Total No. of Questions : 8] **[Total No. of Pages : 2**

P1374

[3965] - 127

M.E. (E & TC) (Microwave)

MACHINE VISION AND PATTERN ANALYSIS

(504207) (2002 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q. 1 and Q. 5 are compulsory, Solve any two questions from the remaining.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is an image file format? Discuss any two formats in detail? **[8]**

b) Write a pseudo code to find the pixel adjacency in an image and mark the connected region. **[6]**

c) What are the statistical properties of an image? **[4]**

Q2) a) What is a histogram? Discuss a technique to improve the dynamic range of the histogram of an image with an example. **[10]**

b) An image is corrupted with salt-and-pepper noise. Which enhancement technique should be applied to remove it? Describe it. **[6]**

Q3) a) What is image segmentation? Write an algorithm for calculating a threshold automatically. **[8]**

b) What is the difference between image enhancement and image restoration? Explain any one technique for image restoration in presence of spatial noise. **[8]**

Q4) a) Explain Hough transform with its applications. **[8]**

b) Explain image opening operation with the help of a binary image and a structuring element. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain how first and second derivatives of an image help in finding the edges. Compare their performance with a suitable example. **[10]**

b) Discuss : **[8]**

i) Region splitting.

ii) Region merging.

Q6) a) Write an algorithm for boundary based descriptor with the help of a suitable example. **[8]**

b) Explain region based description. **[8]**

Q7) a) With the help of an example, discuss how template matching can be used for object recognition. **[8]**

b) What are the different parameters describing shapes of an image? **[8]**

Q8) a) Explain fuzzy systems for object recognition. **[8]**

b) Explain the process of object recognition using neural networks. **[8]**

■ ■ ■

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1382

[3965] - 183

M.E. Electrical (Power System)

SPECIAL TOPICS IN HIGH VOLTAGE ENGINEERING

(503210) (A) (2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the various theories that explain breakdown in commercial liquid dielectrics. **[9]**

b) How do the temperature and moisture affect the breakdown strength of solid dielectrics? **[7]**

c) What are electronegative gases? Why is the breakdown strength higher in these gases compared to that in other gases? **[9]**

Q2) a) Why is a cockcroft-Walton circuit preferred for voltage multiplier circuits? Explain its working with a schematic diagram. **[13]**

b) Give different circuits that produce impulse waves explaining clearly their relative merits and demerits. **[12]**

Q3) a) Electrostatic Generator. **[10]**

b) Marx circuit. **[8]**

c) Impulse current generator. **[7]**

SECTION - II

Q4) a) Why is grounding very important in a h.v. laboratory? Describe a typical grounding system used. **[15]**

b) Explain various auxilliary facilities for large test setups. **[10]**

Q5) a) Discuss partial discharge test set up using straight detection method. **[13]**

b) Explain with a neat schematic diagram the procedure for comparative tracking index measurements. **[12]**

P.T.O.

Q6) Write short notes on :

a) Power supply and safety circuits used in high voltage testing laboratory. **[9]**

b) High voltage resistors and capacitors. **[7]**

c) Radio interference and its measurements. **[9]**

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1388

[3965] - 198

M.E. (Production)

PRECISION ENGINEERING

(2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the influence of geometric accuracy of machine tools on workpiece accuracy. **[8]**

b) Elaborate the errors which are peculiar to NC machines in brief. **[8]**

Q2) a) Illustrate with a suitable example the purpose of using the interchangeability assembly concept in manufacturing. **[8]**

b) Hole $60^{+0.027}$ mm is assembled with shaft $60^{+0.035}_{+0.018}$ mm using selective assembly after dividing the tolerance zones into three groups. Find out the tolerance of the fit without and with selective assembly. **[8]**

Q3) a) Make an optical diagram of a projector, showing how the relative positions of the screen, projection lens and object, affect the magnification and definitions of the image. **[8]**

b) Describe with suitable sketches the influence of machining parameters on surface roughness. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Laser interferometers.

b) Tool Maker's Microscope.

c) Clamping and setting errors.

d) Calculation of clearance in journal bearings.

P.T.O.

SECTION - II

Q5) a) State the principles which govern the design of limit gauges giving examples of such gauges to check : **[8]**

i) Length.

ii) Diameter.

iii) Depth.

iv) Distance between an internal and an external face.

b) Briefly describe the methods used for inspecting screw ring and screw plug gauges. **[8]**

Q6) a) What is meant by automated inspection? Why is it becoming an important part of manufacturing engineering? **[8]**

b) Enumerate your thoughts on the merits and limitations of analog vs. digital measuring equipment. Give specific examples. **[8]**

Q7) a) Discuss the rational subgroup concept. What part does it play in control chart analysis? **[8]**

b) Explain the need of microfinishing processes in the machining of critical parts. **[8]**

Q8) a) A certain dimension of a component produced in quantity on an automatic lathe is specified as 84.60 ± 0.05 mm. A 5% inspection check resulted in the following variation of the dimensions measured to the nearest 0.01 mm.

Dimension (mm)	84.56	84.57	84.58	84.59	84.60	84.61	84.62	84.63	84.64
Frequency	1	8	54	123	248	115	44	6	1

Calculate the mean value and standard deviation for the sample check and draw the frequency curve. Show that for practical purposes the variation of dimension for the whole batch would be expected to fall within the prescribed limits. **[10]**

b) Explain the principle of constant location surfaces with a suitable example. **[8]**

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1393

[3965] - 213

M.E. (Computer Vision)

COMPUTER VISION

(2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as whole.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is image quantization? Explain Scalar and Max quantization. **[8]**

b) Explain T-pyramid and quadtree. **[8]**

Q2) a) What is image smoothing? Explain linear and non linear smoothing. **[8]**

b) What is histogram equalization? Write algorithm for histogram equalization. **[8]**

Q3) a) Explain inner boundary tracing. **[8]**

b) Write generalized Hough Transform algorithm. **[8]**

Q4) Write short notes on : **[18]**

a) Roberts and Laplace operator.

b) Geometric transformation for-

i) Rotation.

ii) Change of scale.

iii) Skewing by an angle.

c) M-pyramid.

P.T.O.

SECTION - II

Q5) a) Define the following border based region descriptors : **[8]**

i) Boundary length.

ii) Curvature.

iii) Bending Energy.

iv) Signature.

b) Explain region decomposition. **[8]**

Q6) a) Describe the following knowledge representation giving at least one example. **[8]**

i) Fuzzy logic.

ii) Semantic net.

b) Explain Mac. Queen K-means clustering. **[8]**

Q7) a) Draw a figure of geometry of a linear perspective camera. **[8]**

b) Explain canonical configuration. **[8]**

Q8) Write short note on : **[18]**

a) Pattern recognition steps.

b) Back propagation learning algorithm.

c) Object recognition as graph matching.

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1394

[3965] - 214

M.E. (Computer Engineering)

BIOINFORMATICS

(2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No. 4 and Question No. 8 are compulsory, out of remaining answer any 2 questions.***
2) ***Draw diagrams wherever necessary.***
3) ***Answers for two sections should be written in separate answer sheets.***

SECTION - I

Q1) a) Draw and explain a plant cell. **[4]**

b) Explain any two biomolecules. **[4]**

c) Write a short note on DNA molecule and its types. **[4]**

d) What are the different types of cells found in human body? **[4]**

Q2) a) Draw and explain the structure of a eukaryotic cell. **[6]**

b) What are the different types of enzymes? **[4]**

c) What is mutation? Explain its types? **[6]**

Q3) a) Write a note on codon usage table. **[6]**

b) What is RNA and explain the types of RNA? **[4]**

c) Distinguish between DNA and RNA. **[6]**

Q4) Write short notes on (Any 6) : **[18]**

a) Prokaryotic cell.

b) Promoter and Enhancer Sequences.

c) DNA replication.

d) Genetic switch mechanism.

e) Lac operaon mechanism.

f) Write formula for (any 3).
A, T, G, C bases.

g) Mechanism of Transcription and Translation of protein.

P.T.O.

SECTION - II

Q5) a) Why is there a need to study Bioinformatics? What are the emerging areas in Bioinformatics? **[6]**

b) What are the current protein and DNA databanks available on internet? **[4]**

c) Explain FASTA algorithm. **[6]**

Q6) a) Write in detail about information in protein databank (PDB). **[6]**

b) Describe the Primary, Secondary and Tertiary structure of proteins. **[6]**

c) Explain multiple sequence alignment. **[4]**

Q7) a) Describe any two methods to predict protein secondary structure. **[6]**

b) Draw and explain Ramchandran plot with reference to protein structure. **[6]**

c) Explain the dot plot method for pairwise sequence alignment. **[4]**

Q8) Write short notes on (any 3) : **[18]**

a) A computer program to convert DNA sequence to protein sequence.

b) Neural Network Method for prediction of protein structure.

c) Markov model.

d) Tertiary Structure Prediction Algorithm.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1408

[3965] - 276

M.E. (CSE) (IT)

DATA WARE HOUSING AND DATA MINING

(Elective - II) (2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve three questions from Section - I and three questions from Section - II.***
2) ***Draw labeled diagrams if necessary.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) Design of star schema for Commonwealth Youth Games (CYG)

Consider particular example of attendance at CYG events. Facts are numbers attending, value of ticket sales. Dimensions include year of CYG, venue, sport, type (common match, semifinal, final), men's/ woman's. Venues are classified by location and type of building into central enclosed, central open, remote. Sports are subdivided into events.

Assume a report representing attendance at various events. State your assumed report before you solve the following :

a) Construct a fact table for this CYG event.

b) What is the key of the fact table?

c) Design a star schema by using the fact table designed in a) and using dimension tables.

[18]

Q2) a) What is data mining? How does data mining differ from traditional database access? **[6]**

b) Discuss in brief the characterization of data mining algorithms. **[6]**

c) Briefly explain the various tasks in data mining. **[4]**

Q3) a) What is Knowledge Discovery in Databases? How does it relate to data mining? **[8]**

b) What is visualization? Discuss in brief the different visualization techniques. **[8]**

P.T.O.

Q4) Write short notes on : **[16]**

a) Discuss the evolution of data mining as a confluence of disciplines.

b) What issues should be addressed by data mining algorithms and products? Why are they relevant?

c) Discuss the need for metrics in data mining.

SECTION - II

Q5) As the project manager for the development of the data warehouse for a domestic sports goods manufacturer, your assignment is to write a proposal for providing metadata. Consider the options and come up with what you think is needed and how you plan to implement a metadata strategy. **[16]**

Q6) a) Distinguish between Star Schema and Snowflake schema. **[8]**

b) Distinguish between OLTP and Data Warehousing system. **[8]**

Q7) a) Which Indexing technique is best suitable for Data Warehouse? **[8]**

b) Write a short note on dimensional modeling. Explain the concept of aggregation hierarchies. **[8]**

Q8) Write short notes on : **[18]**

a) Write a short note on indexing. Distinguish between bitmap indices and join indices.

b) Information filtering techniques for exploring data in databases.

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Total No. of Questions : 06] **[Total No. of Pages : 2**

P1364

[3965] - 40

M.E. (Civil - Structures)

NONLINEAR ANALYSIS OF STRUCTURE

(501509) (2002 Course) (Elective - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Two questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Your answers will be valued as a whole.***
5) ***Use of non programmable pocket calculator is allowed, Use of stability coefficient table is allowed.***
6) ***Assume suitable data if any.***

SECTION - I

Q1) a) Explain Geometric & Material nonlinearities in a structure, Give suitable example. **[8]**

b) Derive from first principles the Moment-curvature nonlinearity equation for a beam. **[7]**

c) Find approximate solution for M - ϕ nonlinear analysis of cantilever beam subjected to point load at its free end. **[10]**

Q2) a) Write strain energies due to stretching and bending, kinetic energy, in isotropic plate. Derive the governing equations. **[18]**

b) Obtain load - deflection relations for nonlinear analysis of orthotropic rectangular plate. Assume approximate solution for in plane translation and transverse displacement. **[7]**

Q3) a) Explain step by step, Method for solution of nonlinear problem. **[6]**

b) Obtain collapse mechanism for beam of length l, loaded with udl, fixed at one end & propped at other end. **[13]**

c) Develop constitutive relation for plates with material nonlinearity. **[6]**

P.T.O.

SECTION - II

Q4) a) Evaluate stiffness matrix for plane frame member. **[15]**

b) develop stiffness matrix for a beam loaded with point load centrally for nonlinear deformation. **[10]**

Q5) The beam ABC is built in at end A & pinned at C. At mid span, B, the beam is connected to the support at D by vertical spring of axial stiffness 'K' construct overall stiffness matrix for the system. Calculator vertical displacement of point B when a vertical load W is applied at B, acting downwards. **[25]**

Q6) a) Write steps involved in elastic-plastic analysis of frame. **[10]**

b) Explain how in two dimensional plate problem nonlinear representation of stress-strain behaviour is accounted. **[15]**

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1413

[3965] - 408

M.E. Civil (Construction and Management)

RESOURCES MANAGEMENT

(2008 Course) (Elective - II) (Theory) (501105)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

(Materials Management)

Q1) a) Carry out A-B-C analysis on the basis of following data related to annual consumption of a construction company : **[10]**

(all figures in thousands of Rs.)

Structural Steel	2800	Precast Piles	350
Cement	5750	Reinf. Steel	950
Bricks	1200	Steel Fixtures	85
Aggregates	750	Timber	750
Paints	680	Rubble	175
Tools and Plant	410	Plumbing	1800
Plastering materials	310	Fuel items	125

Plot the ABC Curve.

b) Discuss in detail the importance of EOQ in Materials management. Also derive the EOQ formula. Explain this concept with a suitable example from construction sector. **[8]**

P.T.O.

Q2) a) Explain the concept of Vendor development and Vendor networking with respect to Materials management. **[8]**

b) Explain with suitable examples how materials management can be an effective tool for project monitoring and control. **[8]**

Q3) a) Codification and classification system is one of the important functions of Materials Management. Explain various methods of codification and classification commonly prevailing. Suggest any one method for construction materials management along with suitable reasons. **[10]**

b) Construction stores layout and overall site house keeping influence the overall productivity and safety on construction sites. Explain this statement with suitable examples. **[6]**

Q4) Write short notes on (any four) : **[16]**

a) Stores Management.

b) Documentation procedures in Materials management.

c) Lead time analysis.

d) JIT System.

e) Materials wastage.

SECTION - II

(HR Management and Equipment Management)

Q5) a) Distinguish between HRM and HRD. Explain in detail various sub-systems involved in HRD. **[9]**

b) In most of the organizations, the vertical growth of an employee is often linked with his productivity and resourcefulness. Explain this statement vis-à-vis construction organization by designing a suitable appraisal system that covers key features that decide the promotion of a particular employee. **[9]**

Q6) A hydro electric power project employs **4 scrapers** of 180 kW engine capacity along with a tractor of 150 kW. The equipment has worked for **8000 hours** on the project and output at present is **185 cu. m/day**. Assume working hours **2000** and working days **200**. The initial cost of scraper is **Rs. 45,00,000/-** and of tractor is Rs. **12,00,000/-**. Life of scraper is **10,000 hours** and that of tractor is **12,000 hours**. Cost of tyre for scraper is **Rs. 2,50,000/-** and life is **3000 hours**. Estimate the hourly ownership and operating cost for **scraper only**. Use the recommendations of Plant and Machinery Committee 1974. Assume suitable data wherever necessary. **[16]**

Q7) a) For a Nuclear power plant construction project you are appointed as a Equipment Manager. You have to decide about purchase of concreting, hauling and conveyance equipments. You have details of two local suppliers and one international supplier. Explain with suitable reasons various steps involved and choice of an appropriate supplier. Assume suitable data if necessary. **[8]**

b) The life and performance of construction equipment is dependent on its maintenance. Do you agree with this statement? Justify the importance of periodic maintenance of construction equipments along with the dos and don'ts during such maintenance exercise. **[8]**

Q8) Write short notes on (any four) : **[16]**

a) Bonus and incentives.

b) Equipment down time.

c) Equipment inspection procedures.

d) Employee training.

e) Issues in man vs. machine operations.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1418

[3965] - 462

M.E. (Civil) (Structures)

DESIGN OF INDUSTRIAL STEEL STRUCTURES

(501405) (2008 Course) (Elective - II)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable calculator, IS 800, IS 875, IS Handbook of steel sections is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A knee braced industrial shed has following data :

a) Span of truss = 16m and Rise of truss = 4.5m.

b) Length of shed = 36m with spacing of trusses = 4.5m.

c) Type of truss = 6 panel Pratt truss.

d) Height upto eaves level = 7m.

e) The basic wind speed is 39 m/s and the building is located in industrial area of plain terrain.

f) A knee brace is parallel to principal rafter which connects panel points of tie member next to support.

g) Column bases are fixed.

Determine the loads at the various panel points of the truss and the columns due to dead load, live load and the wind load.

[25]

Q2) Design **Stepped column** section for the industrial building in which the span and rise of the roof truss are 18 m and 5 m respectively. Use following data :

a) Reaction from roof truss including weight of purlins, roof covering etc. = 15 kN.

b) No side rails and sheeting are provided.

P.T.O.

c) Reaction due to live load = 18 kN.

d) Reaction from crane gantry girder and rails = 8 kN acting at distance 250 mm from the face of column.

e) Basic wind pressure = 1.1 kN/m^2.

f) Height of column upto eaves level = 7m and the crane level is 4m above the base.

g) Weight of crane = 180 kN, Weight of trolly = 75 kN and Crane capacity = 200 kN.

h) Distance between centre of crane wheels = 3m and spacing of gantry = 17m .

[25]

Q3) a) Design the bracket and its connections for gantry given in Que. 2. **[12]**

b) A gable portal frame is having span of 18m. Height upto eaves level is 7m and apex is at 11m above base. Wind pressure intensity is 1.1 kN/m^2. Column ends are fixed. The gable rafter is supported by five columns. The spacing between roof trusses is 4m.

Design gable rafter, side rails (girts) **[13]**

SECTION - II

Q4) a) Design trussed purlin to carry udl of 20 kN/m over simply supported span of 6m. Select your own geometry for trussed purlin. **[20]**

b) What are the advantages and disadvantages of open web frame to be used for industrial shed. **[5]**

Q5) Design a simply supported gantry girder to carry one overhead traveling crane for the following data : **[25]**

a) Weight of trolley, motor, hook etc = 75 kN.

b) Weight of crane girder = 120 kN.

c) Crane capacity = 220 kN.

d) Minimum approach of the crane hook = 1.0m.

e) Distance between centre of crane wheels = 2.5 m and spacing of gantry = 15m.

f) Self weight of rail section = 300 N/m.

Q6) a) Explain design considerations of Machine foundation for impact type machines. **[7]**

b) Explain features of ''Composite flooring'' of industrial building with sketches. **[6]**

c) Explain purpose of bracing system in industrial shed. Draw neat sketches of various bracing systems. **[12]**

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Total No. of Questions : 12] **[Total No. of Pages : 2**

P1444

[3965] - 588

M.E. (Electrical) (Control Systems)

INTELLIGENT CONTROL

(2008 Course) (Elective - IV) (503112)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is an artificial neural network? Mention advantages and disadvantages. **[8]**

b) Give Biological Inspiration for Neural Network and hence explain Simple single Layer Artificial Neuron Model. **[8]**

OR

Q2) a) Explain classification taxonomy of ANN. **[8]**

b) Give Learning rules and hence explain strategies. **[8]**

Q3) The following is the training set for a 2-classification problem. Iterate the Perceptron through the training set and obtain the weights. **[18]**

Inputs		Classification
X1	X2	0/1
0.25	0.353	0
0.25	0.471	1
0.5	0.353	0
0.5	0.647	1
0.75	0.705	0
0.75	0.882	1
1	0.705	0
1	1	1

OR

P.T.O.

Q4) Define generalized delta rule. Write back-propagation algorithm. Evaluate updated weight matrix for 3-input 3-layer 3-output neuron model considering input layer, hidden layer and output layer using back propagation error and delta rule. **[18]**

Q5) a) Explain energy function for a BAM. **[8]**

b) Write simplified Bi-directional Associative memory. **[8]**

OR

Q6) a) Explain Vector Quantization. **[8]**

b) Explain Adoptive resonance theory in detail with architecture. **[8]**

SECTION - II

Q7) a) Explain Fuzzy logic and give its importance in control system. **[8]**

b) Write in detail the evolution phases of fuzzy logic. **[8]**

OR

Q8) What are different fuzzy numbers, operations on fuzzy sets and hence explain. **[16]**

a) Empty fuzzy set.

b) Universal fuzzy set.

c) Equality of fuzzy set.

Q9) Two fuzzy sets are given below. **[17]**

I = {(*F*, 0.4), (*E*, 0.3), (*X*, 0.1), (*Y*, 0.1), (*I*, 0.9), (*T*, 0.8)}

F = {(*F*, 0.99), (*E*, 0.8), (*X*, 0.1), (*Y*, 0.2), (*I*, 0.5), (*T*, 0.5)}

Find I U F, I - F, F U F^c

Also verify DeMorgans Law

OR

Q10)a) Explain in detail Mamdani Inference system. **[9]**

b) Explain Defuzzyfication methods. **[8]**

Q11)Apply fuzzy logic system to Air Conditioner Controller. Enlist the applicable fuzzy rule. Also defuzzyfy the fuzzy outputs. **[17]**

OR

Q12)Robotic Arm Endeffector (with 2 links) is at initial location (1.5, 1.5, 1.5). It is further positioned to final location (2.5, 2.5, 2.5). Design a Neural network model to solve forward. **[17]**

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1367

[3965]-59

M.E. (Mech.) (Heat Power)

ADVANCED AIR CONDITIONING HEATING AND VENTILATION

(502110) (2002 Course) (Elective - II)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, psychrometric chart electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define air conditioning and psychrometrics. Give composition of standard air. Define the following terms. DBT, WBT, DP, RH and humidity ratio. Derive the expression for the same as given below. **[10]**

$$W = 0.622 \frac{p_\vartheta}{p - p_\vartheta}$$ with usual notations.

b) Explain the different types of psychrometers used in practice. **[8]**

Q2) a) Explain the type of psychrometric chart and different processes we come across in practice. **[8]**

b) Discuss the use of Absorbent for hot and humid environment for Air-conditioning. **[8]**

Q3) a) List the sources of heat load and explain how they are estimated in detail. **[10]**

b) Define human comfort and explain use of comfort chart. **[8]**

P.T.O.

Q4) Write notes on (any two) : **[16]**

a) Methods of duct design.

b) Use of Blowers and fans in Air-conditioning and their selection.

c) Typical layout of central Air-Conditioning system and write specifications of the devices used in the system.

SECTION - II

Q5) Give a typical layout of an Auditorium of capacity 1000 seats located in pune where summer conditions may be taken as DBT = 42°C and WBT = 28°C. calculate the load on the Air conditioning system making suitable assumptions. Give the design procedure of such a system. **[16]**

Q6) Write notes on : **[18]**

a) Air locks, Air curtains and Air showers.

b) Laminar flow clean rooms.

c) Modern controls for odour and bacteria.

d) HEPA filters.

Q7) Explain a typical Air conditioning system used on a Modern car. Give the specifications and sketches of all the equipments used on it including climate Box. How the load on such a system is estimated? **[16]**

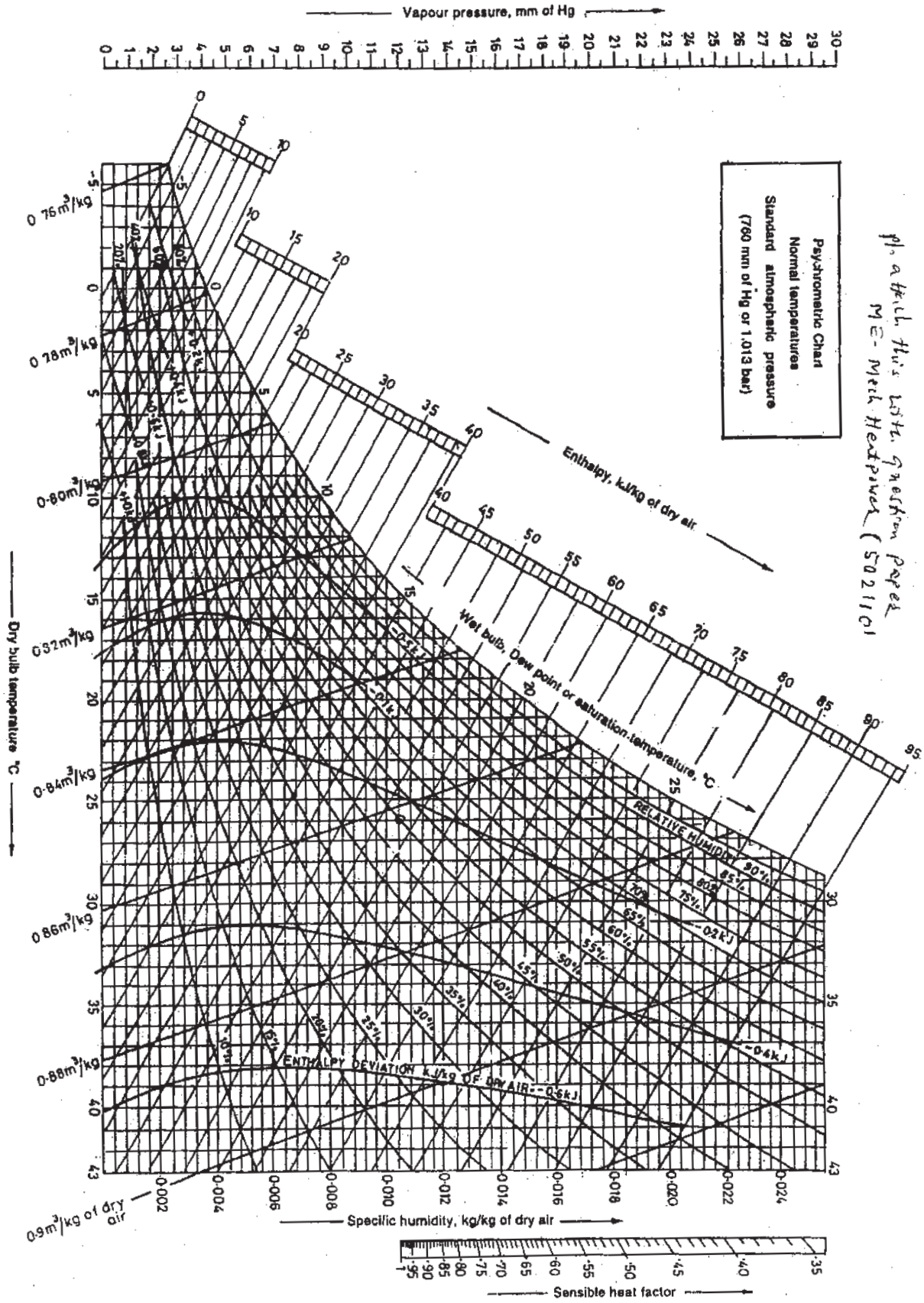
Q8) Explain with neat layout : **[16]**

a) Railway coach Air conditioning.

b) Ship air conditioning.

c) VAV system.

d) Air water system.



Pl. attach this with Question paper
ME- Mech. Heat power (5021)(C)

❑❑❑

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1368

[3965] - 60

M.E. (Mech.) (Heat Power)

GAS TURBINES

(2002 Course) (Elective -II) (502110)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the difference between open cycle and closed cycle Gas turbines. Show the following open cycle arrangements : **[16]**

a) Simple Gas turbine with single.

b) Simple Gas turbine with a heat exchanger/- shaft.

c) Simple twin shaft arrangement.

d) Series flow twin shaft arrangement.

e) Parallel flow twin shaft arrangement.

f) Series flow with intercooling.

g) Series flow with reheating.

Q2) A gas turbine operates on a pressure ratio of 6. The inlet air temperature to the compressor is 300 k and the air entering the turbine is 577°C. If the volume rate of air entering compressor is 240 m^3/s, calculate the net power output of turbine in MW. Also compute the efficiency. Assume that cycle operates under ideal conditions. **[16]**

Q3) A gas turbine with Brayton cycle operates between 27°C and 827°C. Determine the maximum network per kg and cycle efficiency. Derive the expressions use. **[16]**

P.T.O.

Q4) Explain the working of a centrifugal compressor showing : **[18]**

a) A centrifugal compressor stage with all essential parts.

b) The impeller diffuser, diffuser with vanes.

c) Single sided and double sided impeller. pressure rise across the inlet section, impeller and diffuser.

d) Enthalpy entropy diagram and velocity $_{\Delta}$ s.

SECTION - II

Q5) Write notes on : **[16]**

a) Losses in centrifugal compressors.

b) Velocity $_{\Delta}$ s for axial compressor stage.

c) Performance characteristics of axial flow compressors.

d) Surging and stalling.

Q6) Explain the three recognised postulates of gas-turbine combustion Mechanisms. Discuss the factors affecting the combustion chamber design and performance. Sketch a typical combustion chamber. **[16]**

Q7) Write notes on : **[16]**

a) Fuels for gas turbines.

b) Ignition system.

c) Fuel injection system.

d) Flame tube cooling.

Q8) a) Write a detailed note on materials requirements and their selection and methods of manufacturing of various Gas Turbine components. **[9]**

b) Explain the working of a combined cycle power plant. **[9]**

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1458

[3965] - 618

M.E. (E & TC) (Microwave)

FIBER OPTIC COMMUNICATION

(Elective - III) (2008 Course) (504231)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q. 1 and Q. 2 are compulsory solve any two questions from the remaining.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain fiber optic communication system with a neat block diagram. **[8]**

b) Explain any 2 fabrication techniques of fiber. **[8]**

c) What is the acceptance angle for the fiber when n1 = 1.48 and n2 = 1.46. Also find NA. **[2]**

Q2) a) Write a note on attenuation in optical fibers. **[10]**

b) A graded index fiber has the characteristics of N1 = 1.487 and Δ = 1.71%. For a link of 5 km in length, compute pulse spreading due to modal dispersion and determine maximum bit rate. **[6]**

Q3) a) What is pulse spreading? Discuss any one the reason for the occurrence of pulse spreading. Also suggest the mechanism to reduce the same. **[10]**

b) What is OTDR? Explain it. **[6]**

Q4) a) Explain different splicing techniques & the difference between connectors & splices. **[8]**

b) Draw and explain the schematic of optical receiver. **[8]**

P.T.O.

SECTION - II

Q5) a) What is optical switch? Explain its function. Describe any one of the configuration of optical switch. **[8]**

b) Explain the terms : **[8]**

i) BER.

ii) Quantum Limit.

c) A communication system uses optical fiber cable which has an attenuation of A = 0.5 dB/km. Find the output light power if the input power is 1 m W and link length of 15 km. **[2]**

Q6) a) What is mean by link power budget? How to calculate the required length of fiber if rest parameters are given? **[8]**

b) The APD operates at $\lambda = 1 \mu m$. Assuming a zero disparity binary code, estimate the incident optical power required at the receiver to register a binary one with BER of 10^{-9} at bit rates of 10 Mbits s^{-1} and 140 Mbits s^{-1}. The APD has following parameters:
Quantum efficiency = 80%, ratio of carrier ionization rate = 0.02 and operated with multiplication factor of 100. **[8]**

Q7) a) A continuous 40 km long optical fiber link has a loss of 0.4 dB/km calculate. **[6]**

i) What is the maximum optical power level that must be launched into the fiber to maintain the optical power level of 2 micrometer at the receiver end?

ii) What is the required input power if the fiber has a loss of 0.6 dB/km?

b) What are the different challenges in designing of optical fiber network? Explain how to meet these challenges. **[10]**

Q8) a) Explain in detail the concept of WDM. **[8]**

b) Calculate the gain of an erbium fiber if the light input power is 300μ W and output power is 60μ W. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1464

[3965] - 646

M.E. (E & TC) Signal Processing

DIGITAL IMAGE PROCESSING

(Elective - I) (504503) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagram must be drawn wherever necessary.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) a) Give set of intensity slicing transformation equations, which can produce all the individual bit planes in four bit image. **[8]**

b) Binary image of checker board pattern, of size 128 pixels in height and 128 pixels in width is negated and again added to the original image. Sketch the histogram of the original image, negated image and addition of two images. **[8]**

Q2) a) With neat block diagram explain various steps in image processing. **[8]**

b) Explain MTF of human visual system. **[8]**

Q3) a) Explain compression standard 'MPEG'. **[9]**

b) With neat block diagram explain Lossy Predictive Coding. **[9]**

Q4) Write short notes on : **[16]**

a) YIQ color model.

b) Compression of color images.

SECTION - II

Q5) a) Explain multi-resolution representation of an image using wavelet transform. **[8]**

b) What is principal component analysis? Explain. **[8]**

Q6) a) Explain region growing by pixel aggregation. **[8]**

b) Explain edge linking using Hough transform. **[8]**

P.T.O.

Q7) a) Explain image enhancement using Homomorphic filter. **[8]**

b) Explain image restoration using least square filter. **[8]**

Q8) a) Discuss following descriptors : **[9]**

i) Moments

ii) Compactness

iii) Shape number.

b) Explain following morphological operations : **[9]**

i) Opening.

ii) Closing.

■ ■ ■

Total No. of Questions : 08] **[Total No. of Pages : 2**

P1470

[3965] - 665

M.E. (Electronics) (Digital System)

ADVANCED DIGITAL SYSTEM DESIGN

(2008 Course) (Elective - I) (504197)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the methods of control unit implementation? Explain any one method with necessary code, specifications and block diagrams. **[10]**

b) Describe the design issues of RISC & CISC. **[6]**

Q2) a) Implement the Boolean function $f = x_1 x_2 + x_1 x_3$ **[8]**

i) Which type of Hazard exist in the circuit.

ii) Derive the Hazard free circuit of above Boolean function.

b) Explain ASM chart for shift and add multiplier. **[8]**

Q3) a) What is the clock skew? What are the possible problems caused by clocks skew? What is the remedy. **[8]**

b) What is digital signature? What is the use of signature analysis? Explain with a suitable example. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Address and data path architecture of CPU.

b) Fault tree analysis.

c) Switch debouncing.

d) H - tree clock distribution network.

P.T.O.

SECTION - II

Q5) a) Explain how the BIST scheme is implemented for sequential circuits, with necessary block diagram. **[8]**

b) What is boundary scan technique? Explain it's application with neat diagram. **[8]**

Q6) a) What happens to a finite transmission line if it is not terminated in Z_o. **[8]**

b) Explain for digital system. **[8]**

i) Reliability.

ii) Reliability function.

iii) Failure rate.

iv) MTBF.

Q7) a) What is SRAM cell? Design 2 × 2 array of SRAM cell and explain its operation. **[8]**

b) Describe the following design issues with respect to implementation of large circuits on PCB. **[8]**

i) Cross talk.

ii) Power supply noise.

iii) Reflections and terminations.

Q8) Write short notes on (any three) : **[18]**

a) PR BSG.

b) System integrity.

c) Scan path technique.

d) Structure of network design tool.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1473

[3965] - 678

M.E. (Electronics) (Digital System)

DIGITAL SIGNAL COMPRESSION

(2008 Course) (Elective - IV) (504205)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Answer any three questions from each section.***
3) ***Answers to the two sections must be written in separate answer books.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data if required.***

SECTION - I

Q1) a) Generate optimal Huffman codes for a source emitting 6 alphabets with probability specified as. **[9]**

$P(a_1) = 0.2$, $P(a_2) = 0.15$, $P(a_3) = 0.15$

$P(a_4) = 0.3$, $P(a_5) = 0.1$, $P(a_6) = 0.1$

b) Given a source with three alphabets with probabilities $P(a_1) = 0.2$, $P(a_2) = 0.3$, $P(a_3) = 0.5$. If the tag generated using arithmetic coding is 0.046, decode a sequence of length three. **[9]**

Q2) a) Explain backward adaptive quantizer. How will you change a step size by observing the output of the quantizer for a long time? **[8]**

b) Draw a mid riser uniform quantizer input-output mapping with step size of 0.25 volts. If the speech signal has unvoiced segment varying between – 0.3 V to + 0.3 V. Find what will be the output of the quantizer. **[8]**

Q3) a) Explain the advantage of DPCM. Can we use prediction in DPCM? Explain its working. How forward adaptive quantization can be used in DPCM? **[8]**

b) Specify if PCM is a lossy compression or lossless compression? Explain rate distorsion theory. **[8]**

Q4) a) Compare Huffman coding and arithmetic coding. **[8]**

b) Explain what is MIDI? What are its applications? **[8]**

P.T.O.

SECTION - II

Q5) a) Explain desirable properties of any transform. Explain why zig-zag scanning pattern is used for transform output? Explain how using proper step size, the transformed output will lead to compression. **[8]**

b) Consider speech signal with band width of 4 kHz. Explain how will you use subband coding for this signal. What is the advantage of subband coding? **[8]**

Q6) a) Name two different standard wavelets used for image compression. List properties of mother wavelet. Explain two level wavelet decomposition for any image. **[8]**

b) Explain the meaning of perfect reconstruction filters. Why perfect reconstruction is desirable? Explain image compression using coding of DCT coefficients. **[8]**

Q7) a) In case of EZW coding, initial threshold is 16. The sequence of labels transmitted are sp, zr, zr, zr with refinement bit = 1. The next threshold is 8, the coded sequence is iz, zr, zr, sp, sp, iz, iz. The correction bits are 0 1 0. Find reconstructed 4×4 matrix of wavelet coefficients. **[10]**

b) Explain LIP, LIS and LSP in case of SPIHT coding. With suitable example. **[8]**

Q8) a) Explain essential steps in video compression. Explain how motion can be detected? **[8]**

b) Explain the method for music compression. How silence part is compressed? **[8]**

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1479

[3965] - 703

M.E. (Production)

ADVANCE MACHINE TOOL DESIGN

(511104) (2008 Course) (Elective - I) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt one question from each UNIT of Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

UNIT - I

Q1) a) Explain in brief the concept of high speed machining in machine tools. **[8]**

b) Deduce the expression for power in drilling machine and show diagrammatically the forces acting on drill during machining. **[10]**

OR

Q2) a) What is meant by building block concept in machine tool design? **[6]**

b) What are the distinctive features of machining and turning centers? Why are they so versatile? **[6]**

c) Illustrate with a neat sketch the kinematic structure of a radial drilling machine. **[6]**

UNIT - II

Q3) a) Explain why is the stiffness of machine tool important during machining? **[8]**

b) What are the broad considerations for design of machine tool elements such as base and table. **[8]**

OR

P.T.O.

Q4) a) Discuss the importance of following elements in spindle design : **[8]**

i) Diameter of front journal bearing.

ii) Additional spindle support.

iii) Location of bearing and drive element.

iv) Balancing.

b) Explain with neat sketches the methods of preloading of bearings. **[8]**

UNIT - III

Q5) a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. **[8]**

b) What do you understand by hydraulic power pack in machine tool? Explain the factors used for selecting fluids for hydraulic system. **[8]**

OR

Q6) a) A nine speed gear box is to be designed for the minimum speed of 100 rpm and maximum speed of 1600 rpm. It is to be driven by an induction motor rotating at 1440 rpm. Draw best structural diagram, optimum ray diagram and gear box layout. **[10]**

b) With the help of schematic diagram explain the working principle of any one type of mechanical control system incorporated in machine tool.**[6]**

SECTION - II

UNIT - IV

Q7) a) How does a 180^{o} rotation tool changer work? How does a pivot insertion tool changer work in CNC machine? **[8]**

b) What procedure is used by the operator to determine the tool length offsets? **[8]**

OR

Q8) a) Compare CNC machine tool and conventional machine tool with respect to : **[8]**

i) Accuracy.

ii) Rigidity.

iii) Productivity.

iv) Economy.

b) Explain with neat sketches the five basic types of tool changers. **[8]**

UNIT - V

Q9) a) Why is damping of machine tools important? How is it accomplished?**[8]**

b) Explain with suitable example dynamic characteristic of the cutting process. **[10]**

OR

Q10)a) What do you understand by stick-slip motion in machine tool? Explain with a suitable example. **[8]**

b) With suitable sketches explain the procedure followed in performing acceptance tests on drilling machine. **[10]**

UNIT - VI

Q11)a) Discuss in detail modern trends in design of machine tools. **[8]**

b) Enumerate the different CAD techniques applied in design of machine tool structures. **[8]**

OR

Q12)a) Explain with a suitable example the importance of aesthetics in machine tool design. **[8]**

b) Discuss the role of ergonomics in manufacturing of machine tools. **[8]**

■ ■ ■

Total No. of Questions :10] **[Total No. of Pages : 2**

P1370

[3965] - 72

M.E. (Mechanical) (Design Engineering)

COMPUTER AIDED DESIGN

(2002 Course) (Elective -II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write down the principal types of object transformation. Why are homogeneous coordinates often used? **[8]**

b) Compare the various testing methods of IGES processors. Which test is the most comprehensive? Why? **[8]**

Q2) a) What is "graphics software"? What are the functions of it? Explain. **[5]**

b) What are the advantages and disadvantages of the various interactive inputs devises. **[6]**

c) How will you use the CAD/CAM software effectively and efficiently? **[5]**

Q3) a) What are direct and indirect translators? **[5]**

b) Distinguish between Local Area Network and Wide Area Network. **[6]**

c) Where is Hermite cubic spline curve used? **[5]**

Q4) a) How to evaluate points on curve? **[5]**

b) Find the center of the circle tangent to two lines with a given radius. **[6]**

c) Briefly describe various curve manipulations. **[5]**

Q5) a) Q14. A triangular lamina has corners PQR. The coordinates are P(20.20) Q(40.25) and R(30.40). The lamina is rotate about P through 30degree in clockwise direction. **[10]**

i) Obtain the concatenated matrix for the transformation.

ii) Calculate the new coordinates of the triangle.

b) Derive the condition for C^0 and C^1 continuity of a cubic Bezier composite surface of two patches. **[8]**

P.T.O.

SECTION - II

Q6) a) Name three commonly used methods for deriving the element stiffness matrix and element equations. Briefly describe each method. **[8]**

b) Explain how surface can be described mathematically in 3-D space by nonparametric or parametric equations? **[8]**

Q7) a) Briefly explain the three typical areas of engineering where the finite element method is used. **[6]**

b) What is meant by sweep operation in solid modeling? **[6]**

c) What are Triangular Bezier patches? **[4]**

Q8) a) Explain how symmetry is used in FEA with applications. **[6]**

b) What are Gordon surface? **[4]**

c) Why is 3D-modeling important? Explain the limitations of wire-frame modeling over solid modeling? **[6]**

Q9) a) What are the different types of geometric modeling techniques available? What are the common facilities available in solid modeling package? **[8]**

b) Derive an expression for stiffness matrix of a Truss element. **[8]**

Q10)a) How to carry out assembly design using solid models? **[5]**

b) Obtain the stress-nodal displacement relationship for the one-dimensional element. **[8]**

c) What are the transformations required for Isometric Projection and Perspective Projections? **[5]**

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1491

[3965] - 725

M.E. (Production) (CAD/CAM)

CONCURRENT PRODUCT DESIGN

(511203) (Elective - I) (2010 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from Section - I and three questions from Section -II.***
2) ***Use separate answer books for each section.***
3) ***Use of calculator, std. data table is allowed.***
4) ***Assume suitable data, if required.***

SECTION - I

Q1) a) State and explain basic design considerations. **[8]**

b) State and explain technology life cycle. **[8]**

Q2) a) Why process models are important? State and explain types of process models. **[8]**

b) Differentiate sequential design and concurrent design for of Design Product. **[8]**

Q3) a) Explain Design for maintainability and serviceability. **[8]**

b) Explain different factors to be consider while design for packaging and design for handling. **[8]**

Q4) Write a short note on : **[18]**

a) Design for manufacturing.

b) Mass customization.

c) Design specifications for Product.

SECTION - II

Q5) a) Explain different consideration of cost in product design. **[8]**

b) What is the Life Cycle Cost of product? Explain its importance in cost estimation. **[8]**

P.T.O.

Q6) a) Explain the role of supplier in product development. **[8]**

b) Explain in detail internet based product design. **[8]**

Q7) a) What is importance of VRML in concurrent product Design? **[8]**

b) How the concurrent engineering is used to enhance the manufacturability & other attributes of mechanical products? **[8]**

Q8) Write a short note on : **[18]**

a) Cost indexes.

b) PDM tools.

c) Collaborative approach for development of product.

■ ■ ■

Total No. of Questions : 08] **[Total No. of Pages : 2**

P1494

[3965] - 740

M.E. (Computer) Computer Engineering
ADVANCED SOFTWARE ENGINEERING
(510104) (2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate between generic software product development and custom software development. **[4]**

b) Reliability and safety are related but distinct dependability attributes. Describe the most important distinction between these attributes and explain why it is possible for a reliable system to be unsafe and vice versa. **[6]**

c) Bank teller machines rely on using information on the user's card giving the bank identifier, the account number and the user's personal identifier. They also derive account information from a central database and update that database on completion of a transaction. Using your knowledge of ATM operation, write Z schemas defining the state of the system, card validation (where the user's identifier is checked) and cash withdrawal. **[6]**

Q2) a) Explain service oriented architecture with case study in detail. **[12]**

b) Explain difference between thin client and fat client with example. **[4]**

Q3) a) What is essential for forward error recovery to be implemented in a fault-tolerant system? Is forward error recovery possible in interactive systems? **[4]**

b) Explain why a software system that is used in a real-world environment must change or become progressively less useful. **[4]**

c) What are the fundamental differences between components and web services? **[3]**

P.T.O.

d) Why adaptors are usually needed when systems are constructed using COTS? **[3]**

e) What are the principal factors that affect the costs of system re-engineering? **[4]**

Q4) a) Develop the design of the weather station to show the interaction between the data collection sub-system and the instruments that collect weather data. Use sequence charts to show this interaction. **[6]**

b) Identify and briefly describe four types of requirements that may be defined for a computer-based system. **[6]**

c) What is fundamental difference between hardware and software failures? **[4]**

SECTION - II

Q5) a) With a suitable example show how to find cyclomatic complexity? **[8]**

b) Why is software configuration management crucial to the success of large software product? **[4]**

c) Explain why a high-quality software process should lead to high-quality software products. Discuss possible problems with this system of quality management. **[6]**

Q6) a) Why the productivity rate of programmers working as a pair is roughly the same as two programmers working individually? **[4]**

b) Explain how testing is done in extreme programming. **[6]**

c) Write short note on : **[6]**

Clean Room software Engineering.

Q7) a) What are the advantages and disadvantages of using a goal-based rather than a practice-based maturity model? **[6]**

b) What is software, quality? Explain with suitable example measure, Measurement, Metrics and indicator. **[8]**

c) What is meant by risk components and drivers? **[2]**

Q8) Write short notes on (any two) : **[16]**

a) Soft systems.

b) Software Maintenance.

c) Cocomo Model.

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1495

[3965] - 741

M.E. (Computer)

INTELLIGENT SYSTEMS

(510104B) (2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer Three questions from Section - I and Three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain a reflex agent with internal state by describing an agent program with a suitable example. **[8]**

b) What are the properties of environments? Explain the procedure of the basic environment simulator which keeps track of the performance measure for each agent. **[8]**

Q2) a) Explain problem formulation with a suitable example? Describe formulate, search, execute design for the agent. **[8]**

b) How to search strategies are evaluated? Evaluate the Iterative deepening search algorithm with example. **[8]**

Q3) a) What is Constraint Satisfaction Problem (CSP)? Apply CSP for solving 8 Queens problem. **[8]**

b) Prove that A^* algorithm is complete and optimally efficient for any given heuristic function. **[10]**

Q4) a) Solve a shopping problem using problem solving and planning. **[8]**

b) Describe how states, goals and actions are represented using STRIPS language. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain a partial order plan for solving the shoes and socks problem. [8]

b) Write and explain a partial order planning algorithm including nondeterministic algorithm. **[8]**

Q6) a) What is hierarchical decomposition? How to build a frame house problem using hierarchical planning. **[8]**

b) Explain the analysis of hierarchical decomposition. **[8]**

Q7) a) Describe an CPOP algorithm for constructing conditional plans. **[8]**

b) What are issues arrived at designing an agent in real domains and it can be resolved. **[10]**

Q8) a) What is the use of Bayesian Network in probabilistic reasoning? Explain with example a simple Bayesian Network. **[8]**

b) What is the basic task of any probability inference system? Explain the enumeration algorithm for answering queries. **[8]**

■ ■ ■

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1501 **[3965]-742**

M.E. (Computer Engg.) (Computer Network Engg.)

INTERNET ROUTING DESIGN

(510304) (2008 Course) (Elective - I)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

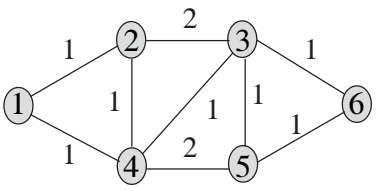
Q1) a) What is CIDR? What are the advantages of CIDR over Classful addressing scheme? **[8]**

b) i) Consider IP address 10.22.8.92 that is given to be part of a /14 address block. Determine the IP prefix it belongs to in the CIDR notation. **[4]**

ii) Consider IP address 10.21.5.90 that is given to be part of a /17 address block. Determine the IP prefix it belongs to in the CIDR notation. **[4]**

Q2) a) What are the disadvantages of Distance Vector Routing? Explain in short Split Horizon technique. **[8]**

b) Apply a simple Path Vector Protocol for link 1-6 using the topology and cost given in figure, ignoring the time dependency. Generate the path table. **[8]**



P.T.O.

Q3) a) What are the sub-protocols of a link state protocol? List the differences between a Distance Vector Protocol and a Link State Protocol. **[8]**

b) Compare various protocols in Distance Vector Protocol family. **[8]**

Q4) Write short note on any Three. **[18]**

a) OSPF link state database synchronization process.

b) Similarities and Differences Between IS-IS and OSPF.

c) Protocol layering in IP.

d) *K*- Shortest Path Algorithm.

SECTION - II

Q5) a) What are the main factors that impact memory requirement at a BGP speaker **[8]**

b) What is Quality of Service? Describe how QoS is provided in MPLS. **[8]**

Q6) a) Describe the importance of classification of IP packets. Explain any one approach. **[8]**

b) Compare different 2-Dimentional Packet Classification Algorithms on the basis of Time and Space complexity. **[8]**

Q7) a) Explain any four close loop flow control strategies. **[8]**

b) Construct a *HiCuts* decision tree for the rules shown in Table 6.1. **[8]**

TABLE 6.1 A two-field classifier.

Rule	F1	F2
R1	0*	10*
R2	0*	01*
R3	0*	1*
R4	00*	1*
R5	00*	11*
R6	10*	1*
R7	11*	00*
R8	*	00*

Q8) Write short note on (any three) : **[18]**

a) Multibit Tries.

b) Characteristics of Network Algorithms.

c) VPN Traffic Engineering.

d) Router Architecture.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1500

[3965] - 757

M.E. (Computer Engineering)

DATA WAREHOUSING AND DATA MINING

(510112) (2008 Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider the data cube Sales_cube [time, item, location] : Sum (sales_in_Rupees). The dimension hierarchies used are "day<month<quarter<year" for time, "item-name<brand<type" for item and " street<city<state<country" for location.

Following materialized cuboids are available

Cuboid 1 : {Year, item_name, city}

Cuboid 2 : {Year, brand, contry}

Cuboid 3 : {Year, brand, state}

Cuboid 4 : {item_name, state} where year = 2011.

Which of the above 4 cuboids should be selected to process the query that is based on {brand, state} with selection constant "year = 2011". **[6]**

b) Discuss the four different views that should be considered while designing a data warehouse. **[6]**

c) Write a note on starnet Model. **[6]**

Q2) a) What is data smoothing? A data string consists of following values.

3, 4, 7, 2, 14, 0, 21, 9, 15.

Find the 3-point and 5-point moving average for the above string for the purpose of data smoothing and rewrite the data string with changed values. **[6]**

b) Discuss various methods to handle missing data. **[4]**

P.T.O.

c) Draw flowchart and explain stepwise forward selection and stepwise backward elimination methods used for attribute subset selection. **[6]**

Q3) a) Consider the following set of values of attribute 'age'.

13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70.

i) Use Min-Max normalization to transform the value **25** for age onto range [0.0, 1.0].

ii) Use z-score normalization to transform value **35** for age, where the standard deviation of age is 12.94 years.

iii) Use normalization by decimal scaling to transform **all** values for age given above. **[6]**

b) What is Sampling? Discuss various forms of sampling. **[4]**

c) Briefly compare. **[6]**

i) Snowflake schema and fact constellation.

ii) Enterprise warehouse, data mart and virtual warehouse.

Q4) a) Consider the following set of transactions : **[6]**

T01	{X, Z}	T02	{U, V, W, X, Y, Z}
T03	{U, W, Y}	T04	{V, X, Z}
T05	{U, Y}	T06	{W, X, Y}
T07	{X, Y, Z}	T08	{U, Z}
T09	{V, Y}	T10	{V, W, X}

Compute the support and confidence for each of the following :

1) $V \rightarrow W$ 2) $X \rightarrow Z$

3) $U \rightarrow Y$ 4) $Z \rightarrow V$

5) $W \rightarrow U$ 6) $Y \rightarrow X$

b) Consider following data : **[10]**

TID	Items	TID	Items
1	i1 i2 i5	2	i2 i4
3	i2 i3	4	i1 i2 i4
5	i1 i3	6	i2 i3
7	i1 i3	8	i1 i2 i3 i5
9	i1 i2 i3		

Assume minimum Support of 20%, calculate the frequent k-itemsets. Suppose {i1, i2, i5} is a frequent, 3- itemset generate 6 possible association rules and compute their confidence levels.

SECTION - II

Q5) a) A multiple dimensional view can be implemented using ROLAP and MOLAP. **[8]**

i) Briefly describe each implementation technique.

ii) For each technique, explain how 'Roll-up' and 'Drill-down' and 'incremental updation' functions may be implemented. Which one you prefer, Why?

b) With suitable example, explain 'Bit-map' and 'Join' indexing techniques. **[8]**

Q6) a) How the decision tree construction algorithms handle numeric values? What is the problem associated with categorical attributes in case of neural network based classifier and how it is over come? **[4]**

b) State Bayes theorem. Discuss the merits and demerits of Bayesian classifier. **[4]**

c) Define 'Entropy' and 'Information Gain'. How the splitting attributes are decided by a Decision tree construction algorithm. **[8]**

Q7) a) What is clustering? Briefly describe the taxonomy of various clustering methods. **[6]**

b) Consider the data about age and income of 6 customers. **[12]**

(21, 21) (22, 26) (25, 35) (27, 24) (27, 18) (29, 15)

Assume a Manhattan distance measure and use k-means clustering algorithm to identify two clusters, starting with the two means : (21, 21) and (29, 15).

Q8) a) Explain distance-based classifiers. Discuss their merits and demerits. **[8]**

b) Write a note on 'Web Mining'. **[8]**

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Total No. of Questions : 08] **[Total No. of Pages : 2**

P1508

[3965] - 778

M.E. (Chemical)

PROCESS DESIGN AND SYNTHESIS

(509104) (2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the approaches for process design. **[10]**

b) What are the stages involved in design of product? **[8]**

Q2) a) Discuss the important parameters in selection of reactor. **[8]**

b) What is life cycle of a process, explain with example. **[8]**

Q3) a) Discuss how environmental aspects are considered in process design in chemical industry. **[8]**

b) Explain working of reactor network with example. **[8]**

Q4) a) What are the various factors affecting the choice of separation methods? **[8]**

b) Write a note on Engineering ethics. **[8]**

SECTION - II

Q5) a) Describe the residue curve map used for azeotropic systems with example. **[12]**

b) Explain an attainable region? **[6]**

Q6) a) Explain construction of composite curve and its significance. **[8]**

b) Discuss thermal coupling of distillation columns. **[8]**

P.T.O.

Q7) a) Explain distillation column sequencing for 4 components mixture. **[10]**

b) Explain criteria of utility selection. **[6]**

Q8) a) Describe heat and power integration used for heat exchanger network and relate it to pinch point approach. **[10]**

b) Explain problem table algorithm method. **[6]**

■ ■ ■

Total No. of Questions : 08] **[Total No. of Pages : 2**

P1516

[3965] - 801

M.E. (Chemical) (Environmental Engg.)

AIR OF NOISE POLLUTION CONTROL

(2008 Course) (509134) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write the Gaussian dispersion model for pollutants. Explain assumptions & limitations of this model. Write the formula for estimation of ground level concentration. **[18]**

Q2) a) Explain the effects of air pollution on materials. Discuss the mechanism of there effects. Write the natural factors which aggravate these effects.

b) Discuss the sampling and monitoring techniques of air pollution. Gives the effects of air pollution.

[16]

Q3) Explain the principle, working and design of the cyclone separator with neat figure. **[16]**

Q4) Write short notes on : **[16]**

a) Control of SO_2.

b) Photochemical smog formation.

SECTION - II

Q5) a) Explain the estimation of plume rise considering buyoncy & momentum components.

b) With a neat sketch, explain importance of isokinetic sampling.

[16]

P.T.O.

Q6) a) What is the difference between sound pressure and sound level?

b) The sound power from a voice shouting is 0.001 W. What is the sound Power level? What are the sound intensity , the sound intensity level, the sound pressure and the sound pressure level at a distance 6m from the source?

[18]

Q7) a) What is air quality Assessment?

b) With respect to vehicular pollution, explain, types of pollutants generated, Air/Fuel ratio and control measures.

[16]

Q8) Write notes on : **[16]**

a) Air pollution laws.

b) Air pollution status in India.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1532

[3965] - 880

M.E. (Instrumentation & Control)

ANALYTICAL INSTRUMENTATION

(2008 Course) (5061104) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Give the classification of Instrumental Techniques in detail. State Advantages and Disadvantages of Instrumental Techniques over classical. **[16]**

Q2) Explain the following with respect to UV - VIS spectro photometer. **[16]**

a) Sources and Detectors.

b) Laws associated with it.

c) Single beam spectro photometer.

d) Typical nature of concentration and absorption.

Q3) Explain principle of emission spectro photometry. Explain the construction and working of flame photometer with neat diagram. State its Limitations.**[16]**

Q4) Define Fluorescence & Phosphorescence. Derive the relationship between Concentration & Fluorescence intensity. Explain filter Fluorescence with neat diagram. **[18]**

SECTION - II

Q5) State different types of Mass spectrometer. Explain the principle, construction and working of Magnetic Mass spectrometer with neat diagram. **[16]**

Q6) Explain the construction and working of Gas chromatography with neat diagram. Draw and explain the chromatogram. **[16]**

P.T.O.

Q7) What is voltammetry? Explain the construction and working of coulometry with neat diagram. **[16]**

Q8) Write short notes on (any two) : **[18]**

a) Scientillation counter.

b) Instrumentation for X-ray spectrometry.

c) Inductively coupled plasma sources.

d) Auger emission spectroscopy with Instrumentation.

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Total No. of Questions : 08] **[Total No. of Pages : 2**

P1538

[3965] - 903

M.E. (Polymer Engineering)

SYNTHESIS AND CHEMISTRY OF POLYMERS

(Elective - I)(2008 Course) (509118)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer Three questions from Section - I and Three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slid rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is polymer degradation? Discuss thermal degradation along with the factors affecting it in detail. **[6]**

b) Give the importance of stoichiometry in polymer synthesis. Discuss the effect of stoichiometric change on polymer structure. **[6]**

c) Write a note on group transfer polymerization. **[6]**

Q2) a) Explain the synthesis of various types of phenolic resins. **[5]**

b) Discuss thermodynamics of polymer dissolution in detail. **[5]**

c) Compare suspension and emulsion polymerization in detail. **[6]**

Q3) a) Discuss how melt polycondensation is different from that of solution polycondensation. **[5]**

b) Why average molecular weight is considered for polymers unlike LMW compounds. Discuss various average MW in polymers. **[5]**

c) Write a note on gelation and crosslinking. **[6]**

Q4) a) Discuss vulcanization reactions in rubber with and without sulphur. **[5]**

b) With suitable reactions explain substitution and hydrogenation reactions in detail. **[5]**

c) Discuss in detail the mechanism for ionic polymerization. **[6]**

P.T.O.

SECTION - II

Q5) a) Give in detail the synthesis of USPE and its uses. **[6]**

b) Discuss the method to determine MW by viscometry. **[6]**

c) Explain the GPC technique to determine MW. **[6]**

Q6) a) Write a note on Carother's equation. **[5]**

b) Discuss plasma polymerization in detail. **[5]**

c) Write a short note on chemistry of PU and silicone polymers. **[6]**

Q7) a) Write the reaction for polymers containing hydroxyl and carboxyl groups. **[5]**

b) Differentiate ultrasonic and mechanical degradation. **[5]**

c) Write a note on polymer supported catalyst. **[6]**

Q8) a) Discuss fractional precipitation technique to determine MWD in polymers. **[5]**

b) Differentiate solid phase and gas phase polymerization in detail. **[5]**

c) Explain ROP mechanism of any one monomer. **[6]**

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Total No. of Questions : 06] **[Total No. of Pages : 1**

P1563

[3965] - 922

M.E. (Printing Engg.)

PRINTING AND PACKAGING MATERIALS

(Elective - I (b)) (2008 Course) (508104)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain process of plate setters and chemicals used for processing of plates. **[10]**

b) Discuss various materials used for making Gravure cylinders. **[8]**

c) Discuss different types of CTP plates used for printing engineering applications. **[7]**

Q2) a) Explain the manufacturing process associated with BOPP film. **[10]**

b) Write a short note on :

Different types of metalised films. **[8]**

c) Discuss the selection criterion of aluminium film over metalised film. **[7]**

Q3) Write short notes on : **[25]**

a) GSM testing procedure and GSM values of PET, BOPP and Polyethylene.

b) Buruing Test for packaging Material.

SECTION - II

Q4) a) How COF plays important role for selection of material used for stacking? **[10]**

b) Discuss bursting strength, puncture strength, drop test, grammage and bond strength. **[15]**

Q5) a) Discuss various applications of liquid inks and paste inks. **[10]**

b) Explain various ingredients of inks used for offset, Gravure and screen printing. **[15]**

Q6) a) Explain colour comparison by Draw Down and Printing. **[7]**

b) Discuss the importance of viscosity measurement in inks. What is the range of viscosity selection for Gravure, Flexo, Screen and offset Printing? **[18]**

■ ■ ■

Total No. of Questions : 06] **[Total No. of Pages : 2**

P1564

[3965] - 923

M.E. (Printing Engineering & Graphic Communication)

DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY

(Elective - I)) (2008 Course) (508104 (C))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) Answer the following :

a) Briefly describe the different steps involved in a research process. **[9]**

b) What is Research? Explain its significance in modern times. **[8]**

c) Distinguish between Research methods and Research methodology. **[8]**

Q2) Answer the following :

a) Explain the concept of Literature review and write down the benefits of Literature review. **[12]**

b) What is Hypothesis? Explain Hypothetical Prosals for future developments and testing. **[13]**

Q3) Answer the following :

a) What is system? Explain the types of system. **[12]**

b) Determine the area of the largest piece of rectangular ground that can be enclosed by 100 m of fencing if part of an existing straight wall is used as one side. **[13]**

SECTION - II

Q4) a) Explain the concept of experimental design & Explain Experiment design procedure steps. **[12]**

b) What is RSM? What are the characteristics and use of RSM? **[13]**

P.T.O.

Q5) Answer the following :

a) Explain facts VS data. **[8]**

b) What is Tabulation? Explain the principles of Tabulation. **[9]**

c) What are the steps involved in product design? **[8]**

Q6) Answer the following :

a) What precaution one has to take while writing the research report ? **[9]**

b) What are the steps involved in writing report? **[8]**

c) Write down the good characteristics of good Abstract? **[8]**

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1372

[3965] - 121

M.E. (E & TC) (Microwave)

MULTIPLE ACCESS COMMUNICATION SYSTEMS

(2002 Course) (504206)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the various multiple access communication techniques. **[8]**

b) A satellite at a distance of 60000 km from a pilot on the earth's surface radiates a power of 3W from an antenna with a gain of 18 dB in the direction of the observer. Find the flux density at the receiving point and the power received by antenna with effective area of 10 m^2. The satellite operates at a frequency of 10 GHz. The receiving antenna has a gain of 50 dB. Find the received power. **[10]**

Q2) a) Explain the terms: **[8]**

i) Traffic measurement units.

ii) Grade of service.

b) Explain the types of satellite orbits. **[8]**

Q3) a) Write a note on antenna link receiver design. **[8]**

b) Write a note on telemetry. **[8]**

Q4) a) Explain ALOHA channel. **[8]**

b) Write a note on spacecraft technology. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the cochannel interference in cellular mobile communication. Discuss the techniques to reduce it. **[10]**

b) Discuss the features and services of CDMA. **[8]**

Q6) a) Explain GMSK modulation technique in detail. **[8]**

b) Explain various handoff mechanisms in CDMA. **[8]**

Q7) a) Explain the GSM architecture with the help of a neat block diagram. **[8]**

b) Explain cordless telephone system. **[8]**

Q8) a) State and explain Kepler's laws of orbital motion. **[8]**

b) How is subscriber authentication and data Encryption done in GSM? **[8]**



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P1377

[3965] - 153

M.E. (Electronics) (Computer)

EMBEDDED SYSTEM & SOFTWARE

(2002 Course) (504402)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Answer any three questions from each section.***
3) ***Answers to the two sections must be written in separate answer books.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data if required.***

SECTION - I

Q1) a) Clearly define the embedded system. Explain function of every essential component of any embedded system. **[8]**

b) Explain any typical application of embedded system. Explain the role of RTOS. **[8]**

Q2) a) What are pointers? What is the use of pointers in 'C' data structures. **[8]**

b) What are essential components of any 'C' program? Explain the function of each. **[8]**

Q3) a) Draw the architectural diagram of Motorola 68 HC11 microcontroller. Explain function of each unit. **[8]**

b) What are important features of ARM controller? What are its applications. **[8]**

Q4) a) Compare RISC and CISC architectures. **[9]**

b) Explain the environment of any simulator. What is a debugger? How it functions? **[9]**

P.T.O.

SECTION - II

Q5) a) Explain what is PCI bus controller protocol. What is the advantage of using a parallel bus? **[8]**

b) Explain the use of CAN controller. Explain any one application of CAN controller. **[8]**

Q6) a) Explain the frame format for IEEE 802.11 protocol for wireless communication. **[8]**

b) What is a Glue logic? Explain the use of PLDs in Digital System design. **[8]**

Q7) a) Explain what is FPGA. What are the essential steps for designing a system using FPGA. **[9]**

b) Write a program for implementation of simple adder using VHDL. **[9]**

Q8) a) What is a real time operating system? Compare RTOs with simple OS. **[8]**

b) Explain RTX 51 environment. How will you use this platform for designing any embedded system. **[8]**

Total No. of Questions : 6] **[Total No. of Pages :2**

P1379

[3965] - 176

M.E. (Electrical) (Power System)

POWER SYSTEM PROTECTION

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the similarities and differences between static relays and digital relays. Compare their advantages and disadvantages. **[8]**

b) Explain under frequency relay. **[8]**

c) Explain working of static over - current relay. **[9]**

Q2) a) With a neat diagram explain working of CVT. **[8]**

b) Write a note on modelling and standards of CTs and PTs. **[8]**

c) Explain with respect to CT. **[9]**

i) Thermal capacity.

ii) Flux swing in core.

iii) Saturation voltage of secondary winding.

Q3) a) What is meant by over - reach of relay? Is it desired or undesired feature? **[7]**

b) Derive from fundamentals the expression for radius of circle and co - ordinates of the centre of a dual input phase comparator. **[10]**

c) Explain duality between amplitude and phase comparators. **[8]**

P.T.O.

SECTION - II

Q4) a) Explain setting and synthesizing relay characteristics of Distance relays. **[12]**

b) Explain three - stepped distance protection scheme of Transmission line. **[13]**

Q5) a) With reference to abnormal operating conditions of synchronous generators explain the protective scheme to be employed against unbalanced loading. Explain the role of negative sequence currents and double frequency currents injected in the rotor. **[16]**

b) Explain Modern bus bar protection scheme. **[9]**

Q6) Write notes on: **[25]**

a) Buchholtz Relay.

b) Effect of magnetising inrush current in transformer.

c) Ratio and phase angle errors in CTs.

d) Effect of power swing on protection of transmission line.

e) Static quadrilateral distance relay.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1389

[3965] - 202

M.E. (Computer Engineering)

EMBEDDED SYSTEM DESIGN

(2002 Course) (Elective - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different characteristics of embedded systems? Explain. **[8]**

b) What are the different design metrics applicable to embedded systems? **[10]**

Q2) a) What are the advantages of using ASIC & ASSP in embedded systems? Explain. **[6]**

b) Name and explain important architectural features of ARM7 processor. **[6]**

c) What do you mean by building ROM image for Embedded systems? **[4]**

Q3) a) It is required to design a real time data acquisition system. For this application select the appropriate processor/microcontroller based on:

i) Instruction cycle time.

ii) Bus width.

iii) Number of interrupts.

iv) On-chip RAM, ROM/Flash memory. **[8]**

b) How contact-less smart card gets power up? Give details. **[8]**

P.T.O.

Q4) a) Explain the following RAM types: SDRAM, EDO RAM and DDR2. **[9]**

b) Explain the data transfer mechanism in I2C protocol with the help of neat timing diagram. **[7]**

SECTION - II

Q5) a) Name and explain topology used to connect devices to host in USB protocol. Also state the application areas of USB. **[8]**

b) List and explain salient features of CAN protocol. Give details about its area of applications. **[10]**

Q6) a) Compare of ISA and EISA buses based on the features such as data rate, data size, connector size, applications. **[6]**

b) Explain the protocol features of CAN. **[6]**

c) What are the important characteristics of I2C protocol? **[4]**

Q7) a) Explain the architecture of CPLD. How it can be programmed? What are its limitations? **[10]**

b) Compare desktop OS and embedded OS. **[6]**

Q8) a) What is Embedded OS? **[4]**

b) Differentiate between soft RTOS and hard RTOS. Also give two examples for each type. **[8]**

c) What are the different IPCs implemented in VxWorks? **[4]**

Total No. of Questions : 10] **[Total No. of Pages : 4**

[3965] - 234

P1396

M.E. (Instrumentation, Process & Biomedical)

ADVANCED MATHEMATICS

(Revised Course 2002) (506101)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With usual notation, prove that (any two): **[6]**

i) $\Delta = \frac{1}{2}\delta^2 + \delta.\sqrt{\left(1+\frac{\delta^2}{4}\right)}$.

ii) $(1 + \Delta)(1 - \nabla) = 1$.

iii) $\nabla\, y_{n+1} = h\left[1+\frac{\nabla}{2}+\frac{5}{12}\nabla^2+.....\right]y_n$.

b) Find the missing values in the following table: **[10]**

x :	45	50	55	60	65
y :	3.0	–	2.0	–	–2.4

Q2) a) The following table gives the results of the measurements of train resistance; V is the velocity in km per hour, R is the resistance in kg per ton: **[8]**

V:	20	40	60	80	100	120
R:	5.5	9.1	14.9	22.8	33.3	46.0

If R is related to V by the relation $R = a+bv+cv^2$, find *a, b* and *c*.

b) Solve $x^4 - 5x^3 + 20x^2 - 40x + 60 = 0$, by Newton - Raphson Method given that all the roots of the given equation are complex. **[8]**

P.T.O.

Q3) a) Apply Runge-Kutta method to find approximate value of y for $x = 0.2$ in steps of 0.1, if $\frac{dy}{dx} = x + y^2$ given that $y = 1$ where $x = 0$. **[8]**

b) Solve, by iteration method, the following equations. **[9]**

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25.$

Q4) a) The population of a certain town is shown in the following table: **[8]**

Year	1921	1931	1941	1951	1961
Population (in thousands)	19.96	39.65	58.81	77.21	94.61

Find the rate of growth of population in 1951

b) Evaluate : $\int_0^{\pi} \frac{\sin^2 \theta}{5 + 4\cos\theta} d\theta$

by Simpson's $\frac{1}{3}^{rd}$ and $\frac{3}{8}^{th}$ rule taking $h = \frac{\pi}{6}$. **[8]**

Q5) a) Use the following table to find x at $y = 10$. **[6]**

x	10	15	17	20
y	3	7	11	17

b) Using Stirling's formula find y_{35}, given $y_{20} = 512$, $y_{30} = 439$, $y_{40} = 346$, $y_{50} = 243$ where y_x represents the number of persons at age x years in a life table. **[7]**

c) Obtain the function whose first difference is $9x^2 + 11x + 5$. **[4]**

SECTION - II

Q6) a) Velocity distribution for a fluid flow is given by $u = -x$, $v = 2y$ and $w = 3-z$. Find the equation of stream line passing through the point (1, 1, 2). **[6]**

b) Prove that Euler's dynamical equations of motion is given by

$$\int \frac{dp}{\rho} + \Omega + \frac{1}{2}(\bar{q})^2 - \frac{\partial \phi}{\partial t} = \text{constant},$$

where ρ be the density, p the pressure, Ω the force potential, ϕ the velocity potential and $\bar{q}$ the velocity of the fluid. **[10]**

Q7) a) Show that the velocity potential $\phi = \frac{a}{2}\left(x^2 + y^2 - 2z^2\right)$ satisfies the Laplace's equation. Also determine the stream lines. **[5]**

b) Determine the condition that $\bar{q} = (ax + by)\,\bar{i} + (cx + dy)\,\bar{j}$ may give the velocity of an in compressible fluid. Show that the stream lines of this motion are rectangular hyperbolas when the motion is irrotational. **[5]**

c) A liquid Mass is rotating with a constant angular velocity ω about a vertical axis under the action of gravity. Find the pressure at any point of the liquid if the motion is steady. **[6]**

Q8) a) Given the PDF: $f(t) = \begin{cases} \dfrac{0.001}{(0.001t+1)^2} & ,t \geq 0 \\ & ,otherwise \end{cases}$

for the random variable T, the time (in operating hours) to failure of a compressor, what is it's reliability for a 100 - hour operating life? And what is the design life for a reliability of 0.95 to be desired? **[6]**

b) Show that

$R_1(t) = e^{-0.002t}$, $t \geq 0$ and

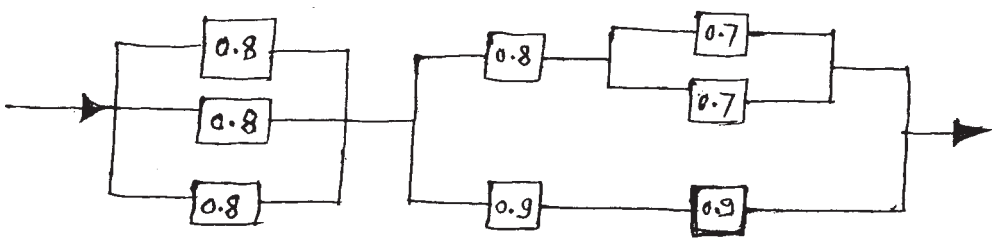
$R_2(t) = \dfrac{1000 - t}{1000}$, $0 \leq t \leq 1000$.

have the same mean but their reliabilities are quite different for the same operating time. **[5]**

c) An aircraft engine consists of three modules having constant failure rates of $\lambda_1 = 0.002$, $\lambda_2 = 0.015$ and $\lambda_3 = 0.0025$ failure per operating hour. Find the MTTF. **[5]**

Q9) a) The three parameter Weibull has $\beta = 4$, $t_0 = 100$ and $\theta = 780$. Compute its MTTF, median, standard deviation and reliability for a 500 – hr mission. **[8]**

b) Find the system reliability of the following series - parallel configurations. Component reliabilities are given. **[8]**



Q10)a) A requirement exists for an engine fuel pump to be repaired (or replaced) within 3 hr 90 percent of the time. If the repair distribution is lognormal with S = 0.45, what MTTR should be achieved to meet this goal? **[9]**
[Given : 1.28 is the normal deviate (z - value) corresponding to a cummulative probability of 0.90].

b) A component has MTBF = 200 hr and MTTR = 10 hr. With both the failure and repair distributions exponential. Find the interval availability for the first 10 time units. **[9]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1400

[3965] - 264
M.E. CSE (I.T.)
OPERATING SYSTEMS
(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Describe a mechanism for implementing consistent ordering of messages in each of the following cases: **[10]**

i) One to many communication.

ii) Many to one communication.

iii) Many to many communication.

b) What are the differences between replication and caching? What are the advantages of replication of data in a distributed file system? **[8]**

Q2) a) Discuss the reasons why distributed computing systems are gaining popularity? **[8]**

b) Describe the wait-for-graph (WFG) based distributed algorithm for deadlock detection. **[8]**

Q3) a) Discuss the desirable features of a good distributed file system. **[8]**

b) Describe how address translation takes place with the help of neat diagrams in **[8]**

i) Paging.

ii) Segmentation.

P.T.O.

Q4) a) Implement the Reader Writer problem using semaphores and discuss how the critical section requirements are fulfilled. **[8]**

b) Discuss the desirable features of a good process migration mechanism. **[8]**

SECTION - II

Q5) a) Explain any two address space transfer mechanisms which are suitable for a process migration facility with high performance and high reliability goals. **[8]**

b) Describe the implementation of logical clocks using: **[8]**

i) Counters. ii) Physical clocks.

Q6) a) What is the primary motivation behind the development of a light weight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. **[8]**

b) Explain the Bully and Ring election algorithms. Discuss the time complexity for both algorithms. **[8]**

Q7) a) Discuss the relative advantages and disadvantages of the various data locating mechanisms that may be used in a DSM system that uses the NRMB strategy. **[8]**

b) What are the main causes of thrashing in a DSM system? What are the commonly used methods to solve the thrashing problem in a DSM system? **[8]**

Q8) Write short notes (Any three) **[18]**

a) Token ring algorithm.

b) Scalability.

c) Mutual exclusion.

d) RPC.

Total No. of Questions : 8] **[Total No. of Pages :3**

P1401

[3965] - 265
M.E. CSE (IT)
ADVANCED DATABASE SYSTEM
(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question 1 and 5 are compulsory. Answer any other two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider a relation schema R and set of functional dependencies hold on R

R = (project-number, project-name, employee-number, employee-name, job-class, charge-per-hour)

project-number $\rightarrow$ project-name
employee-number $\rightarrow$ employee-name, job-class
employee-number $\rightarrow$ charge-per-hour
job-class $\rightarrow$ charge-per-hour,

assuming that the relation R is in 1NF; convert R into 3NF. **[12]**

b) Consider relation R1 and functional dependencies holds on R1

R1 = (A, B, C, D)
AB $\rightarrow$ C
AB $\rightarrow$ D
C $\rightarrow$ B, assuming that R1 is in 1NF,

i) Is R1 in 3NF?

ii) Is it in BCNF? If no then bring it in BCNF. **[6]**

Q2) a) A cricket tournament of 6 countries is held at Delhi. The participating countries are India, Pakistan, Sri-lanka, Austrelia, New-zeland, and England. Each country has a team of 15 players, a coach and a manager. The team has a captain, vice-captain and a wicket keeper. Out of 15 players only 11 of team play in any match. Design an ER model associated with above description. **[12]**

P.T.O.

b) Consider 4 relations R1, R2, R3 and R4 of sizes 10, 20, 30, 40 KB, respectively. If the disk block size is 5 KB, calculate I/O cost of nested join. **[4]**

Q3) Consider the following transactions. **[16]**

Transaction T1	Transaction T2	Transaction T3
Read (X)	Read (Z)	Read (Y)
Write (X)	Read (Y)	Read (Z)
Read (Y)	Write (Y)	Write (Y)
Write (Y)	Read (X)	Write (Z)
	Write (X)	

Write algorithms to

a) Create all possible schedules for the three transactions given above.

b) To determine which of those schedules are conflict serializable and which are not. Print the schedule for each conflict serializable schedule.

Q4) a) Discuss the problems of deadlock and starvation and the different approaches to deal with these problems. **[5]**

b) What is multiple granularity locking? Under what circumstances is it used. **[4]**

c) Discuss the UNDO and REDO operations in the context of Database recovery with examples. **[7]**

SECTION - II

Q5) a) Consider the following extension to the tree-locking protocol, which allows both shared and exclusive locks: **[8]**

i) A transaction can be either a read-only transaction, in which case it can request only shared locks, or an update transaction, in which case it can request only exclusive locks.

ii) Each transaction must follow the rules of the tree protocol. Read-only transactions may lock any data item first, whereas update transactions must lock the root first.

Prove whether or not this protocol ensures serializability and deadlock freedom.

b) Compare the deferred and immediate modification versions of the log based recovery scheme in terms of ease of implementation and overhead cost. **[5]**

c) What is a recoverable schedule? Why is recoverability of schedules desirable? Are there any circumstances under which it would be desirable to allow non-recoverable schedules? Explain your answer. **[5]**

Q6) a) Consider a relation that is fragmented horizontally by plant-number:

Employee (name, address, salary, plant number)

Assume that each fragment has two replicas : one stored at the New York site and one stored locally at the plant site. Describe a good processing strategy for the following queries entered at the San Jose site.

i) Find all employees at the Boca plant.

ii) Find the average salary of all employees.

iii) Find the highest paid employee at each of the following sites : Toronto, Edmonton, Vancouver, Montreal.

iv) Find the lowest-paid employee in the company. **[12]**

b) What is meant by data allocation in a DDBMS? What typical units of data are distributed over various sites? **[4]**

Q7) Consider the following relations: **[16]**

BOOKS (Books#, Primary _Author, Topic, Total_Stock, $Price)
BOOKSTORE (Store#, City, State, Zip, Inventory-value)
STOCK (Store#, Book#, Qty)

a) Give an example of two simple predicates that would be meaningful for the BOOKSTORE relation for horizontal partitioning.

b) How would a derived horizontal partitioning of STOCK be defined based on the partitioning of BOOKSTORE?

c) Show predicates by which BOOKS may be horizontally partitioned by topic.

d) Show how the STOCK may be further partitioned from the partitions in (b) by adding the predicates in (c).

Q8) Write Short Notes on: **[16]**

a) OLTP v/s DSS.

b) Data Mining and Data Warehousing.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1407

[3965]-273
M.E. CSE (IT)
OBJECT ORIENTED SYSTEMS
(Elective - I) (2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q. 1 and Q. 5 are compulsory. Of the remaining attempt any two in Section - I and any two in Section - II.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures in black to the right indicate full marks.***
4) ***Make suitable assumptions, wherever necessary.***

SECTION - I

Q1) a) Draw a class diagram for the following system : "PARKING LOT" for your college is multistoreyed with two wheeler parking on the floor one, visitor parking and VIP parking at ground floor. Cars parking is on upper floors. Employees can pay quarterly or yearly. Visitors pay on a daily basis. System has a GUI to show floorwise plan, show free slots, cars location. Members use swipe card to enter/exit the parking lot. System can help locate free slots, can reserve cars for VIP members, generate space utilization reports too. **[10]**

b) With examples of your choice illustrate the following concepts: **[8]**

i) Sequential substates.

ii) Object flow in an activity diagram.

Q2) a) Draw a sequence diagram for the usecase described below:

Consider the usecase "Buy an insurance policy". Key steps of the use case could be to get customer details, get customer needs, offer policy list and detail of various policies available. Based on customer choice of the policy, he is made a policy member and first premium is paid by customer by credit card (validation needed). State whatever assumptions you make in this use case "Buy an insurance policy". **[8]**

b) From the above insurance system example, with additional assumptions if needed, show the following concepts in context of a collaboration diagram. Concepts : Message nesting, link, iteration, guard condition, creation of object and actor. You could draw a collaboration diagram to show all concepts in the same diagram or show small collaboration diagram parts to show the above concepts. **[8]**

P.T.O.

Q3) a) A customer places an order with a supplier. The order is for various numbers of different kinds of parts. An order consists of a number of order lines; each line specifies a particular part from the supplier's catalogue, and says how many are to be ordered. In response to an order, the supplier makes up a delivery, consisting of all the ordered parts. Draw the class diagram and any 2 Interaction diagrams for this system. **[12]**

b) Write a note on 'Stubs and Skeltons in CORBA'. **[4]**

Q4) a) A simple system is to be developed to support the management of exercises completed by students taking a course. Students first meet with the course tutor to register for the module, and then during the course they submit a number of pieces of work. At any point, a student can find out from the system the marks they have received for any exercises already completed. The course tutor can enter a mark for a piece of work, and print out a summary of the marks gained by all students on course. Describe suitable use cases and draw various UCDs for this system. **[12]**

b) Explain Forward and Reverse engineering a USE CASE Diagram. **[4]**

SECTION - II

Q5) a) What is the purpose of CRC cards? How collaboration is related to Abstraction principles? What are the types of Analysis classes? What is the difference between Services and Responsibilities of a class? **[9]**

b) There is a need to automate the Sales Monitoring System of a Departmental Store. Identify the Problem Issues and narrate the Problem Statement. Perform Traceability of the Problem Statement and draw UML Use Case Diagrams (SCD and RCD (Any Two Goal Level Use Case partitions should be considered for RCDs)). **[9]**

Q6) a) For a manufacturing company, inventory control system is to be automated. The system incorporates the details for requirements of products, maintenance of its catalogue, product sales and demand. The system generates reports on demand and able to process queries from users. Clearly indicate the problem partitions. Draw a detailed software class diagram. **[12]**

b) What do you mean by visibility of elements in class diagrams? How it supports access mechanisms? **[4]**

Q7) a) Suppose that an environmental monitoring station contains three sensors, namely a thermometer, a rain gauge and a humidity reader. In addition, there is an output device, known as a printer, on which the readings from these three sensors are shown. Readings are taken and transcribed onto the printer every five minutes. This process is known as 'taking a checkpoint'. Draw an object diagram showing a plausible configuration for these objects, and include on the diagram the messages that might be generated in the system every time a checkpoint is taken. Assume that a checkpoint is initiated by a message sent from a timer object to the monitoring station. Does you diagram clearly show the order in which messages are sent? If not, how this might be shown. **[10]**

b) Write a note on 'Analysis, Design and Implementation to realize Use Cases'. **[6]**

Q8) a) Many programming languages define a notion of scope. Every identifier is declared within some scope, and it is an error to declare two or more identifiers with the same name in the same scope. Scopes can be nested, however, and an identifier can be defined in an inner scope with a name that has been used in an outer scope. Draw two class diagrams modeling these facts about scopes and identifiers, one using qualifiers and one not. Compare the two resulting diagrams and decide which is the more accurate representation of the situation being described. **[12]**

b) In brief give UML History. What were the goals, objectives of the UML team. **[4]**



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1409

[3965] - 289

M.E. (Chemical)

ADVANCED MOMENTUM & HEAT TRANSFER

(2002 Course) (109101) (Theory)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures on the right indicate full marks.***
4) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Write the chemical reactions wherever necessary.***

SECTION - I

Q1) a) Using Hagen - Poiseuille's Law show that the pressure gradient, $\Delta P/L$, is given by the following expression: **[4]**

$$\Delta P/L = [4\mu^2/\rho R^3]R_e$$

Assume common symbols.

b) For turbulent flow in circular tube

$$V/V_{max} = [1 - (r/R)]^{1/n}$$

Show that the ratio of average (V_{av}) to maximum (V_{max}) velocity is given by $V_{av}/V_{max} = 2n^2/(n+1)(2n+1)$ **[6]**

Assume common symbols.

c) Write a general expression for mass flow rate of a polymer liquid, described by Power Law model and show how the expression simplifies to Hagen - Poiseuille Law. State conditions. **[2]**

d) Derive equation of motion in dimensionless form. **[6]**

Q2) a) A polymer liquid, described by the power law, flows through a long circular tube of radius R and length L. The fluid velocity is described by the equation:

$$m(-dv_z/dr)^n = ([P_0 - P_L]/2L)r$$

P.T.O.

Show that the mass flow rate (w) of the fluid is given by **[5]**

$$W = [(\pi R^3 \rho) / (n^{-1} + 3)] [(P_0 - P_L)R / 2mL]^{1/n}$$

Assume common notations.

How the above equation is used to experimentally determine the power law parameters m and n? **[1]**

b) Define non-Newtonian fluid giving basic mathematical expression. **[2]**

c) A cylindrical rod of diameter kR moves axially with a velocity V along the axis of a cylindrical cavity of radius R. Assume that the fluid in the cylindrical cavity moves only due to rod motion. Show that the velocity distribution in the narrow angular region is given by **[10]**

$$V_Z/V_\theta = \ln (r^\theta / R) \ / \ln k$$

Assume common notations.

Q3) a) Write Rabinowitsch - Mooney equation, explain notations and give dimensions. **[2]**

b) Obtain the following from Navier - Stokes equation

i) Creeping flow equation. **[2]**

ii) Euler equation. **[2]**

c) What is friction velocity (V_*) for turbulent flow? The dimensionless velocity distribution for turbulent flow in circular tube is expressed as:

$$V_x/V_* = 2.5 \ln(yV_*\rho/\mu) + 5.5$$

Show that the average velocity (V_{av}) is given by:

$$V_{av} / V_* = 2.5 \ln(RV_*\rho/\mu) + 1.75$$

Assume common notations. **[10]**

Q4) a) Two unbaffled tanks, one large and another small, filled with oil, are agitated. The agitators have impellors with diameter D_1 and D_2 rotating at speed N_1 and N_2 respectively. Show that the dynamic similarity, which is similar vortices in both tanks, can be achieved with

$$\mu_2/\rho_2 = [\mu_1 / \rho_1] [D_2 / D_1]^{3/2}$$ **[6]**

Discuss the result. **[2]**

b) Using shell momentum balance, obtain an equation to determine viscosity in a capillary tube viscometer. **[6]**

State assumptions made while deriving the equation. **[2]**

SECTION - II

Q5) a) Liquefied gas is stored in a well-insulated spherical container, vented to the atmosphere. The radii of inner and outer walls are r_0 and r_1 and the temperature T_0 and T_1, respectively. The thermal conductivity of the insulation varies linearly with temperature, from k_0 at T_0 to k_1 at T_1. Show that the steady state heat transfer rate is given by the following expression.

$$Q = 4\pi r_0 r_1[(k_0 + k_1) / 2)] [(T_1 - T_0) / (r_1 - r_0)]$$ **[10]**

b) Apply the statement of conservation of energy to the fluid in the macroscopic flow system and show that the steady state macroscopic energy balance is given by **[6]**

$$\Delta [H + \tfrac{1}{2}(V^3 / V) + gh] = Q + W$$

State assumptions.

c) How is thermal diffusivity defined? What are its units? **[2]**

Q6) a) A polymer fluid obeying Ostwald de Waele Model flows throught two coaxial cylinders, having a gap b between two shells. **[8]**

$$T_{xz} = -m(dV_z / dx)^n$$

Show that the viscous heating term (S_v) is given by

$$S_v = m(V / b)^{n+1}$$

b) Explain different methods for power number correlation in non-Newtonian agitation. **[8]**

Q7) a) What is heat transfer augmentation? Explain active and passive methods of heat transfer augmentation. **[6]**

b) Consider an electric wire of circular cross section with radius R and the thermal conductivity and electrical conductivity, k and k_e respectively. The temperature at distance r from the wire axis is given by

$$T - T_0 = [I^2 R^2 / 4k_e k] [1 - (r/R)^2]$$

i) What is the maximum temperature rise? **[2]**

ii) Show that the temperature rise averaged over the cross section is given by **[8]**

$$T_{av} - T_0 = I^2 R^2 / 8k_e k$$

Q8) Write short notes on any four of the following: **[16]**

a) Significance of Brinkman number.

b) Heat transfer analogies.

c) Equation of mechanical energy.

d) Concept of tensor.

e) Heat transfer in liquid metals.

Total No. of Questions : 8] **[Total No. of Pages :2**

P1415 **[3965] - 415-A**

M.E. (Civil Construction and Management Theory)

INFRASTRUCTURE DEVELOPMENT

(501111) (Elective - III) (2008 Course)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question No. 1 and 5 are compulsory out of the remaining attempt any two Questions from Section - I and two Questions from Section - II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) With respect to the Central Governments budget of 2010-11 for India, explain.

i) Various provisions made for development of physical infrastructure. **[6]**

ii) Experts opinions on the provisions. **[3]**

iii) Comparison with budget 2009-10 as regards infrastructure sector. **[3]**

iv) Your individual opinion about the budget. **[2]**

b) Explain GMR's contribution in the development of the infrastructure in India. **[4]**

Q2) Explain in brief the various phases in the creation of road infrastructure in India, as planned at the National level. Discuss the salient features of the Satara-Kolhapur-Kagal NH-4 project. Compare life cycle costing of cement concrete pavements with bituminous low volume rural roads with a case study. **[16]**

Q3) What constitutes the JNNURM program? How is the program implemented through the participation of the Central, state Govt. ULB's etc. Through the various PPP models? What is the expected outcome of the entire programme? What problems may be faced during implementation? **[16]**

Q4) a) Explain recent developments being implemented or planned in the near future in India with respect to: **[9]**

i) Aviation sector. ii) Power sector.

iii) Rural development.

P.T.O.

b) Discuss the role of IIFCL in infrastructure growth in India. **[3]**

c) In case of Sion flyover in Mumbai, explain how the benefits as well as the costs were worked out. Comment on the accuracies of the estimates. **[4]**

SECTION - II

Q5) What are the major issues, elements resulting in problems involved in formation of the construction policy plans at national level restricted by CAC? Explain any one of them in detail. What is the schematic plan for implementation of the above policy? **[18]**

Q6) a) Which are the major transportation systems required to be covered in Infrastructure Planning and design of roads? **[8]**

b) Explain in details any one of the above systems giving functional classification. **[8]**

Q7) a) What are the objectives being adopted to fulfil the resource gap by P-P-P in airport infrastructure? **[8]**

b) Name the methods followed by the govt in construction of the green field airports and explain the salient features of each of the methods giving facilities offered by the govt. **[8]**

Q8) Write short notes on (**any three**): **[16]**

a) Provisions made in National electricity policy.

b) Source of financing PPP mode for port construction.

c) Provisions made in any one airport developed by private sector using PPP model.

d) Policies and incentives followed by NHDP in road works.

e) Advantages of BRTS proposals.

f) Alternative source of Energy.

Total No. of Questions : 6] **[Total No. of Pages :2**

P1419

[3965] - 469

M.E. (Civil-Structures)

NON-LINEAR ANALYSIS OF STRUCTURES

(Elective - III) (2008 Course) (501411)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain 'Material Nonlinearity of beam' with examples. **[5]**

b) Find the solution for a moment curvature by non linear analysis of a simply supported beam subjected to concentrated load at midspan. **[12]**

c) Derive the equation of geometrical non linearity of beam with hinged ends due to stretching. **[8]**

Q2) a) Explain 'Geometric Nonlinearity of plate' **[4]**

b) Explain 'Displacement Equations Approach' of nonlinear analysis of plates. **[8]**

c) using stress function approach, write the strain energies due to stretching, bending and kinetic energy of an orthotropic plate. **[13]**

Q3) a) Derive the equation for maximum deflection of rectangular plate by nonlinear analysis. **[17]**

b) State different out of plain and in plain boundary conditions for the analysis of plates. **[8]**

P.T.O.

SECTION - II

Q4) a) Obtain the deflection components of cantilever column at post-buckling stage due non linear behaviour. **[20]**

b) Explain Ramberg-Osgood stress strain relationship. **[5]**

Q5) a) Explain procedure to find member forces of truss by nonlinear analysis with suitable example. **[12]**

b) Explain with diagrams and derivation, the deformation of square pinned-fixed frame for compressive loading. **[13]**

Q6) a) Write procedure for elastic plastic analysis of **[12]**

i) Frames.

ii) Propped cantilever.

b) Obtain stiffness Matrix for a member with a hinge by elastic - plastic Analysis. **[13]**

Total No. of Questions : 8] **[Total No. of Pages :3**

P1425

[3965] - 489

M.E. (Mechanical - Heat Power)

NUMERICAL METHODS IN THERMAL & FLUID ENGINEERING

(502101) (2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Lee and Duffy relate the friction factor for flow of a suspension of fibrous particle to the Reynolds Number 'Re' by the following empirical equation.

$$\left(1/f\right)^{0.5} = \left(1/k\right).\ln(\mathrm{Re}.f^{0.5}) + \left(14 - 5.6/k\right)$$

Where '*f*' is friction factor, Re is Reynolds Number & k is a constant depending on concentration. For a suspension with 0.08% concentration k = 0.28. What is the value of f if Re = 3750?

Draw the flow chart / Algorithm of the method you use in the above problem. **[18]**

Q2) Solve the following system using Gaussian Elimination method. **[16]**

$5x_1 + x_2 + 2x_3 = 3.5$
$3x_1 - 2x_2 + 2x_3 = 5.5$
$x_1 + 2x_2 + x_3 = -0.5$

Q3) A metal sphere 25 mm in diameter, initially at 325ºC, is immersed in a oil bath at 0ºC. The following table gives measurement of the sphere's temperature versus time.

Time (Sec) (*x*)	0	1	2	3	4	5	6
Temperature (ºC) (y)	325	150	65	30	15	5	2

Using least square technique fit a curve $y = ae^{bx}$, and calculate values of 'a' and 'b'. **[16]**

P.T.O.

Q4) The equation describing the water height h in a spherical tank with a circular drain of area A at the bottom is

$$\Pi\left(2rh-h^2\right)\frac{dh}{dt}=-cd.\text{A.}\sqrt{2gh}.$$

Suppose the tank radius is r = 3 meter and that the circular drain hole has a radius of 20 mm and cd = 0.5. Initial water height is h(0) = 5m.

Estimate the height of water in spherical tank after 2 min. Take Δt = 1min. **[16]**

SECTION - II

Q5) The following table gives the values of critical cavitation factor 'σ' and specific speed 'Ns' for francis turbine,

Ns	200	250	300	350	400
σ	0.086	0.122	0.17	0.23	0.3

Determine value of 'σ' at Ns = 225 and 375 using Newton's interpolation formula. **[16]**

Q6) a) Derive Gauss two point formula and use the formula to evaluate,

$$I=\int_0^1 e^{-x^2}\,dx$$ **[8]**

b) Evaluate using Gauss quadrature (3 point formula in both directions)

$$\int_{-0.2}^{1.4}\int_{0.4}^{2} e^x\cos(x)\,dy\,dx$$ **[10]**

Q7) Find solution of boundary value problem by suitable method

$$\frac{\partial^2 u}{\partial t^2}=\frac{\partial^2 u}{\partial x^2},\ 0\le x\le 1$$

Subject to u (x, 0) = sin (πx), $0 \le x \le 1$

$\frac{\partial u}{\partial t}$ (x, 0) = 0, $0 \le x \le 1$.

u (0, t) = 0, u (1, t) = 0, t > 0

Take Δh = 1/5 and Δt = 3/4. Estimate u value at t = 1.5. **[16]**

Q8) a) Employ the Power Method to determine the highest eigen value for the following set of equations.

$$3.556\, x_1 - 1.778\, x_2 = \lambda x_2$$

$$-1.778\, x_1 + 3.556\, x_2 - 1.778\, x_3 = \lambda\, x_2$$

$$-1.778\, x_2 + 3.556\, x_3 = \lambda x_3$$ **[10]**

b) What are eigen value problems? How are they different from boundary value problems? **[6]**



Total No. of Questions : 10] [Total No. of Pages :2

P1435

[3965] - 523

M.E. (Mechanical) (Design Engineering)

COMPUTER AIDED ENGINEERING

(Elective - III) (502211) (2008 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain generalized procedure for modeling and simulation of mechanical systems. **[8]**

b) Explain the role of assembly modeling in CAE. **[8]**

Q2) a) Explain with suitable example, how the model geometry is used for analysis and simulation of mechanical systems. **[8]**

b) Explain the role of solid modeling in simulation with suitable example. **[8]**

Q3) a) Differentiate between feature based modeling and constrained based solid modeling techniques. **[8]**

b) What do you understand by coupled thermo mechanical stress analysis, explain with suitable example. **[8]**

Q4) a) Explain typical issues in contact analysis used in FEA. **[8]**

b) Differentiate between static, Dynamic and fatigue analysis used in FEA. **[8]**

Q5) Write short notes on:

a) Optimization in FEA Software. **[6]**

b) Bottom up assembly modeling approaches. **[6]**

c) Analytical techniques for structural systems. **[6]**

P.T.O.

SECTION - II

Q6) a) Classify 3D meshing techniques of FEA and explain any one in detail. **[8]**

b) Enlist different types of methods to verify FEA Results. **[8]**

Q7) a) Explain the quality checks used to check 2D meshing in FEA. **[8]**

b) Explain 'P' and 'h' Version of mesh refinement methods. **[8]**

Q8) a) Explain general procedure for Dynamic analysis. **[8]**

b) What are different methods of solving coupled thermo mechanical problems. **[8]**

Q9) a) Write Nevier stroke equation in conservation form and explain meaning of each term. **[5]**

b) Explain some modern developments in grid generations related to CFD. **[6]**

c) CFD as a design and Research tool. **[5]**

Q10) Write short notes on

a) Uniform and compressed grids used in CFD. **[6]**

b) Checks for Tetra 3D meshing techniques. **[6]**

c) Thermal analysis in CAE. **[6]**

Total No. of Questions : 6] **[Total No. of Pages :2**

P1449

[3965] - 601

M.E. (Electrical) (Power System)

DIGITAL POWER SYSTEM PROTECTION

(Elective - III) (2008 Course) (503211)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any TWO questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail Least Error Squared Technique (LES) with equations. **[10]**

b) Draw block diagram of numerical relay. Explain function of each block. **[8]**

c) Explain the importance of sampling theorem in digital power system protection. **[7]**

Q2) a) Explain why digital distance relays are preferred over overcurrent relays for protection of transmission lines. **[5]**

b) Explain Hardware design of digital protection of transmission lines. **[10]**

c) Explain digital protection scheme for transmission line based upon fundamental signal. **[10]**

Q3) a) Explain various faults that can occur in a synchronous generator. **[5]**

b) Explain how second harmonic current injection can protect synchronous generator. **[10]**

c) Explain how injection of sub-synchronous component can protect a synchronous generator digitally. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain percentage differential scheme used for transformer protection. **[6]**

b) Give reasons for taking high bias factor in percentage differential scheme. **[6]**

c) With a neat diagram explain working of Buchholtz relay. **[13]**

Q5) a) What is meant by over-reach of a relay? **[3]**

b) Bring out the salient features of three-stepped distance protection scheme of transmission line. **[12]**

c) Explain importance of Relay setting and Relay co-ordination. **[10]**

Q6) a) With the help of Lattice diagrams explain the principle of Ultra-high speed relaying scheme based on travelling ware for high voltage long transmission line. **[10]**

b) Write a note on short circuit studies of Multi-Phase systems. **[8]**

c) State assumptions made in short circuit studies. **[7]**



Total No. of Questions : 8] [Total No. of Pages :2

P1455

[3965] - 615

M.E. (E & TC) (Microwave)

MICROWAVE INTEGRATED CIRCUITS

(2008 Course) (504228) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Question No.1 and 5 are compulsory.***
2) ***Solve any TWO questions from each section.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) Describe the technological steps involved in the fabrication of hybrid MICs.**[10]**

Q2) a) A 50 Ω microstrip line is to be matched to 100 Ω resistive load. Find the width and the length of a single section quarter wave transformer. The design employs a 0.025 inch thick Alumina ($\in r = 9.70$) substrate and operating frequency is 10 GHz. **[10]**

b) Draw the layout diagram and equivalent circuits of the following microstrip line components: **[10]**

i) An equal split Wilkinson power divider.
ii) Wilkinson power divider with unequal power division.
iii) A quadrature (90°) hybrid branch line coupler.
iv) A hybrid or Rat-race in microstrip form.

Q3) a) Design a coupled line band pass filter with N = 3 and a 0.5 dB equal-ripple response. The center frequency is 2.0 GHz, the bandwidth is 10% and Z_o is 50Ω. What is the attenuation at 1.8 GHz? **[10]**

b) What are the methods in homogenous transmission line analysis? Explain any one of them. **[10]**

Q4) a) Explain, discuss and compare hybrid and monolithic microwave integrated circuits. **[10]**

b) Design a microstrip antenna to operate at 1.8 GHz given the substrate used in the design is FR4 PCB material with the following parameter:**[10]**

$\varepsilon_r = 4.6$

tan $\delta = 0.022$

h = 1.6mm

copper thickness = 35μm.

P.T.O.

SECTION - II

Q5) Calculate the various parameters for the design of co-plainer transmission line at 100 MHz. **[10]**

Q6) a) Explain reactive diode multiplier. **[10]**

b) A four port network has the scattering matrix shown below. **[10]**

$$[S]=\begin{bmatrix} 0.1\angle 90^{o} & 0.8\angle -45^{o} & 0.3\angle -45^{o} & 0 \\ 0.8\angle -45^{o} & 0 & 0 & 0.4\angle 45^{o} \\ 0.3\angle -45^{o} & 0 & 0 & 0.6\angle -45^{o} \\ 0 & 0.4\angle 45^{o} & 0.6\angle -45^{o} & 0 \end{bmatrix}$$

i) Is this network losselss?

ii) Is this network reciprocal?

iii) What is the return loss at port 1 when all other ports are terminated with a matched load?

Q7) Write notes on applications of MICs to: **[20]**

a) Radio system.

b) Satellite communication.

c) Broadcast system.

d) Future trend in MICs.

Q8) a) What are the methods for the synthesis on non-linear MICs? Explain any one of them. **[10]**

b) Design 12.5 to 14.5 GHz Ku-Band Monolithic analog frequency divider. **[10]**

Total No. of Questions : 8] [Total No. of Pages : 4

P1463

[3965] - 643

M.E. (E & TC) (Signal Processing)

LINEAR ALGEBRA AND RANDOM PROCESSES

(2008 Course) (504501) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine non singular matrices P and Q such that PAQ is in the normal form, $\begin{bmatrix} I_r & 0 \\ 0 & 0 \end{bmatrix}$,

Where, A= $\begin{bmatrix} 3 & 2 & -1 & 5 \\ 5 & 1 & 4 & -2 \\ 1 & -4 & 11 & -19 \end{bmatrix}$

Also find rank of A. **[8]**

b) Prove that any two eigen vectors corresponding to two distinct eigenvalues of a real symmetric matrix are orthogonal. **[4]**

c) Prove that the given Hermitian matrix is positive definite.

$$A=\begin{bmatrix} 2 & 1+2j \\ 1-2j & 3 \end{bmatrix}.$$ **[6]**

Q2) a) Show that matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

Satisfies Caley Hamilton theorem. Also determine the characteristic roots and corresponding characteristic vectors of matrix A. **[8]**

P.T.O.

b) Prove that the quadratic form

$6x_1^2 + 3x_2^2 + 3x_3^2 - 4x_1x_2 - 2x_2x_3 + 4x_3x_1$

in three variables is positive definite. **[4]**

c) If A and B are symmetric matrices of order 'n', then show that AB + BA is symmetric and AB – BA is skew symmetric. **[4]**

Q3) a) Determine diagonal matrix orthogonally similar to real symmetric matrix A. Also, obtain transforming matrix. Given: **[8]**

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}.$$

b) Prove or disprove each of the following statement. **[8]**

i) The product of two upper triangular matrices is upper triangular.

ii) The product of two Toeplitz matrices is Toeplitz.

Q4) a) Prove that, **[6]**

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

b) Consider the system of equations:

$2x - y + 3z = 9$

$x + y + z = 6$

$x - y + z = 2$

Prove that matrix A obtained from these equations is invertible. Hence solve the equations. **[6]**

c) Show that the only real value of λ for which the following equations have non zero solution is σ. **[4]**

$x + 2y + 3z = \lambda x$

$3x + y + 2z = \lambda y$

$2x + 3y + z = \lambda z$

SECTION - II

Q5) a) Define and explain properties of probability. **[4]**

b) 2 dice are thrown simultaneously. Find the probability of the following events:- **[6]**

i) Sum of scores is a odd no.

ii) Both the dice show same score on them.

iii) Sum of scores on the dice is a perfect square no.

iv) Product of the scores is 12.

v) Sum of the scores is prime no.

vi) First dice shows odd no. and second dice shows multiple of 3.

c) There are 4 different pairs of handgloves in a box. Two hand gloves are selected at random. What is probability that **[4]**

i) They form a pair.

ii) Both belong to same hand.

d) Probability of person stopping at petrol pump will ask for petrol is 0.80. Probability that he will ask for both is 0.65. What is the probability that new person stopping on petrol pump will ask for **[4]**

i) Either petrol or water.

ii) Neither petrol nor water.

Q6) a) Derive the equation for mean of a discrete and continuous Random Variable. **[6]**

b) Prove that,

Variance = Mean square value

Square of mean. **[6]**

c) A Random Variable 'X' has following probability distribution. **[4]**

X	0	1	2	3	4
P(X=x)	2K	4K	5K	3K	k

Find

i) Value of K. ii) $P(X \leq 2)$.

iii) $P(X > 1)$. iv) $P(1 < x < 4)$.

Q7) A two dimensional Random variable (x, y) has, **[16]**

$$f(x,y) = \begin{cases} 2e^{-(x+y)}, & 0 < y < x < \infty \\ 0, & \text{elsewhere} \end{cases}$$

Find E(X,Y), COV [X,Y], ρ_{xy}.

Q8) a) Derive the equation for mean square value for a WSS [Wide sense stationary] process X (t) at the output of an LTI filter. **[8]**

b) What is a Markov chain? Explain hidden Markov Model. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1466

[3965] - 652

M.E. (E & TC) - Signal Processing

STATISTICAL SIGNAL PROCESSING

(2008 Course) (504507) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain why least square direct method are non linear. **[6]**

b) Show how Wiener Filter can be used as a Noise Cancellation. **[6]**

c) Determine the power spectra for the random processes generated by the following difference equations. **[6]**

i) $x(n) = w(n) - w(n-2)$.

ii) $x(n) = -0.8\,x(n-2) - w(n)$.

Q2) a) What are the advantages of lattice filter over direct form FIR filter? Find Lattice filter coefficient Γ_j form given $A(Z) = 1 + 0.6Z^{-1} + 0.2Z^{-2} + 0.1Z^{-3} + 2Z^{-4}$. **[8]**

b) Write notes on Pole-Zero Modeling Using Prony's Method. What are the disadvantages of Prony's method? **[8]**

Q3) a) State and explain Levinson Durbin algorithm. **[8]**

b) Using Levinson Durbin algorithm find Reflex coefficient Γ_j and filter coefficients $a_p(k)$ from the given autocorrelation $r_x(k) = \{1, -0.25, 0.50, -0.625\}$. **[8]**

Q4) a) Explain the MYWE method for modeling an ARMA(q) Process. **[8]**

b) For N = 2 FIR Least Square inverse system having a unit sample response **[8]**

$$g(n) = \begin{cases} -0.5 & n = 0 \\ 1 & n = 1 \\ 0 & otherwise \end{cases}$$

i) FIR Coefficients $h(n)$.

ii) Minimum Square error $\{\varepsilon\}_{min}$.

P.T.O.

SECTION - II

Q5) a) Compare the performance characteristics of Non-Parametric methods. **[6]**

b) Justify why Whiner filter cannot be used for non stationary process? **[6]**

c) $x(n)$ is a WSS RP generated by filtering white noise $\nu(n)$ having variance of $\sigma_v^2 = 1$ **[6]**

With AR (1), where $x(n) = 0.25x(n-1) + \nu(n)$

i) Determine the power spectrum of $x(n)$

ii) Autocorrelation of $x(n)$

Q6) a) Write notes on minimum variance spectrum estimation. **[8]**

b) The Bartlett method is used to estimate the power spectrum of a signal from a sequence $x(n)$, Consisting of N = 2400 samples. **[8]**

i) Determine the smallest length L of each segment in the Bartlett method that yields a frequency resolution of $\nabla f = 0.01$.

ii) Repeat part (a) for $\nabla f = 0.02$.

iii) Determine the quality factors Q for parts (a) and (b).

Q7) a) Write down the difference between parametric and non parametric methods for power spectrum estimation with examples. **[6]**

b) Consider a signal $x(n) = d(n) + \nu(n)$; where d(n) is a AR(1) Process that satisfy the difference equation.

$d(n) = 0.8d(n-1) + w(n)$.

Where $w(n)$ is a white noise sequence with variance $\sigma_w^2 = 0.49$ and $\sigma_v^2 = 1$.

i) Determine the auto correlation sequence $r_d(k)$ and $r_x(k)$.

ii) Design a wiener filter of length $M = 3$ to estimate $d(n)$.

iii) Determine the MMSE for $M = 3$. **[10]**

Q8) a) For Non causal IIR Wiener Filter derives Wiener - Hope equation and Minimum error. **[8]**

b) Explain how DFT can be used to find Power Spectrum Estimation. **[5]**

c) What are the advantages of Discrete Kalman Filter? **[3]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1474

[3965] - 679

M.E. (E & TC) (Communication Networks)

CODING & MODULATION TECHNIQUES

(Sem. - I) (2010 Course) (504601)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Frequency Domain Equalization in detail. **[8]**

b) What is Channel Coding? Explain in detail with example. **[8]**

Q2) a) What do mean by Compression? Explain in detail about Video Compression. **[8]**

b) What do mean by Modulation and Explain different types of Modulation in detail. **[8]**

Q3) a) Explain IS-95 in detail with suitable example. **[8]**

b) What is Path loss Model in wireless communication? Explain in detail. **[8]**

Q4) Write short notes on (Any Two): **[18]**

a) Wideband Rake Receiver.

b) Propagation Models.

c) Lossy Coding.

P.T.O.

SECTION - II

Q5) a) Explain principle of multi-carrier modulation-OFDM in detail. **[8]**

b) What is Huffman coding? Explain in detail with suitable example. **[8]**

Q6) a) What are advantages and drawbacks of CDMA with respect to GSM? **[8]**

b) Explain why handoff technique is important and Explain types of handoff technique. **[8]**

Q7) a) Explain in detail B/W and color television standards. **[8]**

b) Explain Automatic frequency control. **[8]**

Q8) Write short notes on (Any Two) **[18]**

a) Multipath Fading Simulation Model.

b) Quantization.

c) TDMA and FDMA.



Total No. of Questions : 10] [Total No. of Pages : 4

P1477

[3965] - 697

M.E. (Production)

MATHEMATICS & STATISTICS

Advanced Mathematical Method

(2008 Course) (Old and New Common) (511101) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary,***

SECTION - I

Q1) a) Find the conjugate harmonic function of $v(r, \theta) = r^2 \cos 2\theta - r \cos \theta + 2$. Show that V is harmonic. **[6]**

b) If $f(z)$ is analytic, prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^n = n^2 |f(z)|^{n-2} |f'(z)|^2$ **[5]**

c) Find Taylor's series expansion of $f(z) = \frac{1}{z^2 - z - 6}$ about

i) $z = -1$ ii) $z = 1$.

Determine the region of convergence. **[6]**

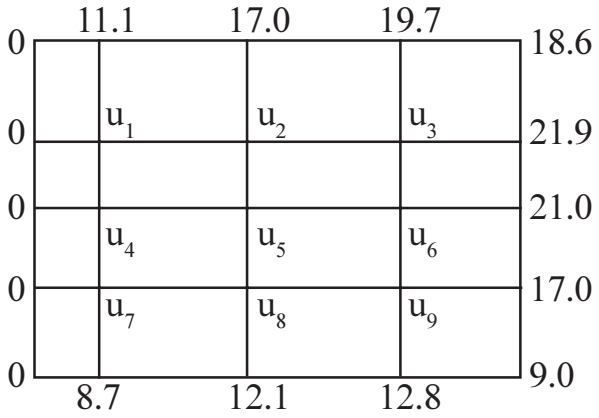
Q2) a) Evaluate $\oint_c |z|^2 dz$ around the square with vertices at (0, 0), (1, 0), (1, 1), (0, 1). **[6]**

b) Determine the region of the w-plane into which the region bounded by $x = 1$, $y = 1$, $x+y = 1$ is mapped by $w = z^2$ show that angle are preserved. **[5]**

c) Find the bilinear transformation that maps $z = 0, 1, \infty$ on to $w = -1, -i, 1$ respectively. **[5]**

P.T.O.

Q3) a) Determine the values of the interior Lattice points of a square region of the harmonic function u with boundary conditions prescribed as shown in the figure. **[8]**



b) Determine the displacement $u(x, t)$ of a string if

$$\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2};\ u(x, 0) = \frac{x(10 - x)}{100}$$

$u(0, t) = 0$, $u(10, t) = 0$, $u(x, 0) = 0$ for $x = 0$ to 10, $t = 0$ to 5 taking $h = k = 1$. **[9]**

Q4) a) Solve the variational problem

$$\int_1^2 \left[x^2 (y')^2 + 2y(x + y)\right] dx = 0 \text{ given}$$

$y(1) = y(2) = 0$ **[8]**

b) Find the extremals of the functional $\int_0^{\pi/2} (y'^2 - y^2 + x^2) dx$ that satisfies the conditions y(0) = 1, y'(0) = 0, $y\left(\pi/2\right) = 0,\ y'\left(\pi/2\right) = -1$ **[8]**

Q5) a) Using cauchy's residue theorem evaluate $\int_0^{2\pi} \frac{d\theta}{1 - 2p\sin\theta + p^2}$ $|p| < 1$.

[7]

b) Using explicit method solve

$$\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2} \quad 0 \le x \le 1$$

$u(0, t) = 0$, $u(1, t) = 0$,

$u(x, 0) = 2x$ when $0 \le x \le ½$

$= 2(1 - x)$ when $½ \le x \le 1$

and for $h = 1$, $k = 0.001$ at $t = 0.001, 0.002$. **[9]**

SECTION - II

Q6) a) Express the polynomial $f(x) = 4x^3 - 2x^2 - 3x + 8$ interms of Legendre's polynomial. **[5]**

b) Prove that $P'_{n+1}(x) - P'_{n-1}(x) = (2n+1)P_n(x)$. **[5]**

c) Express $J_{7/2}(x)$ in terms of sine and cosine functions. **[6]**

Q7) a) In a factory producing spare plugs, the number of defectives found in the inspection of 15 Lots of 100 each is given below: Draw control chart for the number of defectives and comment on the state of control. **[9]**

Sample (i) Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defectives (np)	5	10	12	8	6	4	6	3	4	5	4	7	9	3	4

b) The mileage which car owners get with a certain kind of radial tyre is a Random variable having an exponential distribution with mean 40,000 km. Find the probabilities that one of these tyres will last. **[8]**

i) At least 20,000 km. and

ii) At most 30,000 km.

Q8) a) The probability of a successful rocket launching is P. if launching attempts are made until 3 successful Launching have occured, what is the probability that exactly 5 attempts will be necessary? What is the probability that fewer than 5 attempts will be necessary? if Launching attempts are made until 3 consecutive successful Launchings occur, what are the probabilities. **[9]**

b) Fit a poisson distribution for the following distribution: **[8]**

x:	0	1	2	3	4	5	Total
f:	142	156	69	27	5	1	400

Q9) a) Test the normality of the following distribution by using chi-square test of goodness of fit. **[9]**

x:	125	135	145	155	165	175	185	195	205	Total
f:	1	1	14	22	25	19	13	3	2	100

b) Fit a binomial distribution for the following data. **[7]**

x:	0	1	2	3	4	5	6	Total
f:	5	18	28	12	7	6	4	80

Q10)a) For a markov chain, the transition matrix $P=\begin{pmatrix} 1/2 & 1/2 \\ 3/4 & 1/4 \end{pmatrix}$ with initial distribution $P^{(0)} = \left(1/4, 3/4\right)$ find

i) $P_{21}^{(2)}$. ii) $P_{12}^{(2)}$ iii) $P^{(2)}$ iv) $P_{1}^{(2)}$. **[8]**

b) A man either drives a car or catches a train to go to office each day. He never goes 2 days in a row by train but if he drives one day then the next day he is just as likely to drive again as he is to travel by train. Now suppose that on the first day of the week, the man tossed a fair dice and drove to work if and only if a 6 appeared Find.

i) The probability that he takes a train on the third day. and

ii) The probability that he drives to work in the long run.

(Hint : Use Markov Chain) **[8]**

Total No. of Questions : 8] [Total No. of Pages :2

P1482

[3965] - 708
M.E. (Production)
MATERIAL TECHNOLOGY
(511108) (2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Why does an extremely cold worked material recrystallize upon heating? Is there any relationship between recrystallization temperature & the extent of cold work? Explain. **[4]**

b) Explain multiplication of dislocations during plastic deformation. **[4]**

c) What are Whiskers? Explain with suitable applications. **[4]**

d) Fine grained materials are harder & stronger than coarse grained materials. Do you agree or not? Justify your choice. **[4]**

Q2) a) What is Low angle boundary? Explain Polygonization? How it is produced? **[6]**

b) Compare Age hardening & Dispersion hardening with one example of each. **[6]**

c) What is Griffith theory of crack propagation? A relatively large plate of glass is subjected to a tensile stress of 40 MPa. If the specific surface energy & Modulus of Elasticity for this Glass are 0.3 J/m^2 & 69 GPa respectively, then determine the maximum length of a surface flaw for this glass that is possible without fracture. **[6]**

Q3) a) What is Super plasticity & Homologus temperature? **[4]**

b) Discuss important properties to be considered for a material for high temperature applications. Give 2 examples of high temperature materials. **[4]**

c) What is Low cycle fatigue? What are the various stages of fatigue failure? Explain them in brief. **[4]**

d) Draw a Typical Creep curve & explain each stage of it. **[4]**

P.T.O.

Q4) a) A material is to be selected for low temperature (below 4ºC) which properties will you take in to account. **[3]**

b) Explain what is Fracture Toughness. **[4]**

c) Describe giving reasons the processing route & material you would select for the following applications (Any 3): **[9]**
Milling cutter, Car body, Gear, Die for die casting Aluminium alloy, Mud guard for bicycle, Wood working tools.

SECTION - II

Q5) a) Explain strengthening mechanisms in Dual phase steel & in Mar aging steel. Mention one application of each. **[8]**

b) A material is to be selected for Hip Prosthesis. Which factors are most important for such application? Suggest one material for the same. **[4]**

c) What are Shape memory alloys? Explain with 2 examples. **[4]**

Q6) a) Describe Slip Casting Process. **[5]**

b) What are Conventional & Engineering ceramics? **[5]**

c) Explain Cemented Carbides in detail. Also mention the latest developments in them. **[6]**

Q7) a) What are the commonly used fibers? How Carbon firers are produced. **[4]**

b) Explain Iso strain & Iso stress condition. Also explain the effects of Fiber orientation to stress axis. **[6]**

c) Explain in brief Carbon-Carbon Composite, Metal - Matrix Composite. **[6]**

Q8) a) What are the various factors that must be taken in to account for material selection? **[8]**

b) Explain any one method of processing of Plastic materials. **[4]**

c) What are some of the advantages of plastics for use in mechanical engineering designs? **[4]**

d) You have been given two solid pieces of a polymer. One of them contains branched chain macromolecules while the other contains linear chain macromolecules of similar average mol. Weight. How would you distinguish between the two pieces using simple test? **[2]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1493 **[3965] - 737**

M.E. (Computer) (common to Network Engineering)

APPLIED ALGORITHMS

(510101) (2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A binary tree is a rooted tree in which each node has at most two children. Show by induction that any binary tree the number of nodes with two children is exactly one less than number of leaves. **[10]**

b) Explain the Bayes theorem, and then use this Bayes theorem for the following example:

"In the town ship, there are 525 men and 634 women. 3% of men are color blind and 2% of women are color blind. Find the probability that individual is a woman" **[6]**

Q2) a) Compare the sorting methods Merge sort and quick sort, devise data sets which compare the average and worst case complexities for these two algorithms. **[8]**

b) Suppose you have algorithms with the running time listed below (Assume these are exact running time) How much slower do each of these algorithms get when you (a) Double the input size (b) increase the input size by one ?

i) n^2 ii) n^3

iii) 2^n iv) n logn **[8]**

P.T.O.

Q3) a) Consider another variation of the binary search algorithm so that it splits the input not only into two sets of almost equal sizes, but into two sets of sizes approximately one-third and two third. Write down the recurrence for this search algorithm and find the asymptotic complexity for this search algorithm. **[8]**

b) Write an algorithm for Depth First Search algorithm in Graph using suitable data structure. What is the complexity of the algorithm? If we have not use this data structure can still we implement the same algorithm, if yes what is its complexity? **[8]**

Q4) a) Write an algorithm for finding both the largest and second largest elements from a set of n elements in an array by means of comparisons. Prove that $n+ \lceil \log n \rceil - 2$ comparisons are necessary and sufficient. **[10]**

b) Show that if all internal nodes in a tree have degree K then the number of external nodes n is such that n mod (K-1) = 1. **[8]**

SECTION - II

Q5) a) Explain the following with respect to approximation algorithm **[8]**

i) approximate scheme.

ii) polynomial time approximation scheme.

iii) fully polynomial time approximation scheme.

b) Use separation to obtain a fully polynomial time approximation algorithm for the job sequencing with deadline problem. **[8]**

Q6) a) N=3 and {a1, a2, a3} = {do, if, while} Let p (1:3) = (0.5, 0.1, 0.05) q(0:3) = (0.15, 0.1, 0.05, 0.05)
Compute and construct OBST for above values using Dynamic approach. **[12]**

b) What is dynamic programming approach to solve the problem? Explain with suitable example. **[6]**

Q7) a) Write the CRCW and EREW Algorithms for parallel computers. **[10]**

b) Discuss various parallel computational model and how do they achieve the parallelism in the algorithmic design. **[6]**

Q8) a) Write a short note on "Pointer Doubling". **[6]**

b) Solve the following problem of job sequencing with deadline using Greedy approach. Find out feasible and optimal solution. **[10]**
Let
N = 4, (p1, p2, p3, p4) = (100, 10, 15, 27) and (d1, d2, d3, d4) = (2, 1, 2, 1)



Total No. of Questions : 8] [Total No. of Pages :2

P1504

[3965] - 766

M.E. (Computer) (Computer Network)

OPERATING SYSTEM DESIGN

(510308) (2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define system call. Explain the system call mechanism using some example of system call. **[8]**

b) What are the different scheduling criteria. Explain the different types of scheduler using example. **[8]**

Q2) a) Discuss the different reasons for Process Creation, Process Termination and Process Suspension. What is the context of a process? Explain the context switch. **[8]**

b) What are the different types of the messages. Discuss the different Message forwarding mechanism used in process migration. **[8]**

Q3) a) What are the different types of group communication. Discuss the following points related to one - to - many communication. **[8]**

i) Group Management.
ii) Group Addressing.
iii) Message Delivery to receiver process.
iv) Send to all and bulletin Board semantics.

b) Describe blocking and non blocking types of IPC. Which is easier to implement and why? Discuss their relative advantages and disadvantages.**[8]**

Q4) a) Explain the different types of semaphore and its primitives. Discuss the Reader Writer problem-writer having priority using semaphore. **[10]**

b) What is producer consumer problem. Discuss the correct solution for producer consumer infinite buffer problem. **[8]**

P.T.O.

SECTION - II

Q5) a) What is the necessary condition for deadlock occurrence in system. Why denial of mutual exclusion is rarely used? Explain the following methods used for prevention of deadlock. **[10]**

i) Collective request.

ii) Ordered request.

iii) Preemption.

b) Explain WFG based and Probe based distributed algorithm for deadlock detection. **[8]**

Q6) a) Explain the different services provided by file system on multiprocessor system. Explain the file access model for accessing remote files. **[8]**

b) In multiprocessor file system data can be cached on multiple nodes. Discuss the mechanism for consistency of data on different node. Also explain the client initiated approach for cache validation. **[8]**

Q7) a) What are the different types of authentication used in multiprocessor system. Explain the following mechanism for authentication. **[8]**

i) Proof by knowledge.

ii) Proof by possession.

iii) Proof by property.

b) Compare the active and passive attacks. Explain the Viruses and Worms active attacks. **[8]**

Q8) a) What is shared memory? Explain the use of shared memory. List and explain the Unix APIs used for shared memory. **[8]**

b) Discuss the named and unnamed pipes. Write the pseudo code for chat application using unnamed pipes. **[8]**



Total No. of Questions : 8] [Total No. of Pages :3

P1510

[3965] - 785

M.E. (Chemical)

PROCESS MODELING & SIMULATION

(509108) (2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain modeling & simulation in detail with example.

b) Give the steps involved in model formulation and discuss. **[16]**

Q2) Consider the following dynamic model of a constant volume, isothermal CSTR,

$$\frac{dVC_A}{dt} = q(C_{Ao} - C_A) - V(k_1 C_A + k_3 C_A^2) = F_1(C_A, q, C_{Ao})$$

$$\frac{dVC_B}{dt} = -qC_B + V(k_1 C_A - k_2 C_B) = F_2(C_A, C_B, q)$$

Where C_A & C_B are the concentrations of component A & B respectively, V is the reactor volume; q & C_{Ao} are the volumetric flow rate and concentration of the inlet stream, respectively and k_1, k_2 & k_3 are reaction constants. Assume both q and C_{Ao} vary with respect to time.

a) Find the linear deviation model.

b) Find $C_B(t)$ for unit change in C_{Ao} (t). **[16]**

Q3) Consider a drum in the figure



where q fis inlet molar flow rate and q is the outlet molar flow rate. **[18]**

P.T.O.

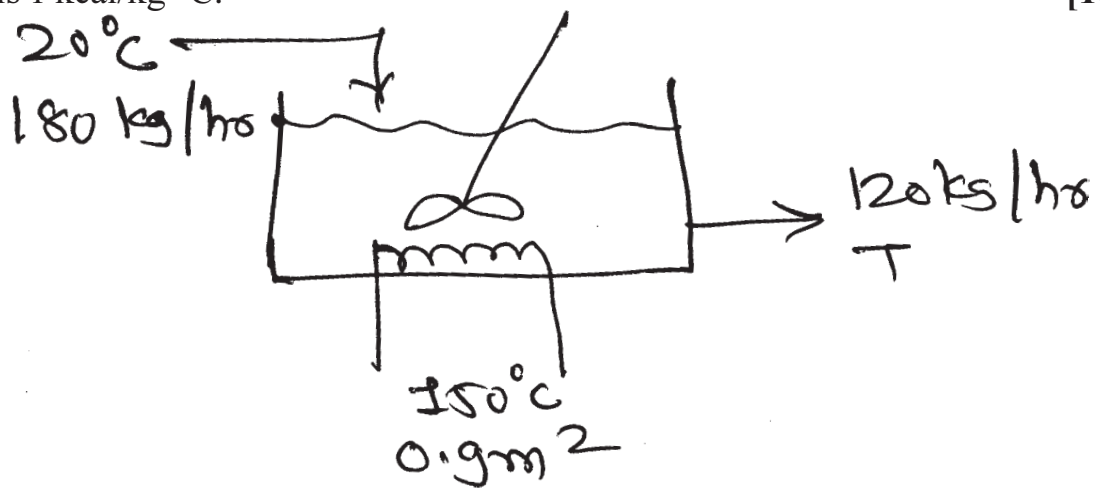
a) Let V,P & T be the volume, the pressure, and the temperature of the drum, respectively. Write a model to describe how pressure in the tank varies with the time. Assume ideal gas and isothermal operation.

b) Solve for P analytically using the following data:
qf = 2-0 + 0.1 t kmo/min, q = 3 kmol/min,
V = 50 m^3 T = 300k
R = 8314 m^3 –pa/kmol–ºK.
If the drum initially contains 10 kmol of methane. Assuming that the vessel was buit to withstand a maximum pressure of 50 atm, how long can we run this operation before the inlet gas flow must be shut off?

Q4) Develop a modeling equation for binary distillation column with net figure and notations. **[16]**

SECTION - II

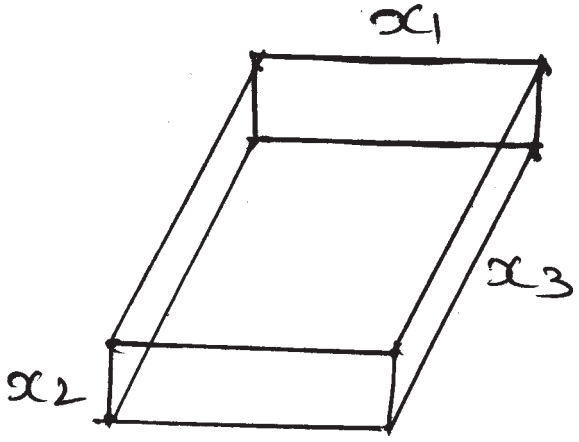
Q5) Consider the heating tank problem. A dilute solution at 20ºC is added to a well stirred tank at the rate of 180 kg/hr. A heating coil having an area of 0.9m^2 is located in the tank and contains steam condensing at 150ºC. The heated liquid leaves at 120 kg/hr and the temperature of the solution in the tank. There is 500 kg of solution at 40ºC in the tank at the start of the operation. The overall heat transfer coefficient is 342 kcal/hr-m^2-ºC & the heat capacity of the water is 1 kcal/kg-ºC. **[18]**



a) Develop a system of mathematical equations to model this system. We are interested in determining the temperature of the solution in the tank at any given time.

b) Solve for the temperature in the tank after 1 hour of heating.

Q6) A chemical engineer wants to build a special container from a metal. The container box has the dimension shown below, the container is to have an



exact volume of $10m^3$. The cost of the lid (material and labor) is Rs. 500/- per square meter. The cost of the material and labor for the other 5 sides is Rs. 100.00 per square meter. The chemical engineers objective is to determine the dimension of the container which minimizes the cost. **[16]**

a) Formulate the problem as an optimization problem and classify it.

b) Solve this problem analytically. Compute the optimum cost too.

Q7) An absorption tower containing wooden grids is to be used for absorbing SO_2 in a sodium sulfite solution. A mixture of air and SO_2 will enter the tower at a rate of 70,000 m^3/min temperature of 125°C and pressure 1 atm. The concentration of SO_2 in the entering gas is specified and a given fraction of entering SO_2 must be removed in the absorption tower. The m.w. of gas mixture is to be 2g.

No. of Transfer units = $0.32Gs^{0.18}$ the height of transfer unit is constant at 5m. The cost of installed tower is Rs. 150 per cubic meter of inside volume and the annual fixed charges amount to 20% of the initial cost.

Total Variable operating cost as Rs/hr = $1.8 \times 10^{-8}\ Gs^2 + \frac{81}{Gs} + \frac{4.8}{Gs^{0.8}}$ The unit is to operate 8000 hr/yr. formulate this problem as an optimization problem to minimize the annual cost. **[16]**

Q8) Write short ntoes on: **[16]**

a) Chemcad.

b) Aspen plus.

[3965] - 795

P1513

M.E. (Chemical) (Environmental Engineering)

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS

(509131) (2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the moment - generating function of the random variable x, whose probability density is given by

$$f(x)=\begin{cases} e^{-x} & for\ x>0 \\ 0 & elsewhere \end{cases}$$

and use it to find an expression for μ'_r **[8]**

b) Define the terms. **[8]**

i) Mode. ii) Median.

iii) Semi - interquartile range. iv) Mean deviation.

Q2) Calculate Karl Pearsons coefficient of correlation taking deviations from actual mean 52 (X series) and 44 (Y series).

X Series :	44	46	46	48	52	54	?	56	60	60
Y Series :	36	40	42	40	?	44	46	48	50	52

[16]

Q3) a) A machine is constructed to produce ball bearings having mean diameter of 0.574 inch and a standard deviation of 0.008 inch. To determine whether the machine is in proper working order, a sample of 6 ball bearings is taken every 2 hours and the mean diameter is computed from this sample. Design a decision rule whereby one can be fairly certain that the quality of the product is confirming to the required standards. **[10]**

b) Given a random sample of size n from a gamma population, use the method of moments to estimate its parameters α and β. **[8]**

P.T.O.

Q4) An urn consists of a very large number of four different colors: red, orange, yellow and green. A sample of 12 marbles drawn at random from the urn revealed 2 red, 5 orange, 4 yellow and 1 green marble. Test the hypothesis that a urn contains equal proportions of the differently colored marbles, and find the P value of the sample result. **[16]**

SECTION - II

Q5) A tea company appoints four salesmen A, B, C and D and observes their sales in three seasons, summer, winter and mansoon. The figures (in lakh) are given in the following table: **[16]**

Seasons	Salesmen				Seasons total
	A	B	C	D	
Summer	36	36	21	35	128
Winter	28	29	31	32	120
Monsoon	26	28	29	29	112

a) Do the salesmen significantly differ in performance?

b) Is there significant difference between seasons?

Q6) a) A study shows that 16 of 200 tractors produced on one assembly line required extensive adjustments before they could be shipped, while the same was true for 14 of 400 tractors produced on another assembly line. At the 0.01 level of significance does this support the claim that the second production line does superior work? **[8]**

b) Explain standard errors associated with Means, Proportions, Medians and Variances. **[8]**

Q7) a) Explain the terms: **[8]**

i) Feasible solution. ii) Convex set in linear programming.

iii) Extreme point. iv) Non-degenerate basic feasible solution.

b) Minimize $Z = 4x_1 + x_2$

Subject to the constraints

$$3x_1 + x_2 = 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 4$$
$$x_1, x_2 \geq 0$$

Using two-phase method. **[8]**

Q8) a) Solve the assignment problem represented by the matrix

	1	2	3	4	5	6
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

[8]

b) Explain Vogel Approximation Method (VAM). **[5]**

c) State various steps of the computational procedure for obtaining an optimal solution by Hungarian Method. **[5]**

Total No. of Questions : 8] **[Total No. of Pages :2**

P1518

[3965] - 806
M.E. (Chemical)
WASTE WATER TREATMENT & DESIGN
(2008 Course) (509138) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question one is compulsory and any two from the remaining questions.***
2) ***Question five is compulsory and solve any two from the remaining questions.***

SECTION - I

Q1) a) Explain the principals involved for the purification of Wastewater. How order of Treatment is used? **[6]**

b) Discuss laboratory tests for determining the quality of wastewater. **[6]**

c) Describe factors responsible for polluting water. Explain the hazards of water pollutants for the environment. **[6]**

Q2) a) Explain design principals for the mixers used in wastewater treatment. **[8]**

b) Explain the effects of various forces on the settling particle. **[4]**

c) How Power Number of a mixer is determined? **[4]**

Q3) a) Explain the terms COD and BOD of a sample used in wastewater treatment. How COD of Glucose ($C_6 H_{12} O_6$) is determined? **[8]**

b) Explain the principals for the determination of soluble oxygen of a pond. **[8]**

Q4) Write Short Notes on the following: **[16]**

a) Pulse input and step input tracer tests.

b) Hydrodynamics of a reactor.

c) Properties of a tracer.

d) Age of a tracer in the reactor.

P.T.O.

SECTION - II

Q5) a) Explain Diffusion and dispersion. **[18]**

b) Ideal and Non Ideal Reactors.

c) Spread of residence time.

d) Response curves of a tracer analysis.

e) Growth Pattern of a Cell.

f) Absorption and Adsorption.

Q6) a) Give reasons for the Non - Ideal behavior of a flow in a reactor. **[16]**

b) Explain how tracer data is used for the Residence Time Distribution studies.

c) Develop E function in terms of concentration of a tracer.

e) What is the significance of E function?

Q7) a) Explain Biological Processes used in wastewater treatment. **[4]**

b) Explain SRT for suspended growth process. **[4]**

c) Explain different rate factors for the biological reactor. **[4]**

d) Explain important of oxidation reactions for cell. **[4]**

Q8) Write Short notes on the following: **[16]**

a) Trickling filter.

b) PAC and GAC.

c) Henry's Law.

d) Adsorption Isotherms.

Total No. of Questions : 8] **[Total No. of Pages :2**

P1524

[3965] - 844
M.E. CSE (IT)
NET CENTRIC COMPUTING
(2008 Course) (514426) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any Three questions from Section - I and Three questions from Section - II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Why Manchester encoding is not used in Fast Ethernet and Gigabit Ethernet? Which are the other techniques available for Fast Ethernet and Gigabit Ethernet? Explain any one multilevel signaling techniques used in Fast Ethernet. **[8]**

b) Give the meaning of value of each following parameter with respect to 10 Mbps Ethernet Technology. **[8]**

Propagation Velocity : 0.65c
Encoding : Manchester.
Propagation Delay : 512 bit.
Interframe Gap : 9.6 ms.
Backoff Limit : 10
Jam Size : 48-bits.

Q2) a) Explain the following terms with respect to Frame Relay Networks. **[8]**
i) CSU ii) DSU iii) PVC iv) SVC

b) How network administrator can assure the throughput of the network. **[8]**

Q3) a) Explain the following terms with respect to queuing system. **[8]**
i) Inter - arrival time distribution.
ii) Service time distribution.
iii) Balking.
iv) Reneging.
v) Jockeying.

b) Justify the following statement **[8]**
"Frame Relay is a slower PSDN than ATM".

P.T.O.

Q4) Write short notes on (Any Three) **[18]**

a) Routing in Optical Domain.

b) Multipoint line layout heuristics.

c) Sharma's algorithm.

d) Bin packing algorithm.

SECTION - II

Q5) a) What do you mean by signaling protocol? Explain any one signaling protocol used in VOIP. **[8]**

b) Compare M/M/l and M/M/2 queue with respect to average service time, average queue length and average utilization. **[8]**

Q6) a) Fixed size cells in ATM can be switched more efficiently. Give reasons to justify or nullify the statement. **[8]**

b) Give block diagram for Kerberos 5 and explain the important features of it. What is the key difference between version 4 and version 5 of Kerberos? **[8]**

Q7) a) Mention the meaning of following each term from security point of view. **[8]**

i) Authorization. ii) Validation.

iii) Certification. iv) Time stamping.

v) Witnessing. vi) Receipt.

vii) Confirmation. viii) Ownership.

b) Compare the Network Attached Storage (NAS) with Storage Area Network with respect to following parameters. **[8]**

i) Connectivity. ii) Data access method.

iii) Key requirement. iv) Type of applications.

v) Typical market segment.

Q8) Write short notes on (Any Three) **[18]**

a) Switching in Optical Domain.

b) Network Planning.

c) NFS.

d) Lossless Compression.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1529

[3965]-854

M.E. (Information Technology)

SERVICE ORIENTED ARCHITECTURE

(Revised 2008 Course) (Elective - IV) (514429)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Q.No. 1 and 5 are compulsory.***

SECTION - I

Q1) a) Consider College first year admission system in a engineering college, assume suitable constraints and model it with SOA Architecture. **[12]**

b) State 8 applications which are ideal for SOA type implementations. **[6]**

Q2) a) Explain IBM's On demand operating Environment. **[8]**

b) Draw and explain basic SOA architecture. **[8]**

Q3) a) Illustrate the technical constraints in SOA planning. **[8]**

b) What are SOA delivery strategies. **[8]**

Q4) a) How the security problems are addressed in SOA? **[8]**

b) Illustrate SOA service registry. **[8]**

P.T.O.

SECTION - II

Q5) a) Consider On line students campus placements and model it with SOA architecture. **[12]**

b) Identify and justify 4 web portals application based on interdisciplinary businesses. **[6]**

Q6) a) What are advantages and disadvantages using SOA implementations in business? **[8]**

b) What are the different standards used to implement SOA? **[8]**

Q7) a) What are the software tools used for End to End SOA solution for a business? **[8]**

b) Illustrate SOA Governance policies. **[8]**

Q8) a) What do you understand by service enablement? **[8]**

b) Explain operational SOA challenges. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1530

[3965] - 877

M.E. (Instrumentation and Control)

TRANSDUCER DESIGN

(Sem. - I) (2008 Course) (5061101)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design displacement transducer and its related instrumentation signal conditioning using, a typical non invasive technique, optical fiber. Displacement is to be measured for 10 mm. The slope of transducer curve is 2mV/ 0.1mm with intercept of 0.1 mV and correlation coefficient of 0.999998. State precautions necessary in the design. Describe capability and limitations of this sensor and instrumentation. **[16]**

Q2) a) A pressure transducer is to be designed for measuring pressures inside thermal plant boiler. The maximum temperature expected is 100 deg C. Pressure of Water in this boiler is 1000 psig. Suggest a suitable design to meet the requirement along with signal conditioner. **[10]**

b) A pressure of 1000psig is applied to a SS diaphragm of 10 mm dia. Consider poison's ratio of 0.3, Young's modulus be 2E+11 N/sqm. Find thickness of diaphragm. Assume suitable parameters. In case LVDT is proposed as sensor what displacement be considered for the diaphragm at rated pressure, and suggest a sensitivity to handle this displacement so an output of 20mV is possible at this pressure. **[6]**

P.T.O.

Q3) a) A piezo - electric accelerometer is available for measuring vibrations. The range of frequencies expected is from 0.5Hz to 5Hz for building/ civil structure. Design a system to acquire data of such a building structure. Maximum 10 transducers are made available. Describe each block of the system with appropriate specifications to complete the job of data acquisition and frequency analysis. **[8]**

b) A two component measurement is to be performed on a vehicle in motion. One can choose Piezoresistive MEMS based accelerometer. Describe specs for such measurement. A warning is desired for a tilt of the vehicle, maximum tilt of 5 degrees is permitted for safe driving. **[8]**

Q4) Write short notes on: **[18]**

a) pH Measurement with temperature compensations for pH between 5 to 8.

b) Colorimeter for displaying transmittance from 0% to 100% and absorbance appropriately.

c) Measurement of CO and NO in the Vijay Chowk in New Delhi.

SECTION - II

Q5) a) A non contact temperature measuring device with necessary display is desired for indicating temperature measurement on a boiler exhaust pipe. Describe any known technique for this work. **[8]**

b) Describe angular measurement employing a servo accelerometer technique. **[8]**

Q6) a) Describe an LDV for measuring a velocity profile in a wind tunnel. **[8]**

b) Describe other applications of LASER in Mechanical industry. **[8]**

Q7) a) Describe a simple calibration method to calibrate electronic blood pressure transducer. What sensing technique is preferred for this transducer? What algorithm is preferred to indicate Systolic and Diastolic pressure? **[10]**

b) Compare accuracies and limitations of resistive Strain gauges and fiber bragg strain gauges. **[6]**

Q8) Write short notes on: **[18]**

a) Optic ring gyro employing Sagnac effect.

b) Sensor for Water pollution monitoring.

c) Pressure transducer to monitor variation of pressure on sea bed due to Tsunami Conditions.

Total No. of Questions : 8] **[Total No. of Pages :2**

P1419

[3965] - 469

M.E. (Civil-Structure) (Process & Bio)

NON-LINEAR ANALYSIS OF STRUCTURE

(Elective) (2008 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator is allowed.***

SECTION - I

Q1) a) Explain 'Material Nonlinearity of beam' with examples. **[5]**

b) Find the solution for a moment curvature by non linear analysis of a simply supported beam subjected to concentrated load at midspan. **[12]**

c) Derive the equation of geometrical non linearity of beam with hinged ends due to stretching. **[8]**

Q2) a) Explain 'Geometric Nonlinearity of plate' **[8]**

b) Explain 'Displacement Equations Approach' of nonlinear analysis of plates. **[8]**

c) using stress function approach, write the strain enerties due to stretching, bending and kinetic energy of an orthotropic plate. **[13]**

Q3) a) Derive the equation for maximum deflection of rectangular plate by nonlinear analysis. **[17]**

b) State different out of plain and in plain boundary conditions for the analysis of plates. **[8]**

P.T.O.

SECTION - II

Q4) a) Obtain the deflection components of cantilever column at post-buckling stage due non linear behaviour. **[20]**

b) Explain Remberg-Osgood stress strain relationship. **[5]**

Q5) a) Explain procedure to find memebr forces of truss by nonlinear analysis with suitable example. **[12]**

b) Explain with diagrams and derivation, the deformation of square pinned-fixed frame for compressive loading. **[13]**

Q6) Write procedure for elastic plastic analysis of

a) Frames.

b) Propped cantilever.



Total No. of Questions : 6] **[Total No. of Pages :3**

P1534

[3965] - 886

M.E. (Instrumentation)

(Process Instru. & Biomedical Instru.)

CONTROL SYSTEM DESIGN

(5061108) (2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from Section - I and two questions from Section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data whenever necessary.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Design a suitable compensator using Root locus approach for a unity feedback control system having open loop transfer function as:

$$G(s)=\frac{1}{s(s+2)(s+7)}$$

To meet the following specifications.

i) Overshoot about 20%

ii) Settling time of 4 sec. **[14]**

b) Find that the point $s_1 = -3.3 \pm 2.8$ j is on the root locus of the system having transfer function: $G(s)=\frac{7(s+2)}{s(s+5)(s+1)}$ **[6]**

c) Compare the lead compensator and lag compensator. **[5]**

Q2) For a unity feedback system with open-loop transfer function.

$$G(s)=\frac{2}{s(s+2)(s+3)}$$

Design a suitable lag compensator using Bode plot approach to satisfy following specifications:

a) Gain Margin at least 10dB

b) Phase Margin = 45°

c) $K\upsilon = 6sec^{-1}$ **[25]**

Draw a Bode plot for compensated system designed above.

P.T.O.

Q3) a) Design a controller for the first-order process whose transfer function is given by:

$$G(s)=\frac{5}{8s+1}$$

such that

$$f(s)=\frac{1}{3s+1}$$

Design a controller using IMC strategy: **[15]**

b) Design a controller for the first-order process whose transfer function is given by:

$$G(s)=\frac{e^{-s}}{3s+1}$$

such that

$$Q(s)=\frac{e^{-2s}}{4s+1}$$

Design a controller using Direct controller synthesis approach. **[10]**

SECTION - II

Q4) a) What is state observer? Explain the necessity and types of state observers. **[4]**

b) Determine the state feedback gain matrix using Ackermann formula for a given system.

$$A=\begin{bmatrix}0 & 1\\ 0 & -2\end{bmatrix}, B=\begin{bmatrix}0\\ 1\end{bmatrix}$$

Assume that the desired close-loop poles need to locate at $s = -2 \pm j2\sqrt{3}$ **[12]**

c) Determine the observer gain matrix using Ackermann formula for a given system Assume that the observer poles need to locate at s = –8, s = –8. **[9]**

Q5) a) Determine the optimal control signal u for the system defined by

$$A=\begin{bmatrix}0 & 1\\ 0 & -1\end{bmatrix},\ B=\begin{bmatrix}0\\ 1\end{bmatrix},\ Q=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix},\ R=[1]$$

Such that the following performance index is minimized

$$J=\int_0^\infty \left(x^T Qx+u^T Ru\right) dt$$ **[13]**

b) Consider the system with the transfer function

$$\frac{Y(s)}{U(s)}=\frac{9}{s^2-9}$$

Design a full-order observer such that the observer-error poles are located at s = $-6 \pm j6$ **[12]**

Q6) Design a suitable digital compensator using Bode plot approach for a unity feedback control system having open loop transfer function as:

$$G(s)=\frac{K}{s(s+7)}$$

To meet the following specifications.

a) Overshoot about 25%.

b) Settling time of 2.5 sec.

c) The velocity error constant $K_v \geq 10$. **[25]**

Total No. of Questions : 6] **[Total No. of Pages : 4**

P1560

[3965]-918

M.E. (Printing Engineering and Graphic Communication)

PROBABILITY, STATISTICS AND QUEUEING THEORY

(Sem. - I) (2008 Course) (508101)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Use of Electronic calculator is permitted.***
6) ***Use of statistical Data tables is permitted.***
7) ***Figures on right indicate marks.***

SECTION - I

Q1) a) The probability that a patient recovers from a rare blood disease is 0.4. If 15 people are known to have contracted this disease. What is the probability that **[6]**

i) at least 10 survive.
ii) from 3 to 8 survive and
iii) Exactly 5 survive.

b) In an NBA (National Basketball Association) championship series, the team which wins four games out of seven will be the winner. Suppose that the team a has probability 0.55 of winning over the team B and both teams A and B face each other in the championship games. **[10]**

i) What is the probability that team a will win the series in six games.
ii) What is the probability that team a will win the series.
iii) If both teams face each other in a regional play off series and the winner is decided by winning three out of five games. What is the probability that team a will win a play off?

c) An electrical firm manufactures light bulbs that have a life, before burn - out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a bulb burns between 778 and 834 hours. **[9]**

P.T.O.

Q2) a) Two samples of size 9 and 8 give the sum of squares of deviations from their respective means equal to 160 and 91 sq. units respectively. Can there be regarded as drawn from the same normal population? Given that for $v_1 = 8$ and $v_2 = 7$; F0.05 = 3.73. **[13]**

b) X = {1, 2, 2, 3, 7, 10, 11, 11}

i) Find out mean, mode, middle.

ii) Find out standard deviation. **[12]**

Q3) a) A study was made on the amount of converted sugar in a certain process at various temperatures the data were coded and recorded as follows.**[15]**

Temperature	Converted sugar
1.0	8.1
1.1	7.8
1.2	8.5
1.3	9.8
1.4	9.5
1.5	8.9
1.6	8.6
1.7	10.2
1.8	9.3
1.9	9.2
2.0	10.5

i) Estimate the linear regression line.

ii) Estimate the mean amount of converted sugar produced when the coded temperature is 1.75.

iii) Prepare Annova table.

b) Given the data **[10]**

X	0	1	2	3	4	5	6	7	8	9
Y	9.1	7.3	3.2	4.6	4.8	2.9	5.7	7.1	8.8	10.2

i) Fit a regression curve of the form $MY/x = \beta_0 + \beta_1 x + \beta_2 x^2$.

ii) Estimate MY/2.

SECTION - II

Q4) a) Samples of size 50 are taken every hour from a process producing a certain type of item that is either considered defective or not defective Twenty samples are taken. **[15]**

Sample	Number of defective items	Sample	Number of defective items
1	4	11	2
2	3	12	4
3	5	13	1
4	3	14	2
5	2	15	3
6	2	16	1
7	2	17	1
8	1	18	2
9	4	19	3
10	3	20	1

i) Construct a control chart for control of proportion defective.

ii) Does this process appear to be in control? Explain.

b) From the above situation. suppose that additional data are collected as follows (samples of size 50) **[10]**

Sample	1	2	3	4	5	6	7	8	9	10
Number of defective items	3	4	2	2	3	1	3	5	7	7

Q5) Suppose that we wish to use a half - replicate to study the effects of five factors each at two levels on some response and it is known that whatever the effect of each factor, it will be constant for each level of the other factors. In other words, there are no interactions. Let the defining contrast be ABCDE. causing main effects to be aliased with four factor interactions. The pooling of contrasts involving interactions provides 15 – 5 = 10 degrees of freedom for error. Perform an analysis of variance on the following data testing all main effects for significance at the 0.05 level. **[25]**

Treatment	Response	Treatment	Response
a	11.3	bcd	14.1
b	15.6	abe	14.2
c	12.7	ace	11.7
d	10.4	ade	9.4
e	9.2	bce	16.2
abc	11.0	bde	13.9
abd	8.9	cdc	14.7
acd	9.6	abcde	13.2

Q6) a) Explain Queuing Model and its channel. **[15]**

b) Explain Kendall's Notation. **[10]**



Total No. of Questions : 10] **[Total No. of Pages : 2**

P1585

[3965]-73
M.E. (Mech.) (Design Engg.)
TRIBOLOGY
(2002 Course) (Old & Revised Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat sketches must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the Theorics of friction. **[8]**

b) Explain the different types of major & minor wear. **[8]**

Q2) a) State and explain the laws of wear. **[8]**

b) Explain in detail the mechanism of rolling friction. **[8]**

Q3) a) Using Adhesion theory of metals, show that coefficient of friction can he written as. **[8]**

$$\mu = c / \left[\alpha (1 - c^2)\right]^{1/2}.$$

b) State and explain various factors of wear. **[8]**

Q4) a) Explain, Apparent area of contact, Real area of contact and contact area. **[8]**

b) Explain in detail modern Research / Experimental methods for determining the real area of contact. **[8]**

Q5) Write in brief on: **[18]**

a) Junction Growth.

b) Auto correlation function.

c) Delamination wear.

P.T.O.

SECTION - II

Q6) a) State the assumptions made in deriving the Reynold's Equation. **[8]**

b) With the help of Reynolds equation state the concept of short and long journal bearing. **[8]**

Q7) a) Explain the theory of EHD lubrication. **[8]**

b) Explain the mechanism of squeeze film and its application. **[8]**

Q8) a) State the advantages and limitations of gas lubricated bearings. Give their applications. **[8]**

b) Derive the equation for flow of viscous fluid through a rectangular slit. **[8]**

Q9) a) What are the applications of pivoted shoe bearings? What are its advantages and limitations? **[8]**

b) Explain in brief Hydrostatic lift. **[8]**

Q10) Write in short note on: **[18]**

a) Bearing material properties.

b) EP additives.

c) Mechanical seals.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1599

[3965]-567

M.E. (Mechanical) (Automotive Engineering)

FUNDAMENTALS OF VEHICLE DYNAMICS

(2008 Course) (502308) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by the term 'RIDE PERCEPTION' and what are the ride excitation sources? Explain with the help of examples. **[8]**

b) Springs of an automobile trailer are compressed 0.1 m under its own weight. Find the critical speed when trailer is traveling over a road with profile approximated by a sine wave of amplitude .08m and wave length 14m. What will the amplitude of vibrations at 60km/hr. **[8]**

Q2) a) Explain with the help of sketches, a spring mass system with a damper which can be used to isolate the vehicle from effects of road roughness. **[6]**

b) Find the front and rear suspension ride rates for a 5 Liter SUV for which the tyre spring rate is given as 210 N/mm. Front suspension rate is 25 N/mm and rear suspension rate is 17.5 N/mm. Also calculate natural frequencies of the two suspensions when front tyres are loaded to 4260N and rear tyres at 3250N each. **[10]**

Q3) a) Draw a neat sketch of a car accelerating on an upward sloping surface and show various forces (Including axle loads) that act on it. **[8]**

b) The curb weight on front axles of a car without passengers or cargo are 10300 N on front axles and 5900 N on rear axle. Wheel base of the car is 2770 mm. Determine fore/aft positions of c.g. of the car. **[8]**

P.T.O.

Q4) a) Explain various types of steering geometries and show position of arms, pins and linkages in steering mechanism, while driving straight, turning to the right and turning to the left. **[10]**

b) Explain with the help of a sketch as to how steering and road holding of a car depend on layout and orientation of stub axles on which the front wheels are mounted. **[6]**

Q5) Write short notes on: **[18]**

a) Steering ratio.

b) 4 wheel steer.

c) Rollover of vehicles.

d) Crash test of cars.

e) Engine vibration Isolation.

f) Reasons for difference in ride quality in low/medium priced cars and high priced cars.

SECTION - II

Q6) Explain vehicle response to various steering inputs and "Directional Response Behavior". How the responses are differ while slow speed cornering and high speed cornering. What do you understand by "yaw velocity" or "yaw rate"? Draw a graph of vehicle speed Vs yaw velocity gain for neutral steer, under steer and over steered vehicles. **[16]**

Q7) Explain with the help of a labeled sketch mechanism and handling of a tracked vehicle (Military tank). **[16]**

Q8) a) Describe different types of suspension systems in modern cards. What are the kinematics and Dynamic requirements of a good suspension system? **[8]**

b) Maruti 800 uses McPherson Strut type of suspension system. Show this in the chassis of the car and design its spring assuming its suitable inclination angle with the vertical axis. Assume total mass of the car as 1000 kg and dynamic mass distribution on front/rear axles 60:40. Specify all dimensions of the spring. **[8]**

Q9) a) Draw a cross sectional view of a twin tube. Mono tube shock absorber used for damping in cars. What do you mean by active and passive suspension systems, explain with the help of examples. **[8]**

b) A car weighs 13 kN and has a wheel base of 2.5 m. The center of gravity of the car is 1.2 m in front of the rear axle and 800 mm above the ground level. The car is having brakes on all four wheels. The coefficient of adhesion between the road and wheels is 0.5. If the car is moving up an incline of angle whose sine is equal to 0.1. **[8]**

Calculate :

i) Load distribution between front and rear axles.

ii) Distance at which it can be stopped while going at speed of 50 km/hr when only rear wheel brakes are used.

Q10) Write short notes on: **[18]**

a) Stiffness ratio, damping ratio, and natural frequency of unsparing mass.

b) Pitching moment and yawing moment.

c) Techniques available for the assessment of passenger comfort.

d) Combined effect of cornering and braking.

e) Roll steer.

f) Solid axles and independent suspensions.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1601

[3965]-671

M.E. (Electronics) (Digital Systems)

COMMUNICATION NETWORK AND SECURITY

(2008 Course) (504202) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw & Explain IEEE 802.11 PHY frame using DSSS? **[8]**

b) Explain DCF & PCF wrt 802.11 Wireless network. **[8]**

Q2) a) Explain the Requirements of Mobile IP. Define MN, FA, COA & HA for mobile IP system. **[8]**

b) Explain IP in IP encapsulation and Minimal encapsulation for mobile IP system. **[8]**

Q3) a) Explain the following in detail : **[8]**

- Reactive routing.
- Proactive routing.

b) Explain the concept of data dissemination and data gathering in wireless sensor network (WSN). **[8]**

Q4) Write short note on any three: **[18]**

a) Sensor management in WSN.

b) Bluetooth.

c) Frame relay.

d) Wireless Adaptation layer.

P.T.O.

SECTION - II

Q5) a) Explain following in detail : **[8]**

- Substitution Technique.
- Transposition Technique.

b) Explain HMAC and IPSec. Briefly. **[8]**

Q6) a) Explain DES algorithm in detail and compare with AES algo. **[8]**

b) Explain Diffie-Hellman algorithm in detail and compare with RSA algo. **[8]**

Q7) a) Explain the following in detail : **[8]**

- Properties of Digital Signatures.
- Requirements for Digital Signatures.

b) Explain IDEA symmetric key algorithm briefly and list the applications. **[8]**

Q8) Write short note on any three: **[18]**

a) S/MIME.

b) SSL & TSL.

c) X.509 Formats.

d) Secure Electronic Transaction.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1602

[3965]-684

M.E. (E & T/C) (Communication Networks)

AD - HOC NETWORKS

(2010 Course) (504603) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare the Cellular Network and adhoc Wireless Network. **[9]**

b) Enlist various applications of adhoc Wireless Network and explain any two in brief. **[9]**

Q2) a) Give the classification of MAC protocol and explain any one in detail. **[8]**

b) What are the design issues of routing protocol for adhoc Wireless Network? **[8]**

Q3) a) Compare on-demand and table driven Routing Protocol. Explain Hybrid Routing Protocol? **[8]**

b) Explain any one Hybrid Routing Protocol? **[8]**

Q4) a) Explain the Bandwidth efficient multicast Routing Protocol. **[8]**

b) Explain the architecture of Multicast Routing Protocol. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain why TCP does not perform well in adhoc wireless N/W? **[9]**

b) What are the requirements of security protocol for adhoc wireless network. Explain the Routing attacks. **[9]**

Q6) a) What is necessity of energy management in adhoc Wireless Network. **[8]**

b) What are the battery management scheme? Explain one of the device dependent battery management scheme? **[8]**

Q7) a) Explain battery aware MAC protocol. **[8]**

b) Explain key management Approaches. **[8]**

Q8) a) What are the issues and challenges for providing Qos in adhoc Wireless Network? **[8]**

b) Explain Fisheye state Routing Protocol. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1603

[3965]-705

M.E. (Production)

SHEET METAL PROCESSING

(2008 Course) (Elective - II) (511105)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***

SECTION - I

Q1) a) Explain different properties and grades for sheet metal. **[8]**

b) Explain different methods for testing of sheet metal product. **[8]**

Q2) a) Explain with suitable example how the Forming limit diagram help in product design for sheet metal. **[8]**

b) Discuss with suitable example the different steps for product design in sheet metal. **[8]**

Q3) a) Write steps followed in deep drawing of sheet. **[8]**

b) Explain different Methods of spring back compensation. **[8]**

Q4) Write short notes on any three: **[18]**

a) Different defects appearing in sheet metal product.

b) Fine blanking.

c) Rate sensitivity and its effect on sheet metal product.

d) Press tools used in sheet metal operation.

P.T.O.

SECTION - II

Q5) a) Explain design considerations in three high roll forming. **[8]**

b) Explain different sheet metal joining process. **[8]**

Q6) a) Discuss automation for part handing in sheet metal processing. **[8]**

b) State necessasity of safety devices and their selection at press shop. **[8]**

Q7) a) Explain numerical methods of analysis of forming process. **[8]**

b) Explain scope of CAD/CAM in sheet metal forming. **[8]**

Q8) Write short notes on any three: **[18]**

a) Different presses used in forming of sheet metal.

b) Blank holding devices.

c) Strain distribution of a drawn component.

d) Centre of pressure in press operation.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1609

[3965] - 787

M.E. (Chemical)

ADVANCED PROCESS CONTROL

(2008 Course) (Sem. - II) (509110)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Starting from differential equation model, of second - order process, derive the following:

a) Transfer function model.

b) Unit step response for $\zeta < 1, = 1, > 1$.

c) Sketch the response curves and compare their characteristics. **[16]**

Q2) a) The open-loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{k}{(s+2)(s+4)(s^2+6s+25)}$$

Applying Routh criteria discuss the stability of closed - loop system as a function of k. Also determine the values of k which will cause sustained oscillations in the closed - loop system along with the corresponding frequency of oscillations. **[8]**

b) Draw the root locus of a closed-loop system with the following component. Transfer functions.

$$Gp(s) = \frac{1}{(s+1)(2s+1)}, \; G_c(s) = k_c, \; G_m(s) = G_f(s) = 1$$

Find the values of K_c that yield.

i) Overdamped ii) Critically damped and

iii) Underdamped responses. **[8]**

P.T.O.

Q3) a) Describe cascade control strategy for controlling temperature of cold fluid exit stream from a shell and tube heat exchanger with flow rate of entering hot fluid stream as secondary variable. Also draw suitable block diagram. **[8]**

b) Describe split - range control strategy for controlling pressure in the steam header connected to 4 parallel boilers. **[8]**

Q4) a) Find the R.G.A. for 2×2 system having steady-state gain matrix

$$K=\begin{bmatrix} 1.318 & -0.33 \\ 0.038 & 0.36 \end{bmatrix}$$

Recommend the loop pairing based on R.G.A. **[6]**

b) The result of a step test performed on an SO_2 scrubber is given in the following table. The water flow rate is input variable and the outlet SO_2 concentration is output variable.

i) Postulate a simple FOPDT model to represent these data and estimate the parameters of the model.

ii) Obtain the theoretical response of the identified model to the indicated input. Plot and compare the response with the given data. Comment on the model fit.

Time t(s)	Water flow rate (LPH)	Outlet SO_2 concentration(ppm)
<0	500	25.00
0.0	400	25.00
10	400	25.00
20	400	25.01
30	-	25.00
40	-	25.06
50	-	25.15
60	-	25.30
70	-	25.39
80	-	25.45
90	-	25.53
100	-	25.60
110	-	25.63
120	-	25.67
130	-	25.74
140	-	25.78

150	-	25.82
160	-	25.85
170	-	25.88
180	-	25.89
190	-	25.90
200	-	25.89
220	-	25.90
240	400	25.90

[12]

SECTION - II

Q5) a) Synthesize a DS-controller for a F.O. process having transfer function $Gp(s) = \frac{0.66}{6.7s+1}$ with desired output trajectory $Q(s) = \frac{1}{5s+1}$ state the values of controller tuning parameters. **[8]**

b) Design a DS - controller for a S.O. process having transfer function $Gp(s) = \frac{k}{(3s+1)(5s+1)}$ so as to follow a reference trajectory $Q(s) = \frac{1}{4s+1}$. **[8]**

Q6) a) Derive IMC controller for a F.O. process $Gp(s) = \frac{5}{8s+1}$ with a first - order filter. **[8]**

b) Derive generic model control (GMS) strategy for a F.O. process modeled as $\tau \frac{dy}{dt} + y = K_p u$

Compare the resulting controller with a DS - controller. **[8]**

Q7) a) Explain the optimization approach in process control (RTO). **[8]**

b) Explain MPC strategy. What are its advantages over classical feedback control strategy. **[8]**

Q8) Write short notes on: **[18]**

a) SP - weighted PID - controller.

b) Autotuning controllers.

c) Fuzzy logic controllers.



P1610

[3965] - 894

M.E. (Instrumentation & Control) (Process & Biomedical)

ADVANCED PROCESS INSTRUMENTATION

(2008 Course) (Elective - III) (5061112)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A tank is used to accommodate the difference between the supply from process - 1 (single inlet flow F1) & demand to process - 2 (single outlet flow F2). Develop two possible control strategies for the system & also classify all process variables from control point of view for each case,

Case I : Process - 2 regulates the flow rate F2.

Case II: Process - 1 regulates flow rate F1. **[16]**

Q2) a) A process has the following transfer function,

$$g_p(s) = \frac{1}{(3s+1)(2s+1)(s+1)}$$

For a P-only controller, find range of the controller gain that will yield a stable closed loop system. Also comment on effect of increasing controller gain on closed loop poles. **[8]**

b) Explain necessity of decoupling control. A system has the following process gain matrix,

$$K_p = \begin{bmatrix} 0.025 & -0.075 \\ 1 & 1 \end{bmatrix}$$

How would you pair variables for your control 1oops? Why? **[8]**

Q3) Consider a perfectly mixed stirred tank heater, with single feed stream & a single product stream. Assuming that the flow rate & temperature of the inlet stream can vary, and that the rate of heat added per unit time can vary, **[18]**

a) Derive the modeling equations for this system. State your assumptions clearly & explicitly.

b) Derive the transfer function between output temperature and heating rate input assuming heat storage in heater mass to be negligible. Comment on the result.

Q4) Two liquids water & calcium chloride salt solution are mixed together in a tank & the product is removed through an exit stream at the bottom of the tank; the flow rate of calcium chloride solution can be adjusted with the available control valve, while the water flow rate is wild, Develop the process flow diagram & propose two control configurations that would maintain a uniform outlet salt concentration by maintaining a constant ratio of water & the calcium chloride salt solution flow rates. Also discuss and compare each configuration. **[16]**

SECTION - II

Q5) a) Describe in brief any one application of selective control. **[8]**

b) Explain with suitable examples limitations to inverting a process model. **[8]**

Q6) a) A process having transfer function

$$g_p(s) = \frac{Kp(-\beta s + 1)e^{-\theta s}}{(Tp1 s + 1)(Tp2\ s + 1)}$$

Where,

Kp = 2, Tp1 = 10 min, Tp2 = 3 min, θ =5 min & β =6 min

Design an IMC for this process assuming that, an all pass filter is used & the controller is strictly proper. **[10]**

b) Explain with suitable example role of cascade control to improve performance of the feedback control system. **[8]**

Q7) a) Explain in brief design steps of feed forward controller for FOPDT process & disturbance transfer functions. Comment on condition for the controller to be realizable. **[8]**

b) Discuss in brief design requirements of a feedback control. **[8]**

Q8) Design Fuzzy logic controller for temperature control system. It should include thermocouple for temperature measurement, design of an amplifier to magnify input signal from the thermocouple & an amplifier to magnify output signal from the computer. Draw the block diagram schematic for the developed system. **[16]**

Total No. of Questions : 8] [Total No. of Pages : 2

P1611

[3965] - 914

M.E. (Polymer Engg.)

SPECIALTY POLYMER AND MATERIALS

(509125) (2008 Course) (Elective - III)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are hydrogels? What are the basic structural requirements for a polymer to exhibit water absorption properties? Give the synthesis of any one polymer of this category. **[9]**

b) Define the term liquid crystallinity. Explain why some polymers show LC behavior while others not. Give examples of any three liquid crystalline polymers. **[9]**

Q2) a) Discuss the theory of conduction in conducting polymers. What are the prerequisites for a polymer to conduct electricity? Explain how a non-conducting or less conducting polymer can be made to conduct electricity. **[8]**

b) Enlist the advantages of biopolymers over conventional polymers. Can biopolymer be differentiated from natural polymers? How? **[8]**

Q3) a) Explain the concept of self reinforcing polymers giving suitable example for its preparation and effect on properties. **[8]**

b) Write a note on cellulosic membranes emphasizing the various cellulosics used, manufacturing process and their applications. **[8]**

Q4) a) Write a detailed note on polymers in construction and agricultural industry. **[8]**

b) Discuss the role of polymers in communication system. **[8]**

P.T.O.

SECTION - II

Q5) a) How will you define thermal stability of polymers? Give the structural requirements for a polymer to show thermal stability. Also discuss the factors affecting thermal stability. **[9]**

b) Give the detailed account of polymers in controlled drug release alongwith its mechanism and various modes. Compare this system with traditional drug therapy. **[9]**

Q6) a) Explain the importance of polymer blend over individual polymers. Differentiate between polymer blends and copolymers. Also explain the choice of blend or copolymer based on applications. **[8]**

b) Write a note on Flory - Huggins solution theory. **[8]**

Q7) a) Define reverse osmosis. Explain its mechanism. Discuss the use of this kind of technique in various applications. **[8]**

b) Explain how thermotropic LCs are different from lyotropic LCs. Write a note on various mesophases seen in LC materials. Give manufacture of any one thermotropic LC. **[8]**

Q8) a) Write a note on synthesis, manufacture and applications of polysulphone membranes. **[8]**

b) Write a note on polyheterocyclic conducting polymers. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1612

[3965] - 916

M.E. (Polymer Engineering)

ELASTOMER TECHNOLOGY

(2008 Course) (Elective - IV) (509126)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give in detail the manufacturing process for tyre. Draw a diagram for a typical tyre showing various layers and reinforcements. **[9]**

b) Give the process and various stages involved in the isolation of natural rubber. **[9]**

Q2) a) Write a note on processing of natural rubber by extrusion. What are the basic requirement for the rubber that should undergo extrusion? **[8]**

b) Why carbon black is predominantly used as filler in rubber? Explain with supporting data. **[8]**

Q3) a) Compare the difference in properties of raw rubber and vulcanized rubber with suitable data. **[8]**

b) Explain the manufacture of latex based products such as dipped goods. What are the advantages of this method? **[8]**

Q4) a) What is vulcanization? Explain the various ways by which sulfur vulcanization can be done. Also comment on various factors affecting the vulcanization process. **[8]**

b) Give your comments on the molecular requirements for any material to behave as rubber. **[8]**

P.T.O.

SECTION - II

Q5) a) Discuss the method to determine the cure rate of rubber. Draw the well labeled graph if necessary. **[9]**

b) Write a note on kinetic and thermodynamic theory of rubber elasticity. **[9]**

Q6) a) Compare and contrast NBR and SBR with reference to their properties, cure characteristics and applications. **[8]**

b) Write a note on testing and analysis of raw rubber. **[8]**

Q7) a) Discuss any two ASTM standards for testing of finished rubber products. **[8]**

b) Write a note on processing of rubber by injection moulding. Explain how it is different from injection moulding of plastics. **[8]**

Q8) Write a short note on each one of the following additives. Emphasize on their mixing method, their role and contribution to properties to the properties of finished product. **[16]**

a) Activators.

b) Peptizers.

c) Blowing agents.

d) Extender oils.

Total No. of Questions : 6] **[Total No. of Pages :2**

P1613

[3965] - 924

M.E. (Printing)

DIGITAL PRINTING

(Elective - II(A)) (2008 Course) (508105) (Theory)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from Section - I and any two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Electrophotographic Process in detail with proper schematic diagram. **[10]**

b) Compare the following: **[15]**

i) LED and LASER Printers.

ii) Infrared film and thermography.

iii) Passive and Active Thermography.

Q2) a) Justify 'Direct-imaging (DI) and computer-to-plate (CTP) technology can help printers to address Staying state-of-the-art and Shortage of skilled production personnel concerns'. **[10]**

b) State and Explain various items which must be considered as a part of prepress at one time or another. List only the various types of scanners and explain in brief 3D Scanner. **[15]**

Q3) a) What is PDF/X? List and Explain PDF/X Standards. **[10]**

b) Explain the following in brief: **[15]**

i) RIP.

ii) Postscript.

iii) Ghost script.

P.T.O.

SECTION - II

Q4) a) State and Explain in the main Image quality attributes. List different tools used for verification and explain one tool in detail. **[10]**

b) Explain in brief the Calorimetric and Visual Assessment of Inkjet print. **[15]**

Q5) a) Justify that 'Profits from print on demand publishing are on a per-sale basis and Royalties vary' with proper examples. **[10]**

b) Explain the following in brief. **[15]**

i) Variable Data Printing.

ii) Web2 Print.

iii) 3D Printing.

Q6) a) What are the future trends in Printing Industry? Explain in detail. **[10]**

b) Write short notes on (Any three): **[15]**

i) Micro printing.

ii) Latest Printers and Print Facilities.

iii) Eco-friendly Approach in Printing.

iv) Color Management.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1611

[3965] - 914

M.E. (Poly. Engg.)

SPECIALITY POLYMER AND MATERIALS

(2008 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Black figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are hydrogels? What are the basic structural requirements for a polymer to exhibit water absorption properties? Give the synthesis of any one polymer of this category. **[9]**

b) Define the term liquid crystallinity. Explain why some polymers show LC behavior while others not. Give examples of any three liquid crystalline polymers. **[9]**

Q2) a) Discuss the theory of conduction in conducting polymers. What are the prerequisites for a polymer to conduct electricity? Explain how a non-conducting or less conducting polymer can be made to conduct electricity. **[8]**

b) Enlist the advantages of biopolymers over conventional polymers. Can biopolymer be differentiated from natural polymers? How? **[8]**

Q3) a) Explain the concept of self reinforcing polymers giving suitable example for its preparation and effect on properties. **[8]**

b) Write a note on cellulosic membranes emphasizing the various cellulosics used, manufacturing process and their applications. **[8]**

Q4) a) Write a detailed note on polymers in construction and agricultural industry. **[8]**

b) Discuss the role of polymers in communication system. **[8]**

P.T.O.

SECTION - II

Q5) a) How will you define thermal stability of polymers? Give the structural requirements for a polymer to show thermal stability. Also discuss the factors affecting thermal stability. **[9]**

b) Give the detailed account of polymers in controlled drug release alongwith its mechanism and various modes. Compare this system with traditional drug therapy. **[9]**

Q6) a) Explain the importance of polymer blend over individual polymers. Differentiate between polymer blends and copolymers. Also explain the choice of blend or copolymer based on applications. **[8]**

b) Write a note on Flory - Huggins solution theory. **[8]**

Q7) a) Define reverse osmosis. Explain its mechanism. Discuss the use of this kind of technique in various applications. **[8]**

b) Explain how thermotropic LCs are different from lyotropic LCs. Write a note on various mesophases seen in LC materials. Give manufacture of any one thermotropic LC. **[8]**

Q8) a) Write a note on synthesis, manufacture and applications of polysulphone membranes. **[8]**

b) Write a note on polyheterocyclic conducting polymers. **[8]**



Total No. of Questions : 10] **[Total No. of Pages :3**

P1618

[3965] - 69
M.E. (Mechanical) (Design Engg.)
PROCESS EQUIPMENT DESIGN
(2002 Course) (Elective - I) (Theory)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of logarithmic tables, slide rules, Mollier chart, electronic steam table and electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary giving reasons.***

SECTION - I

Q1) a) What is dilation of pressure vessel? Give expression for dilation of cylindrical or spherical vessel. **[4]**

b) Explain design of pressure vessel subjected to external pressure. **[8]**

c) Estimate the thickness of a conical head having half apex angle 38°. The diameter of the vessel is 1.5 m. Permissible stress of the material is 1020 kg/sq cm, welded joint efficiency is 85%. **[4]**

Q2) a) Name two materials used for high pressure vessels. **[2]**

b) Explain Design of thick walled high pressure vessels. **[8]**

c) A high pressure vessel is to be operated at 150 N/mm^2, the inside diameter of vessel is 30 cm. Vessel is fabricated from high tensile steel having permissible tensile stress 5000 N/mm^2. Determine wall thickness on the basis of maximum tangential stress at inner surface. **[6]**

Q3) a) Explain Design of flanged joints. **[6]**

b) What are the design consideration in skirt support design. **[6]**

c) Explain any two of the following theories of failure **[4]**

i) Guest theory.

ii) Saint venanat's theory.

iii) Hencky - Von mises theory.

P.T.O.

Q4) a) Explain bracket supports and design aspect related to them. **[6]**

b) Design a saddle support for horizontal vessel using following data.

MATERIAL Low carbon steel, vessel diameter = 1230 mm,

Length of shell = 8000 mm, shell thickness = 10 mm,

Working pressure = 0.5 N/mm^2, Head thickness = 12 mm.\

torishperical head – crown radius = 1230 mm,

Knuckle radius – 75 mm. total head depth = 257 mm,

Corrosion allowance = 1.5 mm, Permissible stress = 95 N/mm^2,

weight of vessel and contents = 119430 N,

Distance of saddle centre line from shell end = 320 mm,

Included angle = 120^o. **[10]**

Q5) Explain with neat sketches (any three) **[18]**

a) Floating roofs for storage vessels.

b) Nozzle reinforcement - need, methods and design.

c) Different types of heads for pressure vessels.

d) Reinforcement of vessel under external pressure.

SECTION - II

Q6) a) A pressure vessel has inside diameter 1470 mm and q plate thickness of 5 mm. Inside diameter of flange is 1482 mm. A gasket is provided over the flange face. Gasket factor is 2.0 and the gasket seating stress is 120 kg/cm^2. Inside diameter of gasket is 1485 mm. Pressure inside vessel is 2.5 kg/cm^2.

Permissible stress in bolts under atmospheric conditions is 600 kg/cm^2.

Permissible stress in bolts at operating conditions is 550 kg/cm^2.

Diameter of bolt is 20 mm. Calculate **[10]**

i) Bolt load.

ii) Bolt area.

iii) Flange thickness.

b) Explain constructional details of high pressure vessels. **[6]**

Q7) a) Explain important features of Plate columns or packed columns. **[6]**

b) What are the design considerations for tall vessels? **[6]**

c) What is a power curve? Explain use of power curves in design of agitator. **[4]**

Q8) a) Explain role of process flow diagrams in plant design and errection. **[4]**

b) Explain design considerations for shell and tube heat exchanger. **[8]**

c) What is the function of baffles in heat exchanger? Explain their classification. **[4]**

Q9) a) Explain thermal stresses and its determination **[4]**

b) Explain either contacting devices in plate columns or Types of packing in packed columns. **[4]**

c) What are filters? Explain classification filters. Describe leaf filter or rotary drum filter. **[8]**

Q10)Explain with sketches (any three) **[18]**

a) Design consideration for process equipment design.

b) Types of driers.

c) Spiral heat exchanger.

d) Protective coatings.

e) Inspection ad testing of pressure vessels.

Total No. of Questions : 8] [Total No. of Pages :2

P1621

[3965] - 447

M.E. (Civil - Hydraulics)

SEDIMENT TRANSPORT AND RIVER MECHANICS

(Sem. - II) (2008 Course) (501310)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to THE right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define sediment? Enlist the nature of sediment problems? Discuss any four in detail. **[10]**

b) What is difference between contact load, saltation load and bed load? **[4]**

c) What is wash load? **[4]**

Q2) a) What do you mean by incipient condition of sedimentary particle? Explain critical tractive force approach in detail. **[8]**

b) Describe different regimes of flow and explain formation of various bed forms on the bed of an alluvial channel due to flow of water. **[8]**

Q3) a) Define fall velocity and derive expression for it? **[6]**

b) Explain DuBoys bed load equation for prediction of bed load transport rate. **[10]**

Q4) a) Explain Magnus effect in detail. **[6]**

b) Determine bed load transport by M-P-M equation with following data. **[10]**

i)	Width of channel	- 50m
ii)	Depth of flow	- 4m
iii)	Bed slope	- 1 in 3500
iv)	Mannings 'n'	- 0.0210
v)	Mean diameter of Particle	- 0.35 mm
vi)	Representative size on bed	- 0.5 mm

P.T.O.

SECTION - II

Q5) a) Compare Lacey's and Kennedy's theory of design of stable channel. **[8]**

b) Design an irrigation channel in alluvial soil according to Lacey's method for following data **[10]**

i) Full supply discharge - 20 cumec

ii) Lacey's silt factor - 0.9

iii) Channel side slope = 0.5H : 1V

Q6) a) Define stable channel and secondary factors affecting stable channel design. **[8]**

b) Write short notes on **[8]**

i) Reservoir sedimentation.

ii) Trap efficiency.

Q7) Discuss River training in consideration with. **[16]**

a) Objectives.

b) River training for sediment control.

c) Flood control.

d) Navigation.

Q8) Explain **Any Two** of the following: **[16]**

a) Delta formation.

b) Meandering of rivers.

c) Einstein's bed load equation.

d) Stokes Law and its limitations.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1625

[3965]-463

M.E. (Civil) (Structures)

THEORY OF PLATES & SHELLS

(2008 Course) (501408) (Sem. - II)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the governing differential equation in Cartesian coordinates for thin plate subjected to distributed lateral loads. **[12]**

b) Derive the boundary conditions for a rectangular plate supported by edge beams assuming that a uniformly distributed line load acts on two opposite edges. **[5]**

c) Obtain the expression for strain energy stored in the small element of a thin plate subjected to bending and twisting moments. Describe the procedure to obtain the deflected surface of the plate under a given loading by Raleigh - Ritz approach. **[8]**

Q2) a) Starting from basic principles, using Navier's method obtain an expression in double series form of a simply supported plate (a x b) subjected to a single load P at some given point $x = \varepsilon$, $y = \eta$. **[19]**

b) Brief about the shear deformation theories for analysis of plates. **[6]**

Q3) Starting from the basic principles, determine the internal forces and the deflection of a circular plate loaded with a uniformly distributed load if **[25]**

i) plate is fixed at the edges.

ii) plate is simply supported at the edges.

P.T.O.

SECTION - II

Q4) a) Derive the equation of equilibrium in terms of stress resultants of thin shell of revolution carrying axi - symmetric loading. **[15]**

b) A uniform spherical shell having a semi central angle 'β' is subjected to uniformly distributed load 'q' per unit area of shell surface. It also carries a ring load 'p' per unit circumference at semi central angle $\beta/4$. Obtain expressions for membrane stresses N_θ and N_Φ at any meridonial angle Φ. **[10]**

Q5) a) A semicircular thin cylindrical shell roof of uniform thickness has length 'l' and mean radius 'a'. It is simply supported at the curved edges and free along the straight edges. Obtain the expressions for the stress resultants, $N_x, N_\Phi, N_{x\Phi}$ induced in the shell due to its own weight of intensity 'q' per unit area. **[14]**

b) For a cylindrical vessel with hemispherical ends, show with proper sketches that if only membrane stresses are considered, we obtain a discontinuity at the joints. **[6]**

c) Show the stress resultants on a small element of a cylindrical shell for general loading. **[5]**

Q6) a) Describe Lundgren's beam theory for cylindrical shells giving expressions for various stress resultants. Compare them with the stress resultants obtain by membrane theory. Discuss the advantages and limitations of the beam theory. **[10]**

b) Derive the expression for strains ε_x and ε_y at a point due to the bending and membrane actions in a shell. Also obtain the expressions for the stress resultants in terms of strains. **[15]**



Total No. of Questions : 6] **[Total No. of Pages :3**

P1627

[3965] - 465

M.E. (Civil) (Structures)

MANAGEMENT IN STRUCTURAL ENGINEERING

(2008 Course) (501410) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What are the resources for building construction and explain briefly the role of resource management in planning and controlling productivity. **[7]**

b) Determine number of skilled and unskilled workers required to complete a task involving 192 m^2 flooring for a slab. The time marked for completion is four days working 8 hours per day. If a workers team consisting of two skilled workers an unskilled worker can work at rate of 1.5 m^2/hour. **[6]**

c) Write short note on selecting construction equipment. **[6]**

d) Write a short note on recruitment. **[6]**

Q2) a) Explain quality control with the help of following points.

i) Concept of quality of structures. **[2]**

ii) Stages of quality control. **[6]**

iii) Means of quality control. **[6]**

b) Explain corrosion in structures with the help of following points. **[11]**

i) Corrosion of concrete.

ii) Reinforcement corrosion.

P.T.O.

Q3) a) Explain N.D.T. with following points. **[6]**

i) Definition.

ii) Significance.

iii) Properties of concrete from which strength is obtained with NDT.

b) List the different methods of NDT for compressive strength of concrete and explain Penetration Resistant Test in details. **[7]**

c) Compare health monitoring and structural audit. **[6]**

d) Write a short note on: **[6]**

i) Presentation of Report.

ii) Limitation on investigation.

SECTION - II

Q4) a) Answer the following: **[8]**

i) Enlist the properties of chemicals used during restoration.

ii) Why acrylics are mostly used as protective coating?

iii) Why epoxy is suitable adhesive in construction work?

iv) What is the difference between repair & retrofitting?

b) Define: **[8]**

i) Polymerisation.

ii) Restoration.

iii) Latex.

iv) Working time.

v) Age hardening.

vi) Catalyst.

vii) Adhesives.

viii) Cross linking agent.

c) Explain in details the specification for sealing of cracks by injection of epoxy grouting with following points. **[9]**

i) General.

ii) Products.

iii) Execution.

Q5) a) Explain the structural aspects for formwork in building. **[7]**

b) Write short note on: **[8]**

i) Safety sign.

ii) Safety precautions working at hight.

c) Write a short note on: **[10]**

i) Material handling and stacking.

ii) Existing methods of formwork.

Q6) Write short notes on: **[25]**

a) Demolition safety.

b) Planning and executing of demolution.

c) Recycling of demolished material.

d) Role of structural drawing in demolition of structures.

e) Wire saw technique of demolition.



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1628

[3965]-466

M.E. (Civil) (Structures)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Elective - III) (2008 Course) (501411)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the write indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1893-2002 (Part - I) is permitted.***

SECTION - I

Q1) a) What are the causes and effects of an earthquake. **[6]**

b) Describe two approaches in details for the assessment of severity of an earthquake. **[9]**

c) Explain three types of boundaries based on inter - plate interaction. **[10]**

Q2) a) "The seismic performance of a structure mainly depends on its foundation design". Justify the statement with reference to earthquake resistant design. **[6]**

b) What is Ductility? Explain philosophy behind earthquake design. **[9]**

c) What are seismic methods of analysis? Explain Time History Method of Analysis. **[10]**

Q3) a) Describe various type of the plane frame mathematical models of multistory RC building. **[10]**

P.T.O.

b) A plan of five storey SMRF building for T.V. Centre is as shown in figure 3.1. The Dead Load including self weight of slab etc. is 5 kN/m^2 and Live Load 4 kN/m^2 on each floor and 1.5 kN/m^2 on the roof. The building is situated in Zone IV. Assuming soil type II and storey height 3.5 m, determine lateral forces and shears at different storey levels. **[15]**

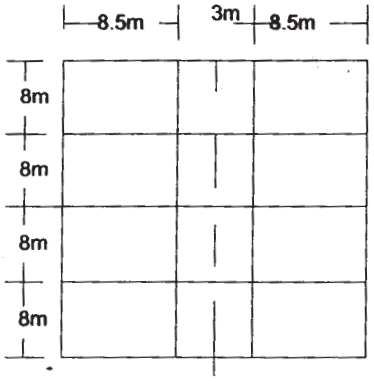


Figure 3.1

SECTION - II

Q4) a) What is Seismic Isolation? Discuss the in details the concepts of Isolators and Dampers? **[10]**

b) A Cantilever Slab 1 m x 1 m and 100 mm thickness projects from a 225 mm thick wall to the outside of the building. The slab is located 1 m above the roof of the building.

Assuming that the weight of the roof slab is 8 kN per meter length of the wall, examine the stability of cantilever if it is situated in Zone III. Assume wall above cantilever supports the slab. **[15]**

Q5) a) Describe various earthquake resistant features that can be introduced in masonry building to make it earthquake resistant. **[10]**

b) What is liquefaction of soil? How does it affect the stability of buildings? Discuss the methods to reduce the liquefaction. **[15]**

Q6) Write short notes on any five: **[25]**

a) Strengthening of Steel Buildings.

b) Behavior of Shear Wall.

c) Effects of Non - structures.

d) Ductile Detailing of Slabs.

e) Learning from past earthquakes in India.

f) Failure Mechanism of Infilled Frames.

Total No. of Questions : 10] **[Total No. of Pages :2**

P1629

[3965] - 482

M.E. (Civil) (Environmental Engg.)

INDUSTRIAL WASTE WATER MANAGEMENT

(2010 Course) (Sem. - II) (501508)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are physical, chemical and biological characteristics of wastewater. **[8]**

b) Define sewage and industrial effluent. Differentiate between industrial and municipal wastewaters. **[8]**

Q2) a) Explain classification of waste minimisation techniques. **[8]**

b) Explain equalisation and proportioning. **[8]**

Q3) a) State methods of removal of phosphorous from industrial wastewater and explain any one. **[8]**

b) State methods of removal of nitrogen from industrial wastewater and explain any one. **[8]**

Q4) a) Explain any one method of removal of Zn from wastewater. **[8]**

b) What is the necessity of treatment of industrial effluent? Explain grab and composite sampling. **[8]**

Q5) Write short notes on following (any THREE) **[18]**

a) Air stripping.
b) Absorption and adsorption.
c) Neutralisation.
d) Reverse osmosis.

P.T.O.

SECTION - II

Q6) a) Explain the manufacturing process of Sugar industry. **[8]**

b) Draw a flow diagram of manufacturing process of Paper and Pulp industry. State the sources of wastewater generated from the manufacturing process of paper and pulp industry. **[8]**

Q7) a) Draw a flow diagram for treating wastewater of Textile and Steel industry. **[8]**

b) What are the characteristics of Petroleum refineries and Tanneries? State the disposal methods of industrial treated waste water. **[8]**

Q8) a) What is a necessity of Common Effluent Treatment Plant (CETP)? Enlist treatment units used for CETP. **[8]**

b) What are the applications of each treatment unit used for CETP? What are the Operation & Maintenance Problems of CETP? **[8]**

Q9) a) What are the economical aspects of CETP? **[8]**

b) Which are the wastes generated from manufacturing process of sugar industry? What are the uses of those wastes? **[8]**

Q10) Write short notes on following (any THREE) **[18]**

a) Common Effluent Treatment Plant.

b) Characteristics of distillery unit.

c) Treatability Index.

d) Activated sludge process.

Total No. of Questions : 10] **[Total No. of Pages :2**

P1630

[3965] - 486

M.E. (Civil) (Environmental Engg.)

AGRICULTURAL POLLUTION CONTROL AND ENVIRONMENTAL BIOTECHNOLOGY

(2010 Course) (Elective - III) (501511)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various types of farming systems. **[8]**

b) What are the primary and secondary agro meteorological parameters? Explain. **[8]**

Q2) a) Enlist any four pesticides. What are the uses of these pesticides? **[8]**

b) What is organic fertilizer? Explain soil conservation. **[8]**

Q3) a) What is water logging? How to control water logging? **[8]**

b) What are the effects of water logging? How to control salinity of soil. **[8]**

Q4) a) Explain requirements of various nutrients for crops. **[8]**

b) Explain reuse of wastewater for agriculture. Explain any one method of reuse of agro wastewater with a neat sketch. **[8]**

Q5) Write short notes on following (any **THREE**): **[18]**

a) Vermicomposting of agricultural waste.

b) Agricultural Pollution.

c) Bioremediation of soil.

d) Salinity of soil.

P.T.O.

SECTION - II

Q6) a) State importance and applications of environmental biotechnology. **[8]**

b) Explain DNA replication. Explain major steps in transcription. **[8]**

Q7) a) Explain biological wastewater treatment system for dairy industry. **[8]**

b) What is Activated Sludge Process (ASP)? Enlist with role of microorganisms in ASP. **[8]**

Q8) a) Explain a principle of bio-trickling filter with a neat sketch. What are the applications of it? **[8]**

b) What is biodegradable plastic? Explain manufacturing process of biodegradable plastic. **[8]**

Q9) a) Which microorganisms are present in Up flow Anaerobic Sludge Blanket Reactor? What is the role of each microorganism in it? **[8]**

b) What is biotechnology? Explain any one method of biotechnology for reduction of CO_2 emission. **[8]**

Q10) Write short notes on following (any **THREE**): **[18]**

a) Root zone treatment of wastewater.

b) Rotating biological contactors.

c) Bio scrubbers.

d) Bio membrane.

Total No. of Questions : 10] **[Total No. of Pages :2**

P1631

[3965] - 487

M.E. (Civil) (Environmental Engg.)

ENVIRONMENTAL SANITATION

(2010 Course) (Elective - III) (501511) (Theory)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by Communicable disease? List down the communicable diseases and their mode of transmission. **[8]**

b) Explain the diseases communicated by the discharges of intestines, nose and throat. Specify also the control measures to be taken. **[8]**

Q2) a) Describe in detail methods adopted to control Plague. **[8]**

b) Explain the various fly control techniques available. **[8]**

Q3) a) Write down about the life cycle of a mosquito and explain the preventive measures to control breeding. **[8]**

b) "Food establishments must have an effective fly control program." Justify. **[8]**

Q4) a) Explain the factors affecting Industrial sanitation. **[8]**

b) How will you achieve sanitation in case of **[8]**

i) Hospitals. ii) Swimming pools.

Q5) a) In order for your Rodent control program to be effective on a long term basis, what measures will you adopt? Explain. **[9]**

b) What is an Insecticide? Explain the commonly available insecticides in market. **[9]**

P.T.O.

SECTION - II

Q6) a) What is an Occupational hazard? Explain the common workplace hazards. **[8]**

b) Explain in detail "Industrial Plant Sanitation." **[8]**

Q7) a) Discuss in detail the various problems associated with Rural Sanitation. **[8]**

b) Comment on "Improvement schemes for rural sanitation." **[8]**

Q8) a) Explain the Necessity of excreta disposal systems in rural areas. **[8]**

b) What do you understand by Low cost excreta disposal system? **[8]**

Q9) a) Explain the measures taken to prevent poisoning by industrial poisons. **[8]**

b) What is Industrial hygiene? How are OSHA and Industrial hygiene related? **[8]**

Q10) Comment on following practices in Rural areas: **[18]**

a) Toilet linked biogas plants.

b) Use of Grey water for farming.

c) Use of Incinerators for school wastes.

P1635

[3965] - 500

M.E. (Mechanical - Heat Power)

ADVANCED HEAT TRANSFER

(2008 Course) (502108) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following:- **[9]**

i) Contact resistance

ii) Biot No. & Fourier No.

iii) Time constant of a Thermocouple

b) Write down the generalized differential equation of heat conduction in cartesian coordinates & cylindrical coordinates for anisotropic materials. **[4]**

c) What is thermal diffusivity? How is it related to Prandtl No.? **[3]**

Q2) a) On a hot day the wood surface gets heated to 50ºC to a considerable depth. Sudden sharp showers cool the surface to 20ºC and maintain the surface at this temperature level. Determine the temperature at 2 cm depth after 40 minutes. The material properties are:

ρ = 2100 kg/m^3, C_p = 920 J/kg K, K = 0.062 W/mK.

Also calculate the heat flow from the surface during 40 minutes and the instantaneous heat flow at the surface. **[10]**

Also given:-

Z	erf (Z)
1.12	0.8867
1.16	0.8991
1.20	0.9103
1.30	0.9340

b) Explain the difference between fin efficiency and fin effectiveness. Also discuss their usefulness in practice. **[6]**

Q3) a) The temperature distribution across a wall 1m thick at a certain instant of time is given by, $T = (a + bx + cx^2)$, where T is in degree celcius and x in metres, while a = 900ºC, b = – 300ºc/m, and c = –50ºC/m^2. A uniform heat generation of 1000 W/m^3 is present in the wall of area 10 m^2. The properties of the material are, ρ =1600 kg/m^3, K = 40 W/mk and C_p = 4 kJ/kg K. Determine:- **[10]**

i) Rate of heat transfer entering the wall (x = 0) and leaving the wall (x = 1m)

b) Write notes on: **[8]**

i) Navier stokes equations.

ii) Effect of Prandtl no. on thermal boundary layer.

Q4) a) Compare the values of heat transfer coefficient for a circular pipe of 5 cm diameter with uniform wall temperature, with a square section of the same cross sectional area. The fluid is air at an average bulk temperature of 40ºC. The flow rate of air is 0.06 kg/sec. The air is heated properties of air are:-

ρ = 1.128 kg/m^3, ϑ = 16.96 x 10^{-6} m^2/s, Pr = 0.7 K = 0.0275 W/mK, Cp = 1005 J/kg K. **[8]**

b) Discuss the various boundary conditions used in heat transfer. **[8]**

SECTION - II

Q5) a) A horizontal steam pipe of 115mm outside diameter passes through a large room whose temperature is 30ºC. The pipe has an outside surface temperature of 165ºC and an emissivity of 0.8. Estimate the heat loss from the pipe for 4m length of pipe. You may use the properties of air as:-

K = 0.0313 W/mK, ϑ = 22.8 x 10^{-6} m^2/s, α = 32.8 x 10^{-6} m^2/s, Pr = 0.7

Use the following relation:-

$$\overline{Nu_D} = \left\{ 0.60 + \frac{0.387 (Ra_D)^{1/6}}{\left[1 + \left(\frac{0.559}{\text{Pr}} \right)^{0.56} \right]^{0.3}} \right\}^2$$ **[11]**

b) Explain Reynolds and colburn analogy. **[5]**

Q6) a) Air at 1 atm and 27ºC is forced through a horizontal 25-mm diameter tube at an average velocity of 30 cm/sec. The tube wall is maintained at a constant temperature of 140ºC. Find the values of Grashoff No. & Reynolds No. State whether the flow is mixed convection or not. Also find the value of Graetz number.

Properties of air at mean film temperature are :-

$\rho = 1.0\ kg/m^3$; $\beta = 2.805 \times 10^{-3}\ K^{-1}$; $\mu_f = 2.102 \times 10^{-5}$ kg/ms; $K_f = 0.03$ W/mK; Pr = 0.7. **[10]**

b) Write a note on Heat pipes & its applications. **[6]**

Q7) a) Explain any two: **[8]**

i) Black, Gray & White surfaces.

ii) Forced convection boiling.

iii) Gaseous emission and radiation.

iv) Radiation shape factors.

b) A cryogenic fluid is carried in a pipe of 1cm OD at a temperature of 100 K, The pipe is surrounded by another coaxial pipe of 13 mm OD with the space between the pipes evaluated. The outer pipe is at 5ºC. The emissivity for both the surfaces is 0.20. If a shield of emissivity of 0.05, and 11.5 mm is placed between the pipes, determine the percentage reduction in heat flow. Draw the radiation network. **[8]**

Q8) Write short notes on (any three):- **[18]**

a) Dropwise and filmwise condensation.

b) Pool boiling curve.

c) Transpiration cooling & ablative heat transfer.

d) Heat frames.

e) Immersion cooling.

f) Cooling of PC's.

P1639

[3965] - 518

M.E. (Mechanical) (Design Engineering)

VIBRATIONS AND NOISE CONTROL

(Sem. - II) (2008 Course) (502208)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A point mass is supported by the three springs in a plane as shown in Fig. No.1, It has two degree of freedom. Determine the two natural frequencies and corresponding mode shapes. Also check on their orthogonality for the case when **[18]**

$\alpha_1 = 30°$, $\alpha_2 = 135°$, $\alpha_3 = 280°$

$k_1 = k$, $k_2 = 2k$, $k_3 = 7k$

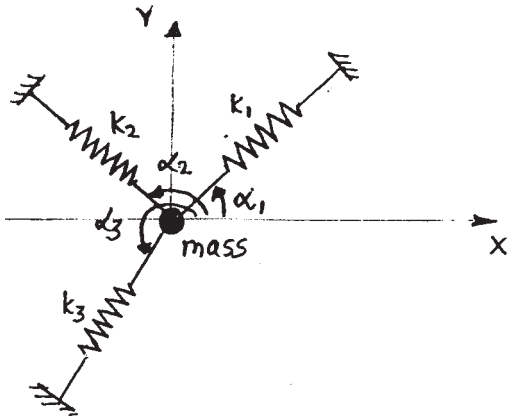


Fig. No. 1

Q2) Find the fundamental natural frequency of torsional vibration of an end milling cutter. The mass moment of inertia of milling cutter is 10 kg-m^2. The diameter of the shank is 25 mm and length is 150 mm. The modulus of rigidity of shaft material is 84* 10^9 N/m^2 and mass density 7800 kg/m^3 Derive the formula by considering it as a continuous system. **[16]**

P.T.O.

Q3) Derive expressions for dimensionless displacements in undamped dynamic vibration absorber in terms of the parameters of the system and explain its working. For the tuned absorber, show **[16]**

a) the relationship between response speed and mass ratio.

b) Frequency response curves for main system and absorber.

Q4) a) What is the maximum acceleration of mass 'm' and spring stiffness 'k' if it is dropped on a hard surface through height 'h'? **[6]**

b) Find the response equation of a damped spring mass system subjected to an impulsive input. **[10]**

Q5) Write the short notes of the following (Any two) **[16]**

a) Axial forced vibration of a rod.

b) Influence coefficients.

c) Duhamel's Integral.

SECTION - II

Q6) A 200 kg machine is attached to a spring of stiffness $4^* 10^5$ N/m. During operation machine is subjected to a harmonic excitation of magnitude 500 N and frequency 50 rad/sec. Design an undamped vibration absorber such that the steady state amplitude of the primary mass is zero and the steady state amplitude of the absorber mass is less than 2mm.

What are the natural frequencies of the system given above with the absorber in place? **[16]**

Q7) a) Derive an expression for the spectral density of a derived process. **[6]**

b) Give three examples of random input. How will you proceed to find their Spectral Density?
Calculate the Autocorrelation function corresponding to the ideal white noise and to the unit step function. **[10]**

Q8) The motion of mechanical system with nonlinear restoring force is given by the equation $\ddot{x} + w_n^2 x + \beta x^3 = 0$ with initial conditions $x(0) = A$ and $\dot{x}(0) = 0$. Where W_n is the natural frequency of linear system.
Using Perturbation method show that $w^2 = w_n^2 + 3/4\ \beta A^2$ upto first order correction. **[16]**

Q9) a) Explain Octave band analysis of sound. **[8]**

b) Show that as the distance from a point source doubles, the sound intensity level decreases by 6 dB. **[8]**

Q10) Write the short notes of the following (Any two) **[18]**

a) Experimental Modal Analysis.

b) Ambient emission noise standards in India.

c) Wide band and narrow band process.

Laplace Transform Pairs

	$f(t)$	$L[f(t)]$
1.	$f(t)$	$\int_0^\infty f(t)e^{-st}dt = F(s)$
2.	$x(t)+y(t)$	$X(s)+Y(s)$
3.	$K f(t)$	$K F(s)$
4.	$u(t)$ *or* 1	$\frac{1}{s}$
5.	$\partial(i)$	1
6.	t	$\frac{1}{s^2}$
7.	t^n	$\frac{n!}{s^{n+1}}$
8.	Sin ωt	$\frac{\omega}{s^2+\omega^2}$
9.	Cos t	$\frac{s}{s^2+\omega^2}$
10.	e^{-at}	$\frac{1}{s+a}$
11.	e^{-at} Sin ωt	$\frac{\omega}{(s+a)^2+\omega^2}$
12.	e^{-at} Cos ωt	$\frac{s+a}{(s+a)^2+\omega^2}$
13.	$e^{-at} f(t)$	$F(s+a)$
14.	$u(t-a)$	$\frac{e^{-as}}{s}$
15.	$\partial(t-a)$	e^{-as}
16.	$\begin{bmatrix} 0 \text{ when } t<a \\ f(t-a) \text{ when } t>a \end{bmatrix} = f(t-a)u(t-a)$	$e^{-as}F(s)$
17.	$\frac{df(t)}{dt}$	$sF(s)-f(0)$
18	$\frac{d^2f(t)}{dt}$	$s^2F(s)-sf(0)-\frac{df(0)}{dt}$
19.	$\int_0^t f(t)dt$	$\frac{F(s)}{s}$

Total No. of Questions : 10] [Total No. of Pages :5

P1640

[3965] - 521

M.E. (Mechanical) (Design Engg.)

RELIABILITY ENGINEERING

(2008 Course) (Elective - III) (502211)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of non - programmable electronic calculators is allowed.***

SECTION - I

Q1) a) What is reliability? Explain different reliability measures. How to select a particular reliability measure? **[8]**

b) Calculate the reliability for the system shown in Fig.1. The number in each block shows the reliability of individual component. Use Conditional Probability Method. **[10]**

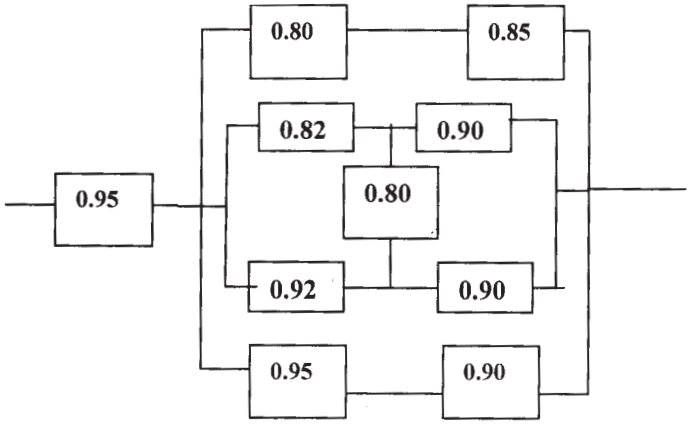


Fig. 1 (Q1b)

Q2) a) Explain the most common basic causes of failures of engineering product. What are the main objectives of a reliability engineering team working on an engineering development project? Describe the important skills and experience that should be available within the team. **[10]**

b) Explain failure density and failure rate. Describe the main features of the "bathtub" failure rate curve, explaining why each of the three regions has its characteristic shape. **[8]**

P.T.O.

Q3) a) A system consists of 5 sub-systems in series. The system reliability goal is 0.994 for 20 hours mission time. Each sub - system consists of some number of modules. The following data are available. Find the individual reliabilities of the sub - systems. **[8]**

Subsystem (i)	Number of modules (Ni)	Importance factor (Wi)	Operating Time (ti) hours
1	25	1.00	20
2	80	0.97	18
3	45	1.00	20
4	60	0.93	14
5	70	1.00	20

Table 1 (Q3 a)

b) A system is operating from the time t = 0. Prove that the probability of system functioning properly between times t_2 and t_1 ($t_2 > t_1$) is $Rt_2–t_1 = 1 – R(t_1) + R(t_2)$ **[8]**

Q4) a) A manufacturing company buys two machines A and B. The time to failure of machine A can be represented by Weibull distribution with η = 1000 hours and β = 2. The time to failure of machine B can be represented by Weibull distribution with η = 1000 hours and β =0.5. The maintenance manager in charge of operation plan to apply preventive maintenance for both the machines for every 200 hours, so that he can improve the expected time to failure of the machines. Check whether the manager's decision is correct. **[8]**

b) Derive an expression for linearly increasing hazard. **[8]**

Q5) Write short note on following (Any Four) **[16]**

a) Choice of distribution method.

b) MTBF and MTTF.

c) FMEA.

d) Reliability management by objectives.

e) The Weibull Model.

SECTION - II

Q6) a) In the following example of a fault tree diagram (Fig. 2), define the meanings of the symbol used and write the Boolean expression which describes this tree. Simplify the expression to identify the minimal cut set and draw the reduced fault tree. **[12]**

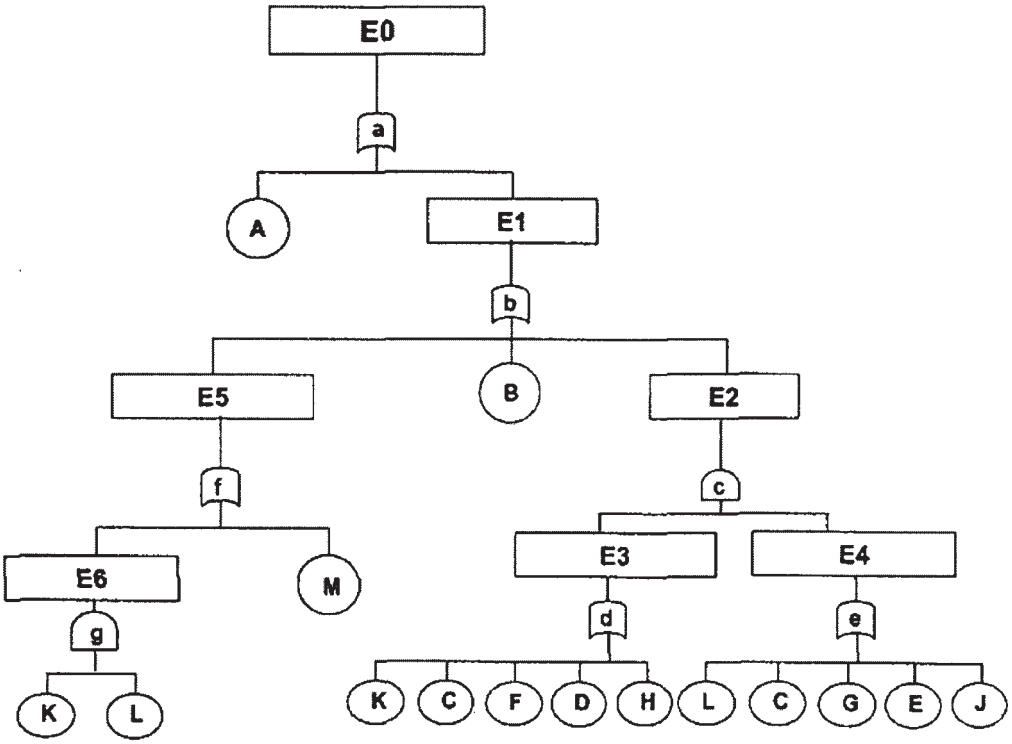
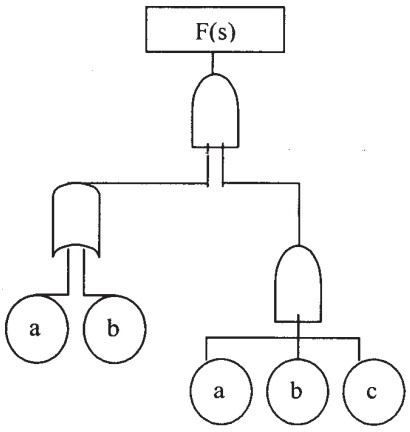


Fig. 2 (Q 6. a)

b) What is meant by Availability? Explain types of availability of the system. **[6]**

Q7) a) Fig. 3 shows the fault tree diagram. The probability of failure of each basic fault is given. Find out the reliability of the system. **[8]**



P(a)= 0.01

P(b)= 0.1

P(c)= 0.05

Fig. 3 (Q. 7a)

b) If the mean value and the standard deviation of the load in a heavy manufacturing plant are 125 kg/cm^2 and 62.5 kg/cm^2 respectively. Determine the probability of failure of system if load exceeding 150 kg/cm^3. Assume lognormal distribution and table shows $\Phi(z)$ values. **[8]**

Z	0.9	0.91	0.92	0.93
$\Phi(z)$	0.8159	0.8185	0.8212	0.8238

Table 2 (Q. 7 b)

Q8) a) A system consists of three units connected in series, with reliabilities $R_1 = 0.70$, $R_2 = 0.80$, and $R_3 = 0.90$. It is desired that the reliability of the system be 0.65. How should this be apportioned among the three units? **[8]**

b) Discuss the method of obtaining criticality of a component or a subsystem using Risk Priority Number (RPN). **[8]**

Q9) Aircraft engine is one of the most critical items used in today's aviation industry. There are totally eleven items including the external gearbox, oil tank and filter. The time - to - failure of these items are given in Table below. **[16]**

Item no.	Item	Distribution	Parameter Values
01	LP compressor	Weibull	$\eta = 15000, \beta = 3$
02	LP stage 2 stator	Weibull	$\eta = 5000, \beta = 2.8$
03	Intermediate casing	Weibull	$\eta = 11000, \beta = 3$
04	HP compressor	Weibull	$\eta = 12000, \beta = 3.5$
05	HP NGV	Weibull	$\eta = 8000, \beta = 3$
06	HP turbine	Weibull	$\eta = 25000, \beta = 4$
07	LP NGV	Weibull	$\eta = 7000, \beta = 2.2$
08	LP turbine	Weibull	$\eta = 20000, \beta = 2.8$
09	Exhaust mixer	Weibull	$\eta = 7000, \beta = 3$
10	External gear box	Weibull	$\eta = 6500, \beta = 3$
11	Oil tank and filter	Weibull	$\eta = 5000, \beta = 3.8$

Table 3 (Q. 9)

a) Draw the reliability block diagram of the engine.

b) Find reliability of the engine for 3000 hours of operation.

c) Find the hazard rate of the engine at t = 3000 and t = 7000 hours.

d) Find the MTTF of different items of the engine and estimate the MTTF of the engine from the MTTF values of the items.

e) Find the MTTF of the engine if all the items are subject to preventive maintenance after every 1000 hours of operation (assume that after maintenance all the items behave as good as new).

f) For an engine of age 5000 hours, find the mission reliability for 1000 hours of operation.

g) Find the MFOPS of the engine for 500 hours of operation for different cycles.

Q10) Write the short note on following (Any Four) **[18]**

a) System redundancy.

b) AGREE method of reliability allocation.

c) Reliability of complex systems.

d) Accelerated test for reliability.

e) Baye's rule.

Total No. of Questions : 10] [Total No. of Pages :3

P1641

[3965] - 522

M.E. (Mechanical) (Design Engineering)

ENGINEERING FRACTURE MECHANICS

(2008 Course) (Elective - III) (502211)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain how the effect of small notches or cracks can be analyzed in terms of fracture toughness? **[8]**

b) Distinguish between the following types of fracture mechanics problems: **[8]**

i) Linear - elastic.

ii) Elastic - plastic.

iii) Time - dependent.

Q2) a) Explain the Griffith crack theory of fracture for evaluating critical stress level in a cracked body? **[10]**

b) The stress intensity for a partial through thickness flaw is given by

$K = \sigma . \sqrt{\Pi a} . \sqrt{\sec\left(\frac{\Pi a}{2.t}\right)}$, where '*a*' is the depth of penetration of the flaw through a wall thickness *t*. If the flaw is 5 mm deep in a wall of 12mm thick, determine whether the wall will support a stress of 172 MPa if it is made from Aluminium alloy. Take the value of K_{IC} as 24 MPa $\sqrt{m}$. **[6]**

Q3) a) Explain the plastic zone shape according to Tresca and VonMises criteria? **[10]**

b) Write short notes on different modes of crack opening. **[6]**

P.T.O.

Q4) a) Explain the application of Irwin plastic zone correction theory to elastic - perfectly plastic materials? **[12]**

b) Discuss the *compliance method* of evaluating fracture toughness? **[6]**

Q5) a) Define the terms COD and CTOD. Explain the relationship between COD and CTOD? **[6]**

b) Explain the following: **[10]**

i) Yield locus.

ii) Crack growth and residual strength curves.

SECTION - II

Q6) a) Define J-integral. Discuss the significance and limitations of J - integral as a fracture parameter? **[8]**

b) Describe in brief any two testing methods used for the determination of fracture toughness? **[8]**

Q7) a) Draw typical S - N curves for mild steel and Aluminium and explain the differences? **[8]**

b) Explain the different stages of fatigue crack initiation and propagation? **[8]**

Q8) a) Consider a large plate with a small center crack. The initial total crack length $2a$ is 20 mm. The plate is subjected to repeated remote stress cycles from σ_{min} = 0 MPa to σ_{max} = 75 MPa. The initial crack grows as the stress cycles are applied. The critical stress intensity factor K_c for fracture initiation for the plate is 25 MPa $\sqrt{m}$. The material is assumed to have a very high yield stress such that the plastic zone size is small compared to the crack size under the applied stress. Assume that the Paris law will be applicable to the plate material to characterize the fatigue crack growth

$$\frac{da}{dN} = C(\Delta K)^m$$

where C = 1×10^{-9} and $m = 3$. The value of C is obtained with the units of MPa $\sqrt{m}$ for ΔK and mm/ cycle for $\frac{da}{dN}$.

i) Determine the final half crack length a_f at fracture initiation. **[5]**

ii) Determine the number of cycles before the fracture initiation of the plate. **[3]**

b) Identify and explain the problems a designer must recognize when dealing with fatigue loading as compared with static loading? **[8]**

Q9) a) Explain in brief the mechanisms of creep deformation? **[10]**

b) Draw the fatigue - creep interaction diagram at constant temperature and explain? **[6]**

Q10) Answer any *three* of the following: **[18]**

a) Cyclic stress - strain curve.

b) Fatigue life calculation methods.

c) Structural features of fatigue.

d) Creep resistant materials.

Total No. of Questions : 10] **[Total No. of Pages :2**

P1642

[3965] - 542

M.E. (Mechanical) (Mechatronics)

AUTOMOTIVE ELECTRONICS

(2008 Course) (502811 C) (Elective - III) (Part II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from Section -I and any three questions from Section - II. Answers to each section should be written in separate answer books.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data wherever necessary but mention it clearly.***
4) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) Write Short Notes on (Any Two) **[18]**

a) Multipoint Fuel injection systems in Spark Ignition Engines.

b) Discuss Modern Wiper System over conventional one speed wiper system.

c) The sensors, controls, and displays employed in Automobile speed measurement.

Q2) a) Describe Automobile Battery with respect to types, recent trends, protections. **[8]**

b) Compare Microprocessor assisted Engine Cooling System with fan driven by crank shaft. **[8]**

Q3) a) Describe sensors used in Automated Parking. **[8]**

b) Discuss Antilock Breaking System. **[8]**

Q4) a) Explain controls used in Automotive Heating System. **[8]**

b) Explain Throttle position sensor and its advantages. **[8]**

Q5) a) Discuss the Electronics involved in Head Lamps in modern automobiles. **[8]**

b) Describe Electronic Injection Advance in Compression Ignition Engines. **[8]**

P.T.O.

SECTION - II

Q6) Write Short Notes on (Any Two) **[18]**

a) Anti-Fog system in Automobiles.

b) Electronic Fuel Injection System.

c) Advantages of microprocessors used in Automobiles.

Q7) Discuss Diesel Engine Control System with representative block diagram. Identify major inputs and outputs to engine control unit along with the corresponding sensors and actuators. **[16]**

Q8) a) Discuss recent trends in power windows. **[8]**

b) Sensors used in wheel alignment and balancing of wheels. **[8]**

Q9) a) Compare 8 bit microprocessors and 16 bit microprocessors in Luxury Cars. **[8]**

b) Discuss the controls used in Automotive Air conditioning. **[8]**

Q10)a) Discuss the Battery tests. **[8]**

b) Compare 8 bit microprocessors and 16 bit microprocessors in Luxury Cars. **[8]**

Total No. of Questions : 12] [Total No. of Pages : 4

P1646

[3965]-582

M.E. (Electrical) (Control Systems)

MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS

(2008 Course) (Sem. - II) (503108)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat block diagram the structure of a multivariable control system. Give an example of any industrial multivariable control system. **[6]**

b) The overall transfer matrix of a multivariable control system is given by **[10]**

$$T(s) = \begin{bmatrix} \frac{1}{s+1} & \frac{1}{s+4} \\ \frac{1}{s+4} & \frac{1}{s+1} \end{bmatrix}$$

Find

i) The state space model of the system.

ii) The characteristic polynomial of the system.

OR

Q2) a) What are the merits and demerits of representing the multivariable control system into: **[6]**

i) Transfer - matrix form

ii) State - space form.

P.T.O.

b) A multivariable control system is represented in state space form

$$\dot{x} = Ax + Bu$$

$$y = Cx + Eu$$

where,

$$A=\begin{bmatrix}1 & 1 & 1\\ 0 & -3 & 0\\ 0 & 0 & 2\end{bmatrix};\ B=\begin{bmatrix}1 & 2\\ 0 & 1\\ 0 & 0\end{bmatrix};\ C=\begin{bmatrix}1 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}\ \text{and}\ E=0$$

Obtain the transfer matrix form of the system. **[10]**

Q3) a) State and explain the conditions for full state controllability and observability of the multivariable control system. **[6]**

b) A multivariable control system is described by the following state space model,

$$\dot{x}(t)=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & -1\\ -3 & -7 & 0\end{bmatrix}x(t)+\begin{bmatrix}0 & 0\\ 1 & 0\\ 0 & 1\end{bmatrix}u(t)$$

$$y(t)=\begin{bmatrix}1 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}x(t)$$

Investigate the controllability and observability of the system. **[12]**

OR

Q4) a) Discuss in detail the pole allocation using Linear state variable feedback in multivariable control system. Draw appropriate block diagram show LSVF. **[8]**

b) A linear time - invariant control system is represented in state space form

$$\dot{x}(t)=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ 8 & -2 & -5\end{bmatrix}x(t)+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u(t)$$

Design the linear state variable feedback to place the poles at desired locations S = –3 and $(-4 \pm j2)$ **[10]**

Q5) a) Explain in detail the nature of the state estimation problem using an observer. Draw the block diagram showing the structure of a full order observer. **[10]**

b) With reference to the multivariable control system define and explain clearly the following concepts. **[6]**

i) Stability.

ii) Reproducibility.

OR

Q6) a) Explain clearly the following design aspects of multivariable control system. **[10]**

i) Decoupling or Non - interactive control.

ii) Model matching control.

b) Enumerate the different methods extending the classical control theory for the multivariable control system. What are their limitations? **[6]**

SECTION - II

Q7) a) Discuss any one method for the numerical solution of Matrix Riccati Equation. **[6]**

b) Given a linear control system represented by the state equation:

$$\dot{x}(t)=\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}x(t)+\begin{bmatrix} 0 \\ 1 \end{bmatrix}u(t)$$

with quadratic performance index

$$\mathrm{J}=\frac{1}{2}\int_0^{\infty}\left[x^T(t)Q\,x(t)+u^T(t)Ru(t)\right]dt$$

Assume, $Q=\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}; R=1$

i) Find the optimal control law $u^*(t)$.

ii) Test whether the closed - loop control system is asymptotically stable. **[12]**

OR

Q8) a) Explain the factors to be considered in the formulation of an optimal control problem using quadratic performance criterion. **[8]**

b) State and explain the infinite - time state linear regulator problem. Outline the procedure for obtaining the optimal control law for infinite - time linear state regulator problem. **[10]**

Q9) a) State the merits and demerits of optimal control. **[6]**

b) Define Hamiltonian. Derive the state, co - state and control equations in terms of Hamiltonian. Explain the procedure for solving optimal control problem using Hamiltonian method. **[10]**

OR

Q10)a) State the Pontryagin's Minimum Principle. Discuss step by step procedure of solving optimal control problem using Pontryagin's minimum principle. **[12]**

b) Explain briefly the relation between the Pontryagin's minimum principle and Dynamic Programming. **[4]**

Q11)a) Define and explain the singular control solution. **[6]**

b) Draw the block diagram showing the structure of feedback minimum - time optimal control system and outline the procedure for solving minimum time optimal control problem. **[10]**

OR

Q12)a) Explain the Bang - bang control strategy and state its advantages. **[6]**

b) A linear time - invariant control system is described by the state equations:

$$\dot{x}_1(t) = u(t)$$
$$\dot{x}_2(t) = x_1(t)$$

Determine the optimal control $u^*(t)$ satisfying the constraint $|u(t)| \leq 1.5$ which transfers the initial state $x_1 = 1$ and $x_2 = 1$ to a zero final state (i.e. $x_1 = x_2 = 0$) in minimum time. **[10]**

Total No. of Questions : 6] **[Total No. of Pages :2**

P1647

[3965] - 587

M.E. (Electrical) (Control System)

LARGE SCALE SYSTEM

(2008 Course) (Elective - III) (503111)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule Mollier charts, electronic Pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Explain the method. Reduced order model using davison Technique for model reduction problem. **[12]**

b) Write the steps of obtaining reduced order model using chidambara Technique. **[13]**

Q2) Define the concept of aggregation of control systems with the aggregated system matrix and state its properties. **[25]**

Q3) Find the reduced order model by using model aggregation. **[25]**

$$\dot{x}=\begin{bmatrix} 0.5 & 0.5 & 0 \\ 0 & 1 & 0 \\ 0.833 & -2.1169 & -0.333 \end{bmatrix} x+\begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} u$$

SECTION - II

Q4) By using the technique of moment matching, obtain the order reduced model for.

$$G(s)=\frac{s^2+13s+40}{s^3+13s^2+32s+20}.$$ **[25]**

P.T.O.

Q5) Explain the technique of singular value decomposition along with its properties.

[25]

Q6) Design the system with **[25]**

$$A=\begin{bmatrix}-2 & 0\\ 1 & -1\end{bmatrix},\ B=\begin{bmatrix}1\\ 0\end{bmatrix},c=\begin{bmatrix}1 & 1\end{bmatrix}$$

The desired poles are –1 & –2.



Total No. of Questions : 8] [Total No. of Pages :2

P1649

[3965] - 636

M.E. (E & TC) (VLSI & Embedded Systems)

RF IC DESIGN

(Sem. - II) (2008 Course) (504190)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an expression for conversion gain of single ended MOSFET mixer. MOSFET is operated in CS mode. **[8]**

b) With suitable example, explain back gate bias effect. **[8]**

Q2) a) What are the causes of cross talk? List the sources. Give the cross connect mechanism **[8]**

b) What is the power constrained noise optimization? Give the expression for device width and noise figure. **[8]**

Q3) a) Design RF amplifier for following specifications A_v = 50, Bandwidth = 200 MHz, Source resistance = 50 Ω, load = 10 Pf, supply voltage = 2.5V. Assume suitable data. **[8]**

b) With the help of incremental model of MOSFET based tuned amplifier, explain unilateralization & neutralization techniques in detail. **[8]**

Q4) Write short notes on (any Three) **[18]**

a) EDA tools in Analog IC design.

b) MOSFET capacitor.

c) Power budget & noise optimization.

d) Effects of technology scaling on RF amplifiers.

P.T.O.

SECTION - II

Q5) a) How will you make EMI immune RF ASIC? Give the analytical justifications to the suggestions. **[8]**

b) Explain ASIC design flow. At what stage will you care for cross talk. **[8]**

Q6) a) Why is degeneration required in LNA? Explain inductive source degeneration with necessary expression. **[8]**

b) Design LNA to operate at 650 MHz. Design suitable bias. Compute device width degenerating inductance, noise figure & L_g. Assume suitable data. **[8]**

Q7) a) Explore the bandwidth enhancement with f_T doublers. **[8]**

b) With suitable schematics explain LF and RF models for MOSFET. What is SPICE model? What are the dynamic elements? **[8]**

Q8) Write short notes on (Any Three): **[18]**

a) Spurs and solutions.

b) Power match versus noise match.

c) Requirements of LNA.

d) Types of noise in RF.

e) Series and shunt peaking amplifier.



Total No. of Questions : 8] [Total No. of Pages :2

P1651

[3965] - 666

M.E. (Electronics) (Digital System)

WIRELESS & MOBILE TECHNOLOGIES

(2008 Course) (504197) (Elective - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the principal difference between connectionless communicative and connection - oriented communicative? **[8]**

b) How is mobility restricted using WLANS? Explain. **[8]**

Q2) What are the main problems of signal propagative? Why do radio waves not always follow a straight line? Why is reflective both useful and harmful? **[16]**

Q3) Name the main elements of the GSM system architecture and describe their functions. What are the advantages of specifying not only the radio interface but also meternal interfaces of the GSM system? **[17]**

Q4) a) How does GSM convert 456 bits of the speech, data or control signal into a normal burst of 156.25 bits? **[8]**

b) Differentiate between remote and self - positioning systems? **[9]**

SECTION - II

Q5) a) Show the interactive of mobile IP with standard TCP. Draw the packet flow from a fixed host to a mobile host via a foreign agent. **[8]**

b) Compare wireless and wired solutions for home access and in - home distributions. **[8]**

P.T.O.

Q6) Why does WAP define its own security layer and does not relay on the security provided by the mobile phone network? What problems does the WAP security layer cause? Think of end - to - end security. **[16]**

Q7) a) Compare IEEE 802.11, Hiper LAN 2, and Bluetooth with regard to their ad - hoc capabilities. Where is the focus of these technologies? **[8]**

b) Why is a common synchronizative framework useful? What problems remain? **[9]**

Q8) Discuss in detail about the request - to - send / clear - to - send (RTS/CTS) mechanism. **[17]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1652

[3965]-670

M.E. (Electronics) Digital Systems

EMBEDDED SYSTEMS

(2008 Course) (504201) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figure to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) Explain the common design metrics for embedded system. **[8]**

b) Explain why PLD based design is more flexible than ASIC during development phase of embedded system. Explain typical architecture of CPLD. **[10]**

Q2) a) List the features of ARM processor. With the help of block diagram describe the architecture of ARM7 core. **[10]**

b) How 5 stage pipeline of ARM 9 improves performance as compared to 3 stage pipeline in ARM7 processor? **[6]**

Q3) a) What are privileged and non privileged modes of operation in ARM processor? Explain. **[8]**

b) Explain with diagram the CAN bus data packet format. **[8]**

Q4) a) Compare Bluetooth, IEEE 802.11 and IrDA w.r.t. following features. **[8]**

i) Technology.
ii) Distance.
iii) Security.
iv) Data Rate.

b) Describe different software tools used in embedded system. What are cross compilers? How they are different then compilers? **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the need of scheduler. What are different methods of scheduling? What type of scheduler is required for priority inheritance? **[10]**

b) How memory management is organized in µCOS - II operating system? **[6]**

Q6) a) With suitable example, explain how shared data problem occurs when interrupt comes. How it can be overcome using semaphores? **[8]**

b) Describe various software architectures used in embedded system. **[8]**

Q7) a) What features of µCOS - II makes it suitable for embedded system design? **[6]**

b) What are the various functions of µCOS - II operating system used for inter-process communication. **[10]**

Q8) a) Explain the following functions in µCOS - II . **[8]**

i) Task related functions.

ii) Time related functions.

b) Write list the various features / specifications regarding digital camera as embedded system capable of grabbing image transfers them to computer over serial link. Draw the appropriate block diagram. **[10]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1656

[3965]-730

M.E. (Production) (CAD/CAM)

COMPUTER INTEGRATED MANUFACTURING

(511208) (2010 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in two separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the potential benefits of CIM? How can you apply the CIM in the case of

i) Job shop production,

ii) Mass Production. What differences do you find in these two? **[8]**

b) What do you mean by CAD, CAM and CIM? Differentiate them. How do you integrate them. **[8]**

Q2) a) Discuss the main elements of CIM systems. **[8]**

b) List and describe various activities involved in product development. **[8]**

Q3) a) What are the four classes of data in manufacturing? Describe the three database models. **[8]**

b) What are the features of PDM which help speedy product development? What are the advantages of PDM? **[8]**

Q4) a) Discuss how group technology is used in designing manufacturing cells. **[9]**

b) "Cellular manufacturing - The heart of lean manufacturing" Discuss. **[9]**

P.T.O.

SECTION - II

Q5) a) What is a FMC? How does FMC ensure flexibility in manufacturing? **[8]**

b) Describe the principle of an automated storage and retrieval system used in FMS. **[8]**

Q6) a) What are the different types of drives used in robots? Explain. **[8]**

b) "A graphical simulation system for the validation and specification of the robot program is an integral part of an advanced programming system". Discuss. **[8]**

Q7) a) Describe the three basic network topologies. **[8]**

b) "Networks are today integral parts of CIM systems, which have made data sharing easy, peripheral changing or interfacing easy and information sharing possible". Comment. **[8]**

Q8) a) Explain with neat sketches types of layout in FMS. **[9]**

b) Write notes on: **[9]**

i) Types of robots.

ii) Network techniques.

iii) AGV in CIM.

Total No. of Questions : 8] **[Total No. of Pages :2**

P1658

[3965] - 743
M.E. (Computer)
MOBILE COMPUTING
(510104) (2008 Course) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Draw the basic reference architecture of 3GPP-R99 network. Show the architecture of the core network in it. Give a concise meaning of 3GPP-R99 and discuss the basic network architecture and the key network elements and interfaces. Particularly state in short the functions of Um interface to access GSM Bcc and Un interface to access UTRAN.
State functions of Authentication Center, Equipment Identity Register, SGSN, GGSN, and MSC. **[18]**

Q2) With reference to a Mobile Station (MS) explain the meaning of the following terms: **[16]**

a) IMSI attached.
b) Roaming.
c) Location Updating.
d) Locating.

Q3) Describe the functions of the following items: **[16]**

a) Wi_Fi PCI adopter.
b) Access Point 802.11.
c) OMC.

Q4) a) State reasons for the use of frequency hopping in GSM networks.
b) Elucidate an approximate frequency algorithm.

[16]

P.T.O.

SECTION - II

Q5) Describe the basic procedures in the formation of a call including: **[18]**

a) Connection Request.

b) Paging procedure.

c) Identification procedure.

d) Authentication procedure.

Q6) Enlist and explain the major functions, features and applications of the following: **[16]**

a) Android.

b) Nokia internet Toolkit.

Q7) a) Define the spectral efficiency of the GSM system taking into account modulation.

b) Show that the relative spectral efficiency of system X with respect to system Y decreases according to the increase in the square root of C/I (Carrier to Channel Interference).

c) Show how the spectral efficiency is related to the channel bandwidth Bx.

[16]

Q8) a) "GSM system uses both FDMA and TDMA techniques". Explain the above statement with suitable illustration.

b) Explain how the GSM system is secured against fraudulent use.

[16]

Total No. of Questions : 8] [Total No. of Pages :3

P1660

[3965] - 754

M.E. (Computer) (Computer Networking)

ADVANCED INTERNET PROGRAMMING

(2008 Course) (510111D) (Elective - III)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw a schematic diagram showing client, web server and data base. Include in the diagram examples of two major approaches to web application enabling technologies used viz. compiled modules and interpreted scripts. Show the relationship between the components of enabling technologies and the web server. Show how the compiled modules and the interpreted scripts handle the web page request from the client.

b) Draw a diagram of the Document Object Model (DOM) interface showing the relationship between the browser, HTML document, scripts, compiled modules and the DOM. How are the dynamic capabilities of the client enabled?

[16]

Q2) a) Draw a simple block diagram showing the structure of JDBC API. Show in it some of the most commonly used methods provided by JDBC. Also show how JDBC provides a vendor independent interface to any relational Database system.

b) Show how the combination of JDBC and Java allows the information held in databases to be easily and quickly published on the web.

c) Explain one method of registering a driver with a driver manager in JDBC.

[18]

P.T.O.

Q3) a) Is it true that Enterprise beans are restricted from performing the operations of monitoring and synchronizing threads?

b) What are the four types of modules specified by J2 EE specification?

c) Can the primary key in the entity bean be a Java primitive type such as int?

d) What is the need for remote and home interfaces? Why can't there be one?

e) Differentiate between .jar, .ear and .war files.

f) Specify various types of J2EE clients.

[16]

Q4) a) State the difference between a Remote Procedure Call (RPC) and a Remote Method Invocation (RMI).

b) With respect to RMI discuss the following issues:

i) Marshalling and Unmarshalling.

ii) Parameter porting.

iii) Stubs and skeletons.

iv) RMI registry and how it manages RMI references.

[16]

SECTION - II

Q5) a) State what are the three most common web application architectural patterns.

b) Explain in detail any ONE of these patterns with respect to

i) Applicability.

ii) Structure and

iii) Dynamics.

c) Draw the architectural view and logical view of the pattern.

[16]

Q6) a) Explain the difference between JTS and JTA.

b) What is the difference between session bean and entity bean?

c) What is the difference between container managed and bean managed persistence?

[16]

Q7) With reference to IBM portlet API explain the characteristics functions of the following objects: **[18]**

a) Portlet request.

b) Portlet response.

c) Portlet session.

Q8) a) State the sequence of steps that one needs to go through to create a bean.

b) What is meant by log manifest file?

c) How is a ready bean packed in a .jar file?

d) Describe a suitable IDE for bean development.

[16]



Total No. of Questions : 8] **[Total No. of Pages :2**

P1662

[3965] - 763

M.E. (Computer) (Computer Networking)

ADVANCED TCP / IP

(Elective - I) (2008 Course) (510304)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain system calls with examples to send and received the data through a Socket for a TCP and UDP environment? **[8]**

b) An ISP has block of 1024 addresses it needs to divide the addresses to 1024 customers, does it need Subnetting? Justify your answer with suitable diagram. **[8]**

Q2) a) A BOOTP packet is encapsulated in UDP packet, which is encapsulated in IP packet, which is encapsulated in a frame. A RARP packet, on the other hand, is encapsulated only in a frame. Find the efficiency of a BOOTP packet verses a RARP packet. **[8]**

b) Why the relay agent is required in the BOOTP operations? **[4]**

c) Explain the exchange of messages in DHCP. **[4]**

Q3) a) Generate a DNS tree for the Generic, Country and Inverse Internet domains with suitable example. **[8]**

b) A DNS client is looking for the name of a computer with IP address 132.1.17.8 Show the query and response message? **[8]**

Q4) Write short note on **any THREE.** **[18]**

a) DHCP Transition.

b) DNS Compression.

c) Zone Delegation and Transfer in DNS.

d) Protocols and Network Services.

P.T.O.

SECTION - II

Q5) a) Explain sub option negotiation in Telnet and explain the mechanism for controlling the server. **[8]**

b) What is *rlogin*? Differentiate between SSH and Telnet. **[8]**

Q6) a) What happens in FTP if the TCP connection is used for data transfer breaks, but the control connection does not? **[8]**

b) Host A uses TFTP to read 2150 bytes of data from host B. Show all the TFTP commands including commands needed for connection establishment and termination. Assume error free communication? **[8]**

Q7) a) Differentiate between HTTP and HTTPS. Explain under what circumstances can a proxy caches web page, when using HTTPS? **[8]**

b) User aaa@xxx.com sends a message to user bbb@yyy.com, which is forwarded to the user ccc@zzz.com. Show all SMTP commands and responses? **[8]**

Q8) Write short note on **any THREE**. **[18]**

a) Sorcerer's Apprentice Bug.

b) Quality of Service in RTP.

c) RSVP.

d) POP3 and IMAP.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1669

[3965]-31

M.E. (Civil - Structures)

NUMERICAL METHODS & FINITE ELEMENT METHODS

(2002 Course) (501501) (Old)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Solve the following system of equations **[15]**

$u^1 = -3u + 2v$, $v^1 = 3u - 4v$

$u(0) = 0$, $v(0) = 0.5$

b) Find smallest eigen value in magnitude of the matrix. **[10]**

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

using inverse power method. Also find its corresponding eigen vector.

Q2) a) Solve the equation $\nabla^2 f = 2x^2y^2$ over the square domain $0 \le x \le 3$, $0 \le y \le 3$ with $f = 0$ on the boundary and mesh of length '1'. **[13]**

b) Solve the following equating using crank. Nicholson method. **[12]**

$$\frac{\partial^2 u}{\partial t^2} = 8\frac{\partial u}{\partial t}$$

Given $u(0, t) = 0$, $u(20, t) = 10$, $u(x, 0) = 2$

$\Delta x = h = 5$ & $r = 1$.

P.T.O.

Q3) a) Solve the following boundary value problem,

$u'' + u = x$, $0 < x < 1$, $u(0) = 4$, $u(1) = 1$, with linear piecewise polynomials for two elements. **[12]**

b) Solve the boundary value problem

$u'' = 3/2\ u^2 \quad 0 < x < 1$,

$u(0) = 4$, $u(1) = 1$, using finite element method with h = 1/3. **[13]**

SECTION - II

Q4) a) Using Raileigh - Ritz Method determine the expression for deflection and bending moment in a simply supported beam subjected to uniformly distributed load over entire span. **[9]**

b) Explain using Pascal's triangle how displacement function is assumed in F.E.M. **[8]**

c) Explain requirements for the convergence of FEM solution. What are necessary and sufficient conditions for convergence. **[8]**

Q5) a) Compare contrast lumped load formulation and consistent load formulation used in FEM analysis. Demonstrate with example. **[6]**

b) Explain with suitable example. CST (Constant Strain Triangle) LST (Linear Strain Triangle) used in FEM analysis. **[7]**

c) Explain impact of aspect ratio and accuracy of FEM results in FEM analysis. **[6]**

d) Write using natural co-ordinates the shape function for one dimensional element. **[6]**

Q6) a) Explain isoparametric & non-iso parametric elements. **[6]**

b) Write elasticity matrix each for plain stress and plain strain problem of elasticity. **[6]**

c) Write note on (any three): **[13]**

i) Jaccobian matrix at a point.

ii) Sum of derivative of shape function at a point.

iii) Sum of shape function at a point.

iv) Gauss point.

v) Sub and super parametric element.

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1672 **[3965] - 46**

M.E. (Mechanical Engg. - Design and Heat Power)

NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES

(2002 Course) (502101)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of a calculator is allowed.***

SECTION - I

Q1) The deflection curve of a beam subjected to a linearly increasing load can be given as

$y = C(-x^5 + 2L^2x^3 - L^4x)$,

where $C = 4 \times 10^{-5}/m^4$ and L (beam length) = 5m.

a) Write the equation for the maximum deflection. Use Newton - Raphson to solve for the location of maximum deflection. **[12]**

b) Compute the maximum deflection. **[4]**

Q2) Solve the follwoing system using Gaussian elemination (or any other direct method): **[16]**

$5x_1 + x_2 + 2x_3 = 6.8$

$3x_1 - 2x_2 + 2x_3 = -1$

$x_1 + 2x_2 + x_3 = 4.3$

Q3) Consider the following data on the variation of tensile strength of a plastic as a function of time it is heat treated.

Time (min)	10	15	20	25	40	50	55
Tensile Str	5	18	22	41	37	57	72

a) Fit a straight line to the data. **[12]**

b) Use the same to determine the tensile strength at a time of 32 min. **[4]**

P.T.O.

Q4) Consider one dimensional transient conduction in a rod of 1m length, given by

$$\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}.$$

The boundary and initial conditions are

- T = 0 at $t = 0$ (initial condition)
- T = 0 at $x = 0$ (boundary condition)
- T = 100 at $x = 1$ (boundary condition)

Choose $\delta x = 0.25\ m$ and $\delta t = 0.01$s. Take $\alpha = 1 m^2/s$.

a) Using the explicit method, advance by two time steps and determine the temperature field at $t = 0.02$s. **[12]**

b) Form the equations for the implicit scheme for one time step. The solution is not required. **[6]**

SECTION - II

Q5) Consider the function

$$f(x) = 2x^2 + \frac{1}{x}$$

Integrate this function from $x = 1.2$ to $x = 2.4$ with a step size $h = 0.2$.

a) using Trapezoidal rule. **[6]**

b) Using Simpson's one - third rule. **[6]**

c) Compare both methods against the exact solution. **[4]**

Q6) a) Derive the (first order) forward and (second order) central difference approximations to the first derivative, along with the leading error term. **[7]**

b) Derive the approximation for the second derivative along with the leading error term. **[4]**

c) Consider $f(x) = \sin(x)$. Taking $\delta x = 0.04$, determine the forward and central difference approximations to the derivative at $x = 1$ radian. Compare against the exact solution. **[5]**

Q7) For the case of water draining out from the bottom of a tank, the water level in the tank can be given as

$$\frac{dy}{dt} = -k\sqrt{y},$$

Where $k = 0.2m^{\frac{1}{2}}/min.$

The initial condition is $y = 2.4$m at $t = 0$.

Integrate this from $t = 0$ to $t = 2$min.

a) Using Forward Euler with $\delta t = 0.5$min. **[6]**

b) Using Fourth Order Runge Kutta with $\delta t = 1$min. **[12]**

Q8) Consider steady state conduction given by the Laplace equation in a square of 1m length. The boundary conditions are as follows:

- T = 120 for $y = 0$, $0 \leq x \leq 1$
- T = 180 for $y = 1$, $0 \leq x \leq 1$
- T = 80 for $x = 0$, $0 \leq y \leq 1$
- T = 250 for $x = 1$, $0 \leq y \leq 1$

with $\delta x = \delta y = \frac{1}{3}$,

a) Form the equations at the interior nodes. **[8]**

b) Carry out 2 cycles of iteration. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1674

[3965] - 53
M.E. (Mech.) (Heat Power Engg.)
I.C. ENGINES - I
(2002 Course) (502109) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the ideal and actual indicator diagrams of a four stroke cycle SI engine. Specify P - T also. **[6]**

b) Discuss briefly the design performance data of SI engines. **[6]**

c) A Single - cylinder, four stroke hydrogen fuelled spark - ignition engine delivers a brake power of 20 kW at 6000 rpm. The air-gas ratio is 8:1 and calorific value of fuel is 11000 kJ/m^3. The compression ratio is 8:1. If volumetric efficiency is 70%, indicated thermal efficiency is 33% and the mechanical efficiency is 90%, calculate the cubic capacity of the engine. **[6]**

Q2) a) Define:

i) Octane Number.

ii) Performance Number.

What is the relationship between ON and PN. What is the Laboratory method to determine ON. **[8]**

b) Explain Ethanol as alternate fuel for SI engine bringing out their merits and demerits? **[8]**

Q3) a) How the power and efficiency of the SI engine vary with air - fuel ratio for different load and speed conditions? **[6]**

P.T.O.

b) An engine fitted with a single jet carburetor having a jet diameter of 1.25 mm has a fuel consumption of 6 kg/h. The specific fuel gravity of fuel is 0.7. The level of fuel in the float chamber is 5 mm below the top of the jet when engine is not running. Ambient conditions are 1 bar and 17ºC. The fuel jet diameter is 0.6 mm. The discharge coefficient of air is 0.85. Air fuel ratio is 15. Determine the critical velocity of flow at throat and the throat diameter. Express the pressure at throat in mm of water column. Neglect compressibility effect. **[10]**

Q4) a) What are fuel additives? Why are they added to fuel? What is the effect of adding TEL to fuel. **[4]**

b) From the point of view of fuel -air cycle analysis how does fuel - air ratio affect efficiency, maximum power, temperature and pressure in a cycle. Draw only graphs. **[4]**

c) What are the typical losses in Gasoline engine for r = 8. Write only values. **[4]**

d) Define following: **[4]**

i) Brake Thermal efficiency.

ii) Volumetric efficiency.

iii) Specific fuel consumption.

iv) Specific Output.

SECTION - II

Q5) a) Write analytical steps to find out Heat Balance on minute basis on any Petrol Engine. **[6]**

b) The swept volume of a gas engine is 9 litre and the clearance volume is 2.25 litre. The engine consumes 3500 litre of gas per hour, when running at 160 rpm firing every cycle and developing 4 kW. It has a mechanical efficiency of 75%. What is the relative efficiency of the engine compared with air standard cycle if the calorific value of gas is 20 MJ/m^3. Assuming a volumetric efficiency of 0.87, find the ratio of air to gas used by 1 m^3 of the mixture in the cylinder. **[8]**

c) Briefly explain the reason for poor part load efficiency of SI engine. **[4]**

Q6) a) What are the factors that affect the power output of an engine. Explain how supercharging helps to improve the power output. **[6]**

b) Two identical vehicles are fitted with engine having the following specifications

Engine 1 : (Naturally aspirated)

Swept Volume, Vs	:	3.6 litres.
Break mean effective pressure	:	9 bar
Speed	:	5000 rpm
Compression ratio	:	8
Efficiency ratio (thermal/Air Std)	:	0.5
Mechanical efficiency,	:	90%
Mass	:	250 kg

Engine 2 : (Super Charged)

Swept Volume, Vs	:	3.6 litres
Break mean effective pressure	:	12 bar
Speed	:	5000 rpm
Compression ratio	:	6
Efficiency ratio (thermal / Air Std)	:	0.5
Mechanical efficiency,	:	90%
Mass	:	260 kg

Identify the engine first. If both engines are supplied with just enough fuel for test run, determine the duration of test run so that specific mass (engine + fuel) is the same for both the arrangements. Take the calorific value of the fuel as 43 MJ/kg. **[10]**

Q7) a) What causes the engine emissions? What are the problems created by exhaust Emissions? **[8]**

b) What are catalytic converters? How are they helpful in reducing HC, CO and NO emissions? **[8]**

Q8) a) Explain with graph the effect of following factors on Ignition Delay in SI engine.

i) Speed.

ii) Atomization and duration of injection.

iii) Injection timing.

iv) Compression ratio. **[8]**

b) What are fast combustion chambers? Draw schematic diagram of one. **[4]**

c) What are the important characteristics of OHV combustion chambers? **[4]**

Total No. of Questions : 8] [Total No. of Pages : 3

P1675

[3965] - 57
M.E. (Mech.) (Heat Power)
I.C. ENGINES - II
(Compression Ignition Engines)
(2002 Course) (Elective - II) (502110)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss briefly the design performance data of CI engines. **[6]**

b) What is meant by mean piston speed? Explain its importance. **[4]**

c) Determine the ideal efficiency of the diesel engine having a cylinder with bore 250mm, stroke 375 mm and a clearance volume of 1500cc, with fuel cut-off occurring at 5% of the stroke. Assume γ=1.4 for air. **[4]**

d) How do exhaust temperature and mean effective pressure affect the engine performance? Explain. **[4]**

Q2) a) Explain clearly the reasons for looking for alternate fuels for CI engines. **[4]**

b) Comment on Retrofitted Bio-Diesel engine. **[6]**

c) Can alcohol be used for CI engines? Explain any two methods. **[6]**

Q3) a) Enlist the salient features and with the help of schematic diagram, explain the working of Common - Rail Fuel Injection System. **[6]**

b) What is the purpose of a fuel injector? Mention the various parts of a injector assembly by drawing a scale. **[6]**

c) A four cylinder, four stroke diesel engine develops 100 kW at 3500 rpm. Its brake specific fuel consumption is 180 gm per kWh. Calculate the quantity of fuel to be injected per cycle per cylinder. Specific gravity of the fuel may be taken as 0.88. **[4]**

P.T.O.

Q4) a) Explain the combustion stages in a CI engine with the help of P-θ Diagram. **[8]**

b) Define Squish, Swirl, directional movement and turbulence. Explain their importance in the design of CI engine combustion chambers. **[8]**

SECTION - II

Q5) a) Discuss the effect of speed on the following parameters of CI engines. **[8]**

i) Mechanical and Brake thermal efficiency.

ii) BMEP and BSFC.

iii) Brake torque of engine.

b) In a test of a single cylinder, four stroke oil engine the following results were obtained.

Cylinder Diameter	=	20 cm
Stroke	=	40 cm
Mean effective pressure	=	6 bar
Torque	=	407 Nm
Speed	=	250 rpm
Oil Consumption	=	4 kg/h
Cooling water flow rate	=	4.5 kg/min
Calorific value of fuel	=	43 MJ/kg
Air used per kg of fuel	=	30 kg
Rise in cooling water temperature	=	45ºC
Final temperature of exhaust gases	=	420 ºC
Room temperature	=	20ºC
Mean specific heat of exhaust gas	=	1 kJ/kgK
Specific heat of water	=	4.18 J/kgK

Find the ip, bp and draw up a heat balance sheet for the test in kJ/h **[10]**

Q6) a) A four stroke diesel engine working at sea level (pressure : 1 bar and Temp. = 17ºC) develops a brake power of 280 kW with a volumetric efficiency of 80% at sea level conditions. The engine works at an air-fuel ratio of 18:1, with a specific fuel consumption of 0.240 kg/kwh. The engine runs at 1800 rpm. Determine the engine capacity and the bmep.

This engine is taken to an altitude of 3 km where ambient temperature and pressure are -23ºC and 0.715 bar. A mechanically coupled supercharger is fitted to the engine which consumes 12% of the total power developed by the engine. The temperature of air leaving the supercharger is 37ºC. Determine the degree of supercharging required to maintain the same brake power of sea level. Also calculate the isentropic efficiency of the compressor. Assume air-fuel ratio, thermal efficiency and volumetric efficiency remain the same for naturally aspirated and supercharged engine. **[10]**

b) Make the thermodynamic analysis of a Turbocharged CI engine cycle. **[6]**

Q7) a) Explain the instruments for measuring the following invisible emission. **[6]**

i) Oxides of nitrogen.

ii) Carbon monoxide.

iii) Unburned hydrocarbons.

Write their approximate values.

b) What are the causes of Particulates generation? How are they controlled? **[6]**

c) Explain with sketch working of hartridge smoke meter. **[6]**

Q8) Write short notes on (Any Three): **[16]**

a) CNG as an alternate fuel.

b) Heat Release Programme.

c) Hybrid Engines.

d) Refrigerated Transport.

Total No. of Questions : 10] **[Total No. of Pages :2**

P1676

[3965] - 70
M.E. (Mechanical - Design Engg.)
ROBOTICS
(2002 Course) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers for each section to be written on separate sheets.***
3) ***Neat Diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain with suitable sketch the configuration of cylindrical type and jointed type robot. **[10]**

b) Discuss the terms: **[8]**

i) Control resolution. ii) Payload capacity.

iii) Spatial resolution. iv) Degrees of Freedom.

Q2) a) Explain the tactile array sensor used in Robotic system. **[8]**

b) Explain the construction and working of steeper motors used in robotic system. **[8]**

Q3) a) What are the velocity sensing and force sensing devices used in the Robot system. Explain in brief. **[8]**

b) Explain the uses of sensors in robotic system with suitable illustration. **[8]**

Q4) a) Explain forward kinematics in robot link transfer mechanism. **[8]**

b) Using the link parameters for a robot shown in Table 1., compute the individual transformations for each link and total transformation from initial to final link. **[8]**

Table - 1

i	α_{i-1}	a_{i-1}	d_i	θ_i
1	90°	0	0	0
2	0°	0	5	90°
3	45°	2	0	0°

P.T.O.

Q5) a) Explain hydraulic actuation used in robot system. **[8]**

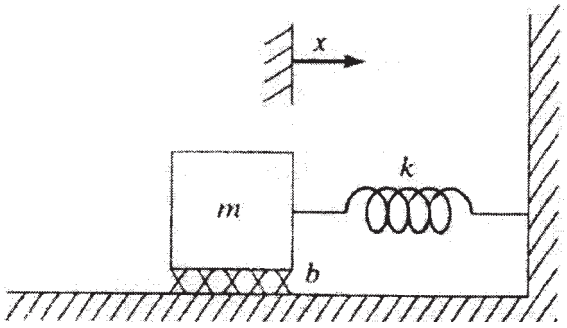
b) Explain the Thresholding and region growing in robotics vision system. **[8]**

SECTION - II

Q6) a) What is meant by the singularities of the mechanism in robot system? Explain with suitable example. **[8]**

b) A single – link robot with a rotory joint is motionless at $\theta = 30^{\circ}$. It is desired to move the joint in a smooth manner to $\theta = 90^{\circ}$ is 5 seconds. Find the coefficients of a cubic that accomplishes this motion and brings the manipulator to rest at the goal. Plot the position, velocity and acceleration of the joint as a function of time. **[10]**

Q7) a) Find the motion of the system in Fig. if parameter values are m = 1, b = 5 and k = 6 and the block is released from the position x = –1. **[8]**



b) What is meant by control law partitioning in closed loop control system. **[8]**

Q8) a) Explain the Powered lead through method of robot programming. **[8]**

b) Explain the applications of robot in material handling. **[8]**

Q9) a) Explain the motion commands used in VAL programming languages. **[8]**

b) What is mean by blending? Explain parabolic blends for linear segments. **[8]**

Q10)a) Explain the servo and nonservo control system for the robot. **[8]**

b) For a control system Explain continuous vs discrete time control. **[8]**

Total No. of Questions : 10] [Total No. of Pages : 4

[3965] - 71

P1677

M.E. (Mechanical) (Design Engineering)

RELIABILITY ENGINEERING

(2002 Course) (Elective - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Section I and Section II must be attempted on separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Following table shows the results of life tests carried out on 300 components simultaneously for 100 hours. **[10]**

Operating Time (hours)	0	10	20	30	40	50	60	70	80	90	100
Number of surviving Components	300	275	220	175	140	115	95	80	70	45	0

Evaluate hazard rate, failure density and reliability and plot these functions against time.

b) What is bays Rule? In a Mfg. plant, 70% of crankshaft are ground by Machinist R and 30% by Machinist S. It is known from past experience that the crankshaft ground by machinists R & S contains 8% and 4% defective units resp. If a randomly selected crankshaft is found to be defective, find the probability that it was ground by the machinist R. **[8]**

Q2) a) Explain maintainability and Availability. Also types of Availability. **[6]**

b) The following data refers to an availability study in a flexible manufacturing system using identical FMM. Find the inherent and operational availability. Assume administrative logistic time as 100% of MTTR. **[10]**

No.of Months	Uptime (Hrs)	MTTR (Hrs)	Spares Management time (Hrs)
1	390	5	4
2	350	10	2
3	330	8	3
4	345	6	2
5	340	4	2
6	366	5	3

P.T.O.

Q3) a) A system consists of two components. At time t = 0, both components are activated and as long as at least one of the two components is functional, the system is functional. Write an expression for system reliability if each of the components has an exponential time to fail distribution with mean time to fail of 40 hrs, and 100 hrs resp. What is the reliability at time 50 hrs? **[8]**

b) Explain the following: **[8]**

i) Central limit theorem.

ii) Chebyshev inequility.

Q4) a) A manufacturing concern specializing in high pressure relief valve to a particular acceptance test before certifying it as fit to use. Over a period of time, it is observed that 90% of all values manufactured pass the test. However the acceptance test adopted is found to be only 95% reliable. Consequently a valve certified as fit for use has a probability of 0.05 being faulty. What is the probability that the satisfactory valve will pass the test. **[8]**

b) Explain the characteristics & significance of weibull distribution. **[8]**

Q5) a) Allocate failure rates and reliabilities for the following data if the reliability goal is 0.98. **[8]**

i	No.of modules	Importance factor	Operating time
1	40	1	10
2	65	0.95	10
3	30	0.9	10
4	50	1	10

b) Fig. 2 shows a system configuration. The block shows elements of system with their reliability. Find the system reliability. **[8]**

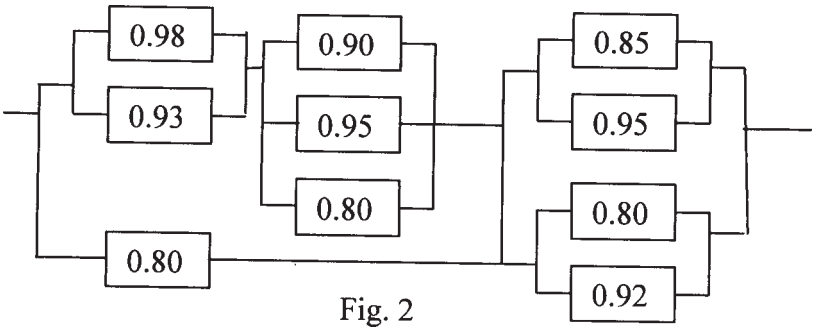


Fig. 2

SECTION - II

Q6) a) Explain the types of loads considered in designing machines and structures. **[8]**

b) Find the reliability and the corresponding central factor of safety of a system for which $\mu_s = 45000 kg/cm^2$ and $\mu_L = 40000\ kg/cm^2$. $\sigma_s = 3000\ kg/cm^2$ and $\sigma_L = 1000 kg/cm^2$ and S & L follows normal distribution. The table shows normal variant (z) and $\Phi(z)$. **[8]**

z	1.56	1.58	1.60
$\Phi(z)$	0.9406	0.9429	0.9452

Q7) a) In a short sample life testing of a system the following data are recorded. **[8]**

Component	1	2	3	4	5	6	7	8
MTTF(Hrs)	14	20	18	24	19	22	30	38

Plot the variation of reliability against time using

i) Mean and ii) Median Ranking Method.

b) Nine identical components are connected in parallel to achieve the system reliability of 0.9. Determine the reliability of each component. Also find the total number of components to be added in parallel to increase the reliability to 0.95. **[8]**

Q8) a) Construct a fault tree for the system failure shown in Fig. 3. The failure probability of elements are P(A) = 0.1, P(B) = 0.01, P(C) = 0.05, P(D) = 0.15, P(E) = 0.2, P(F) = 0.06, calculate system failure using fault tree analysis. **[8]**

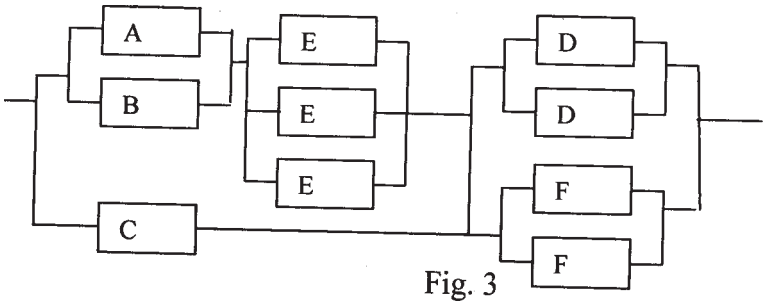
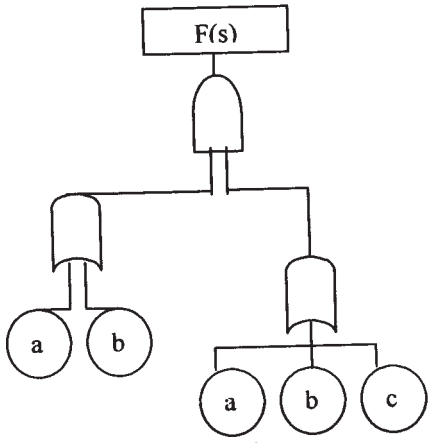


Fig. 3

b) Fig. 4 shows the fault tree diagram. The failure rates of each basic element is given. Find out the failure rate of the system. **[8]**



$\lambda(a) = 0.0025$

$\lambda(b) = 0.001$

$\lambda(c) = 0.005$

Fig.4

Q9) a) Explain the steps involved in Failure mode effects analysis. **[8]**

b) Explain accelerated testing methods for reliability evaluation. **[8]**

Q10)a) Determine the reliability of system using event tree diagram if four subsystems are connected in series and management considers the system giving satisfactory performance even if two out of four units remain out of order. The failure rate of each subsystem is 1 in 2000 hrs and working hours are 200. **[10]**

b) Determine the reliability of the system shown in Fig. 5 using the tie-set method, assume R be the reliability of each element. **[8]**

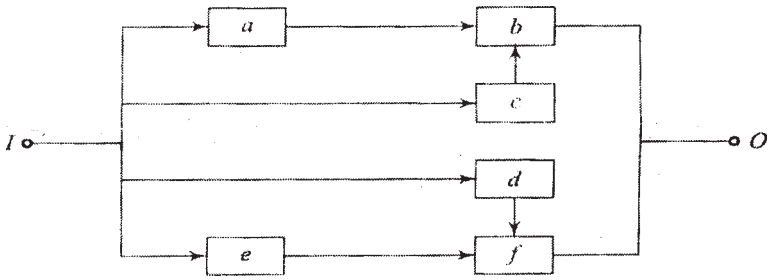


Fig. 5

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1679

[3965] - 161
M.E. (Electronics) (Computer)
HIGH PERFORMANCE COMPUTER NETWORKS
(2002 Course) (Elective - I) (504407)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following network components. **[6]**

i) Facilities. ii) Devices.

b) List various network functions. Describe various types of networks you know. **[10]**

Q2) a) How the data about 'Location of data', 'Traffic demands', 'Tariffs','Characteristics of network devices' and 'Performance objectives' support the design of a network? **[10]**

b) Explain various approaches to network design. **[6]**

Q3) a) Draw a diagram showing IP-based transport protocols that find use in IP based telephony. Briefly explain 'SIP' and 'MGCP' protocols. **[8]**

b) Explain in detail the 'AAL2' protocol. **[8]**

Q4) Write short notes on (Any Three): **[18]**

a) Wireless LAN standard IEEE 802.11b.

b) RSA Algorithm.

c) Network Design Tools.

d) RAID.

P.T.O.

SECTION - II

Q5) a) Suppose you are given an input sequence of the form "*bbbb...bbb*"; that is the symbol *b* repeated *k* times. Which string-matching encoding scheme LZ77 or LZ78, would encode this more efficiently? Justify your answer by clearly stating your assumptions, if any. **[4]**

b) Consider the following character string, and assume that the relative probabilities of the symbols are reflected in this string **[12]**

aa bbb cccc ddddd eeeeee fffffff gggggggg

Show the code for this string for the following:

i) Huffman. ii) LZW.

iii) Arithmetic.

Q6) a) With suitable example(s), explain the term 'Entropy'. State properties of Entropy function. **[8]**

b) With suitable example, explain Huffman Code. Comment on Entropy and coding efficiency. **[8]**

Q7) a) Draw a neat diagram showing Classical Feistel Network. List and briefly discuss its various parameters and design features. **[8]**

b) Discuss the significance of location of encryption devices. Draw a diagram showing link and end-to-end encryption devices used for encryption across a Packet-Switching Network. **[8]**

Q8) Write short notes on (Any Three): **[18]**

a) Facsimile Compression.

b) NAS.

c) Fiber channel attached storage.

d) Network Design Issues.

Total No. of Questions : 10] **[Total No. of Pages : 5**

P1683

[3965] - 200
M.E. (Production Engg.)
RELIABILITY ENGINEERING
(2002 Course) (511110) (Elective - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use non-programmable electronic calculator is allowed.***

SECTION - I

Q1) a) i) A system operates for 10,000 hrs and data obtained shows a failure rate of 1 in 30,000 hrs, what will be the probability of survival of system? **[4]**

ii) If probability of survival is expected 90% at 5000hrs, what will be the span of MTBF? **[4]**

b) Following table shows the results of life tests carried out on 200 components simultaneously for 200 hours. **[8]**

Operating Time (hours)	0	20	40	60	80	100	120	140	160	180	200
Number of surviving Components	200	175	160	145	130	105	96	80	70	66	40

Evaluate hazard rate, failure density and reliability and plot these functions against time.

Q2) a) Two identical motors are operating in a redundant configuration. If either of the motor fails the remaining one can still operate with full load. Failure rates for motor are 0.004 and statistically independent. If both starts at t = 0, Find the Reliability at 100 hrs and Mean time to Failure (MTTF). **[8]**

b) Following data refer to the problem of allocation of Reliability to each component in the system. **[8]**

Sr. No. i	No. of Components (n_i)	Operating time, Hrs (ti)	Probability of system failure due to failure of (i^{th}) subsystem (W_i)
1	22	15	0.10
2	10	10	0.05
3	8	25	0.25
4	2	20	0.20
5	4	30	0.30
6	8	35	0.10

Find out the failure rates of the components, so that the system reliability becomes 0.95, using AGREE method.

Q3) a) i) If in a system we need at least one out of 3 units to operate for the successful working of the system, then prove that the system reliability can be written as:

$R_s(t) = 3e^{-\lambda t} - 3e^{-2\lambda t} + e^{-3\lambda t}$, where λ - failure rate and t-mission time. **[4]**

ii) An aircraft consists of three engines-independent, active and identical. At least one engine must operate successful for the aircraft to fly successfully. The average failure rate of each engine is 0.008 failures/hour. Compute reliability of the aircraft for 8-hour flying mission. **[4]**

b) The following data refer to predicted reliability of Eight components in series. In case the desired reliability of the system is not fall below 0.85 find the reliability goal for individual components. **[8]**

Components	1	2	3	4	5	6	7	8
Predicted reliability	0.99	0.998	0.992	0.97	0.994	0.980	0.95	0.98

Q4) a) Find the reliability of system shown in Fig 1 using conditional probability method. The values in the blocks show reliabilities of each element. **[8]**

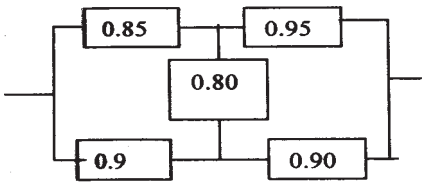


Fig 1

b) A system consists of three subsystems A, B, C having failure rates 0.005, 0.004 and 0.008 respectively per hour. If the mission time is 50 hours and the system reliability required is 0.95, find the failure rate as well as reliability of each subsystem for the entire mission period, using ARINC method. State any assumptions used. **[8]**

Q5) Write short notes on following (Any three) **[18]**

a) Reliability Centered Maintenance.

b) Reliability effort function.

c) Star - delta method for reliability evaluation.

d) Matrix method for solving conditional configuration.

e) Bath - Tub curve with significance of each phase.

SECTION - II

Q6) a) Explain the systematic procedure to be followed for constructing Failure mode and effects analysis (FMEA) Table. **[8]**

b) A Logic gate diagram for FTA study has been shown in Fig. 2. The failure probabilities for basic modes A, B, C, D and E are 0.001, 0.002, 0.04, 0.005 and 0.008 respectively. Find out the failure probability of T_0. Assume mission time of 100 hrs. Also calculate the reliability of system. **[8]**

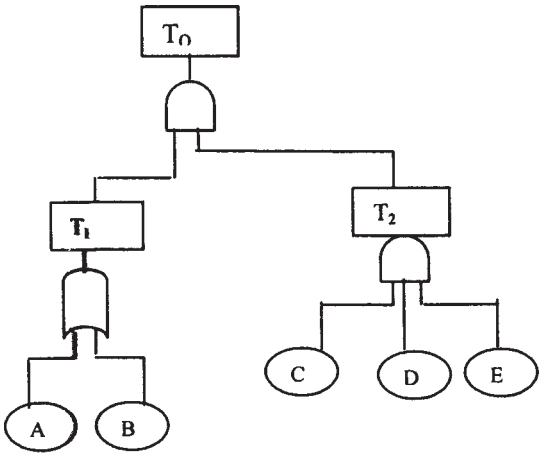


Fig.2

Q7) a) The following data refers to a short sample reliability test of an engineering instruments: **[8]**

Failure No.	1	2	3	4	5	6	7	8
MTTF(Hrs)	12	22	7	10	15	29	28	30

Calculate the reliability using mean and median ranking method. Also plot the reliability Vs Time.

b) Determine the reliability of the system shown in Fig. 3 using the tie - set method, assume R be the reliability of each element. **[8]**

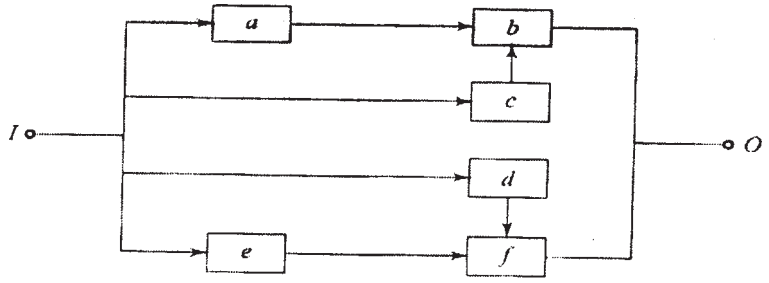


Fig. 3

Q8) a) Explain sudden death testing method for reliability evaluation. **[8]**

b) Define Minimal Tie - sets and minimal Cut - sets. State various tie - sets and cut - sets from the Fig. 4. Give optimal tie sets and optimal cut sets. **[8]**

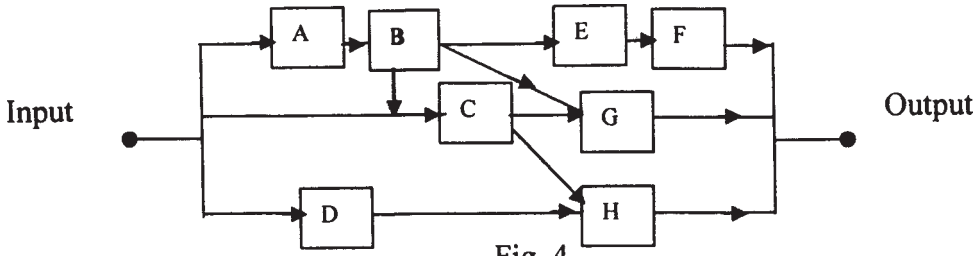


Fig. 4

Q9) a) State what is meant by redundancy and classify it. **[8]**

b) Define availability and maintainability for the system from the following data collected at a plant: **[8]**

Mean time before failure : 85 Hrs.

Mean time to repair : 10 Hrs.

Administrative logistic time : 150 % of MTTR.

Calculate operational availability and inherent availability of the plant.

Q10)a) The mean strength and the standard deviation of a bolted joint are 3000 kg/cm^2 and 250 kg/cm^2 respectively. The joint is loaded such that stress induced has a mean value of 2500 kg/cm^2 with a standard deviation of 50 kg/cm^2. Assuming that shear strength and the induced stresses are independent and normally distributed, find out the probability of survival of the bolted joint. Extract of data from statistical table is given below:**[8]**

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8
ϕ(z)	0.8849	0.9032	0.9192	0.9331	0.9452	0.9550	0.9640

b) Calculate the reliability if the system shown in Fig. 5. Using conditional probability approach. If each has reliability 0.8, calculate the system reliability. **[10]**

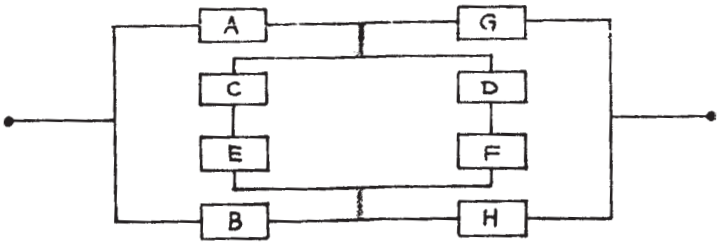


Fig. 5

Total No. of Questions : 6] **[Total No. of Pages : 1**

P1687

[3965]-216

M.E. (Petroleum Engineering)

NUMERICAL METHODS & SIMULATION IN PETROLEUM ENGG.

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non - programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) For the following system of equations, find x,y,z using SOR, LU decomposition, and Gauss Seidel method. w = 1.1

$$2x + y + z = 8$$
$$2x + 3y + z = 17$$
$$x - 5y = -z$$

[25]

Q2) Solve the following system of equations by Newton Raphson method.

$x^2y + \cos(xy) = 54$

$\sin h\,(x^2y) + xy = \cos y.$ **[25]**

Q3) Solve $y' = x^2y + \cos(xy) + 4$, $y(1) = 2$, RK –4 and Adam Moulton predictor corrector method. **[25]**

SECTION - II

Q4) Given a 1 D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 50 psi for one well and 4000 psi at the other well, both at each boundary. Length of the reservoir are 400ft. Assume delx = 100 ft. Solve by explicit, crank-nicolson and implicit method. Only set up the matrix. **[25]**

Q5) Derive the IMPES method for BLACK Oil reservoir. **[25]**

Q6) Write a detailed Essay on history matching. **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1689

[3965]-222

M.E. (Petroleum Engineering)

ADVANCED NATURAL GAS ENGINEERING AND TECHNOLOGY

(Elective - II) (2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non - programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Explain an EOS. How is it used in Petroleum Engineering? **[25]**

Q2) Derive the pipe line flow equation for series and parallel flow. **[25]**

Q3) Explain the design of reciprocating compressors. **[25]**

SECTION - II

Q4) Explain phase behavior of a gas reservoir and material balance equation. **[25]**

Q5) Draw a process flow diagram to show two methods how H_2S is removed from a natural gas stream. **[25]**

Q6) Derive the equation used to calculate flow rate in a orifice meter. Explain all the constants. **[25]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1690

[3965] - 227
M.E. (Petroleum)
WELL CONTROL

(2002 Course) (512109) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Q. 1 and Q. 5 are compulsory. Out of the remaining attempt two questions from Section I and two questions from Section - II.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain in brief. **[12]**

i) Mud cake.

ii) Hole capacity.

iii) Filtrate loss.

iv) Mud weight.

v) Specific gravity.

b) While pulling out driller forgot to fill the hole and 36 stands of drill pipes were pulled out dry. Use following data and calculate reduction in bottom hole pressure.

Well depth = 9788 ft. (TVD),

Casing shoe depth = 5600 ft. (TVD)

Mud weight = 12.5 ppg.,

Open hole capacity = 0.1486 bbl/ft.

Casing capacity = 0.1711 bbl/ft.,

Drill pipe metal displacement = 0.0076 bbl/ft.,

Length of one stand = 93 ft. **[6]**

Q2) a) Explain, how will you calculate pump SPM, if annular velocity and pump output is given to you for the circulation through casing - drill pipe annulus. **[4]**

b) Draw the neat schematic sketch of choke manifold and kill line. **[4]**

P.T.O.

c) A well is being drilled with 13.8 ppg mud. How much barite is required to increase the mud density to 13 ppg.?
Hole volume = 689 bbl.
Surface volume = 333 bbl.
Barite density is 35.4 ppg. **[4]**

d) Determine the height in feet of the influx using following data. **[4]**
Pit gain = 29 bbl
Hole size = 8.5 in
Drill collar OD = 6.5 in
Drill collar length = 650 ft.
Drill pipe OD = 5.0 in

Q3) a) Draw neat schematic sketch and differentiate between Christmas tree and well head equipment, show all the components. **[8]**

b) What is a surface choke? Write the functions and objectives of its use and explain, how it helps to mount back pressure in the line and on the reservoir formation. **[8]**

Q4) Write short notes on: **[16]**

a) Problems during drilling.
b) Pressure losses during drilling.
c) Blow out.
d) Well kick.

SECTION - II

Q5) Use the following data and calculate: **[18]**

a) Initial circulating pressure.
b) Kill mud weight.
c) Final circulating pressure.
d) Surface to bit, and bit to surface strokes.

A kick was observed after closing the surface BOP. Fill out a kill sheet. Prepare step down plan on graph paper for drillers method.
Data : Original mud weight = 9.7 ppg,
Measured depth = 9,725 ft,
Kill rate pressure @ 50 SPM = 940 psi.
Kill rate pressure @ 30 SPM = 730 psi.
Drill string - drill pipe 5.0 in. -19.5 lb/ft. Capacity is 0.01779 bbl/ft.
HWDP 5.0 in. 49.3 lb/ft., capacity = 0.00883 bbl/ft., length = 240 ft.
Drill collars - 8.0 in. O.D. - 3.0 in . ID, capacity is 0.0087 bbl/ft., length = 366 ft.

Annulus - Hole size = 12 $\frac{1}{4}$ in. drill collar/open hole capacity = 0.0836 bbl/ft.,
drill pipe/open hole capacity = 0.1215 bbl/ft.,
Drill pipe / casing capacity = 0.1303 bbl/ft.
Mud pump (7 in. X 12 in. triplex @ 95% eff.) = 0.136 bbl/stk.
Leak of test with 9.6 ppg mud = 1130 psi.
Casing setting depth = 4580 ft.

Shut in drill pipe pressure = 580 psi, Shut in casing pressure = 590 psi, Pit volume gain = 49 bbl, True vertical depth = 9888 ft.

Q6) a) 600 ft. of 13 3/8" surface casing is to be set in 16" hole. The slurry yield is 1.18 cubic ft/sack & 75% excess is needed. The cement slurry weight is 15 ppg & requires 5.2 gal/sack of water. Cement is circulated to the surface. Capacity of the annulus to be cemented is 0.42305 cubic ft/ft. Capacity 13 3/8" Casing is 0.1497 bbl/ft. Calculate

i) No.of sacks.

ii) Volume of water in bbl & in litrs.

iii) Displacement volume. **[6]**

b) Write a note on, **[10]**

i) Well control during completion.

ii) Types of Drilling fluids.

Q7) a) Write in brief procedure of well control using, **[10]**

i) Wait and weight method.

ii) Volumetric method.

b) What is the basis to know the type of influx? Determine the same using following data. **[6]**

SICP = 1154 psi
SIDPP = 768 psi
Height of influx = 529 ft.
Mud weight = 15.8 ppg.

Q8) a) Draw and explain with neat schematic sketch a BOP accumulator and hydro-pneumatic well control system. **[8]**

b) Write various types of blowout preventors and their functions in brief. **[8]**

Total No. of Questions : 6] **[Total No. of Pages : 1**

P1691

[3965]-228

M.E. (Petroleum Engineering)

WELL TESTING AND ANALYSIS

(2002 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non - programmable calculator, log-log, semi-log paper is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Derive the diffusivity equation in cylindrical coordinate system. **[25]**

Q2) Write short notes on: **[25]**

a) Interference Tests.
b) Fractured Tests.
c) Type curves.
d) Early time region.
e) Type curves.

Q3) Derive Bessels solution to the diffusivity equation. **[25]**

SECTION - II

Q4) State the complete methodology in analysis of a Drill Stem Test. **[25]**

Q5) State the complete methodology in analysis of pulse test. **[25]**

Q6) Explain Gas well testing with reference to Isochronal and modified isochronal tests. **[25]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1694

[3965] - 284

M.E. (Industrial Engineering)

FINANCIAL MANAGEMENT

(2003 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate between the profit maximization and the wealth maximization objectives of financial management. **[8]**

b) Mention and discuss any four objectives of the Financial Management. **[8]**

Q2) a) Discuss in brief any four major functions of Financial Management. **[8]**

b) Explain the areas to be looked into in Working Capital Management. **[8]**

Q3) a) What is net worth? Does it differ from Working Capital? Justify. **[8]**

b) Discuss in brief the capital structure of an organization. What is the difference between share capital and borrowings? **[8]**

Q4) Write short notes on any three of the following: **[18]**

a) Difference between Profit and Loss account and Balance Sheet.

b) Trial Balance - its purpose and relevance.

c) Ratio Analysis - purpose and some important ratios.

d) Important taxes in India and their purpose.

e) Profit - liability or asset?

P.T.O.

SECTION - II

Q5) a) Can we use the technique of Cost Benefit Analysis for small businesses? If so or otherwise can we base our decisions just on the basis of this analysis? **[8]**

b) Discuss the different ways in which costs can be classified. What is the purpose of cost classification? **[8]**

Q6) a) What is the main purpose of Budget? How is the budget prepared for an organization? What are the problems in budgeting? **[8]**

b) What are the positive aspects of Payback period analysis? What are its limitations? **[8]**

Q7) a) Discuss the utility of Flexible Budget? How is it prepared? **[8]**

b) What is Zero Based Budgeting? In which areas it is more useful? What is the practical relevance of this approach? **[8]**

Q8) a) A company is having two alternatives for its expansion plan, which are given below. You are requested to analyse these on the basis of Present Worth Method and give your decision. You may consider any additional factor while taking the decision.

Details - all figures are in Rupees unless. specified	Proposal 1	Proposal 2
Initial Investment Required	10,00,00,000	8,00,00,000
Number of workers required - number	500	1000
Annual Expenditure	1,00,00,000	90,00,000
Profit expected to be generated per year	10,00,000	9,50,000
Expected life of the plant in years	10	8
Expected resale value of the plant after the expected life	2,00,00,000	1,00,00,000

The rate of inflation is expected to be 7% for the next ten years. **[6]**

b) Discuss the utility of Flexible Budget? How is it prepared? **[6]**

c) What is Zero Based Budgeting? In which areas it is more useful? What is the practical relevance of this approach. **[6]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1696

[3965] - 296
M.E. (Chemical)
CATALYSIS & SURFACE PHENOMENA
(2002 Course) (Elective - I) (109109)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give the essential characteristics of a solid catalyst. **[8]**

b) Explain the dual site mechanism. **[6]**

c) What are the steps involved after a reactant hits the catalyst surface. **[4]**

Q2) a) In a catalytic reaction what can be the possible controlling factors. **[8]**

b) Describe the Langmuir and Freundlich Adsorption isotherms. **[8]**

Q3) a) How can we say adsorption preceeds reaction in a catalytic process. **[8]**

b) Derive Elovith equation. **[8]**

Q4) What is micro, meso & macro prosity? What is the effect of pore size & psd on reaction ? Give a method for finding pore size and psd. **[16]**

SECTION - II

Q5) a) Describe the ammonia synthesis process completely giving mechanism of reaction, role of catalyst and reaction conditions. **[12]**

b) What are promoters & inhibitors? **[6]**

P.T.O.

Q6) a) What is catalyst poisoning, fouling and deactivation. **[10]**

b) How are catalysts regenerated? **[6]**

Q7) a) What is the significance of Thiele Modulus? Derive an equation for it for a cylindrical pellet. **[10]**

b) How does tortuosity affect diffusivity? How is it accounted for? **[6]**

Q8) a) Describe the working of a monolith type catalyst with application. **[12]**

b) What is the role of a catalyst support & what are its desirable characteristics. **[6]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1698

[3965] - 416

M.E. (Civil - Construction Management)

INTERNATIONAL CONTRACTING

(Elective - III) (2008 Course) (501111)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) "Bidding for International projects is very challenging as compared to the local projects" - Justify this statement with the help of any case study related to construction works. **[18]**

Q2) Explain the methodology of risk identification, analysis, mitigation, based on the concept of "Whole to part" as adopted in the ICRAM - 1 model in detail. Discuss advantages of this methodology. **[16]**

Q3) Enlist the various risks which were identified by the consultants on the Mumbai - Pune expressway. Explain how the effect of these risks were assessed for the smooth management of the project. Which were the most critical risks? Why? **[16]**

Q4) "Institutionalized Arbitration will prove to be much better than the adhoc arbitration system, presently practiced" Justify whether true or false, with reference to the CIDC - SIAC system being advocated. **[16]**

P.T.O.

SECTION - II

Q5) a) As a Planning Engineer, if you have to go for 'International Contracts', which are the three important areas you will study, before you take final decision, for submitting your quotation to the clients? **[8]**

b) Select any one of the above, list out and discuss important areas which you will give most importance, in taking the final decision. **[8]**

Q6) a) List out the important action the buyers should never forget and explain in detail importance of any one of these aspects. **[8]**

b) Give various reasons and problems you will face while executing such contracts. **[8]**

Q7) a) Draw a Flow Diagram showing BIMS components in implementing BIMS in a Firms operation. **[8]**

b) List out and Explain in details 'Integrity Review Check list' in any one of the following **[8]**

i) Marketing.

ii) Contracting.

iii) Project Execution.

Q8) a) Explain the sequence of activities involved in project authority and bidder, for pre - qualification and up to submission of bid for international contract? **[9]**

b) What are the guidelines in the procurement policy by World Bank in financing the huge project? **[9]**

Total No. of Questions : 8] [Total No. of Pages : 2

P1701

[3965] - 492

M.E.Mech. (Heat Power)

PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENTS

(Elective - I) (2008 Course) (502104)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule steam tables, moiller charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data.***

SECTION - I

Q1) a) Explain different feed water treatments in detail? **[8]**

b) Explain the energy conservation opportunities in boilers? **[8]**

Q2) a) Explain different factors affecting the boiler performance? **[8]**

b) The following observations were recorded during a boiler trail Mass of feed water & its temperature = 720 kg/hr. & 50 degree C
Steam pressure = 12 bar, Fuel used = 65 kg/hr.
H.C.V. of fuel = 44100 KJ/Kg, temperature of gases = 300 degree C.
Boiler room temperature = 30 degree C.
For finding the dryness faction of steam, the steam is passed through the throttling calorimeter and the following observations were noted
Temperature of steam = 120 degree C, pressure of steam = 5 cm of Hg above atmosphere.
Barometer reading = 762 mm of Hg.
Heating surface of the boiler = 20.6 meter square.
Cpg (for gases) = 1.1 KJ/kg-K, Cpg (super heated steam) = 2.1 KJ/Kg-K
The composition of oil used by mass, C = 85%, H_2 = 13%, & remaining is ash.
The flue gas analysis by volume done by using orsat apparatus is given as CO_2 = 12.5%, O_2 = 4.5% and N_2 = 83%
Find

i) Equivalent evaporative per Kg of fuel & per meter square of heating surface area / hr.
ii) Efficiency of the boiler.
iii) Also draw the heat balance sheet on one kg of fuel basis.
Take steam partial pressure in exhaust gases = 0.06 bar. **[9]**

P.T.O.

Q3) a) Explain the procedure of constructing daily waste heat source and load diagram for furnace. **[9]**

b) What are the different types of fuel used in furnaces, and briefly describe fuel economy measures adopted in furnaces? **[8]**

Q4) a) Explain the Cogeneration used in sugar industries. **[8]**

b) What are the basic Cogeneration systems used? **[8]**

SECTION - II

Q5) a) Explain the different pumping system component in details. **[8]**

b) A centrifugal fan has the following data:

Impeller dia. = 0.8m, Impeller speed = 1260 r.p.m.

This fan gives the following test results

Vol. in m^3/sec	Fan static pressure in mm of water	Fan static efficiency
0.2	145	50
0.3	137	68
0.4	127	77
0.5	112	77
0.6	87	68

The duty requirement of 0.6 m^3/ sec at 175 mm static water column are to be meet, the following alternatives are available:

i) One 0.8 m diameter fan.

ii) Two 0.8 m diameter fan in series.

iii) Two 0.8 m diameter fan in paralle.

Determine the fan speed and total pressure required in each case. Which alternative is most desirable? **[9]**

Q6) a) Explain flow control strategies in fan and blowers. **[8]**

b) Explain energy conservation opportunities in fans and blowers? **[8]**

Q7) a) Illustrate in detail leakage testing procedure in compressed air system? **[8]**

b) What is slip factor? What is its effect on the flow and pressure ratio in the stage. **[8]**

Q8) a) Explain the role of energy technology in energy conservation, and its effect in modern times? **[9]**

b) Describe energy conservation opportunities in pumping systems. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 4**

[3965] - 493

P1702

M.E. (Mechanical) (Heat Power Engineering)

REFRIGERATION TECHNOLOGY

(2008 Course) (502104(B)) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Q.No.1 is compulsory.***
2) ***Solve any two questions from Q.No.2, 3 and 4.***
3) ***Q.No. 5 is compulsory.***
4) ***Solve any two questions from Q.No. 6, 7 and 8.***
5) ***Use of refrigerant property tables, thermodynamic charts, psychrometric charts, calculator, and log table are allowed.***
6) ***If required, assume suitable data, cases, conditions etc. with supportive justifications.***
7) ***Use dark graphite pencils, ball point pens to mark the cycles etc. on the thermodynamic charts.***

SECTION - I

Q1) a) Discuss the factors considered for selection of refrigerant for any refrigeration system. **[8]**

b) Discuss the applications of cascade refrigeration system. **[6]**

Q2) Calculate: theoretical cycle COP and power consumption of the compressors for the following HCFC22 refrigeration system used for the pre - cooling application. Assume the subcooling of liquid refrigerant to 30°C and the low side compressor suction superheat 7°C. Draw the plant cycle layout on P-h and T-s thermodynamic charts. **[18]**

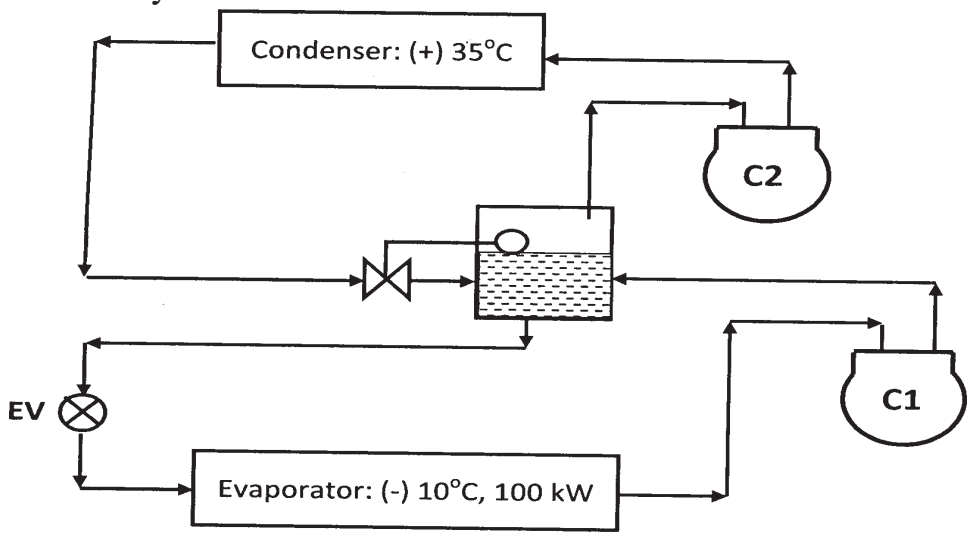


Figure A

P.T.O.

Q3) The poultry products processing unit processes 45 tones chicken every day to meet its export requirements. The unit works in three shifts of 8 hours each. The fresh cut chicken is packed at the frozen temperature -10ºC. Design the refrigeration plant considering the following data: **[18]**

a) Compressors are available in the displacement capacities = 150, 200, 250, 300CC.

b) Compressor speed range available = minimum 750 to maximum 1400 rpm.

c) Volumetric efficiency of the compressors is 86%.

d) Isentropic efficiency of the compressors is 75%.

e) Refrigerant preferred: ammonia (R717).

f) Electrical motor efficiency = 91%.

g) Transmission efficiency = 94%.

h) Specific heat of chicken above freezing temperature of 0ºC is 3.1 kJ/kg-K and below freezing point is 1.47 kJ/kg-K.

i) Consider the weather data for the plant location - Pune.

Weather station	Cooling DBT/MCWBT					
	0.4%		1.5%		2.5%	
	DBT	MCWBT	DBT	MCWBT	DBT	MCWBT
	ºC	ºC	ºC	ºC	ºC	ºC
Pune	38.4	20.5	37.4	20.4	36.3	20.6

Summarize the design for the refrigeration plant layout, actual cooling capacity in kW, actual total electrical motor power consumption and actual COP.

Q4) Calculate the actual COP and actual compressor power consumption for the refrigeration plant layout in Figure B. Plot the cycle on P-h chart. **[18]**

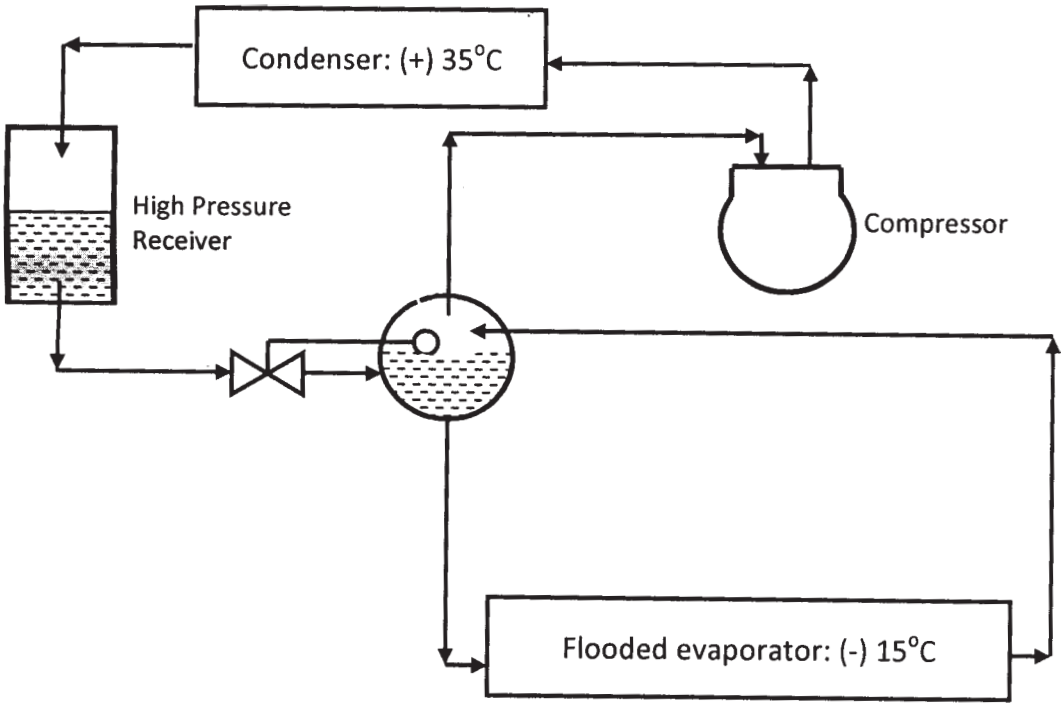


Figure B

Assume: evaporator cooling capacity 100 TR, refrigerant: R22, isentropic efficiency and volumetric efficient of the compressor 78% and 84% respectively. Speed of the

SECTION - II

Q5) a) Explain the general procedure for the designing of any refrigeration plant. **[7]**

b) Enlist types of compressors and explain any one of them with a neat sketch. **[7]**

Q6) Calculate the theoretical COP and heat rejection in the condenser for the HCFC - 22 refrigeration cycle shown in Figure C. Assume isentropic efficiency 75% and volumetric efficiency 82% for the compressor.

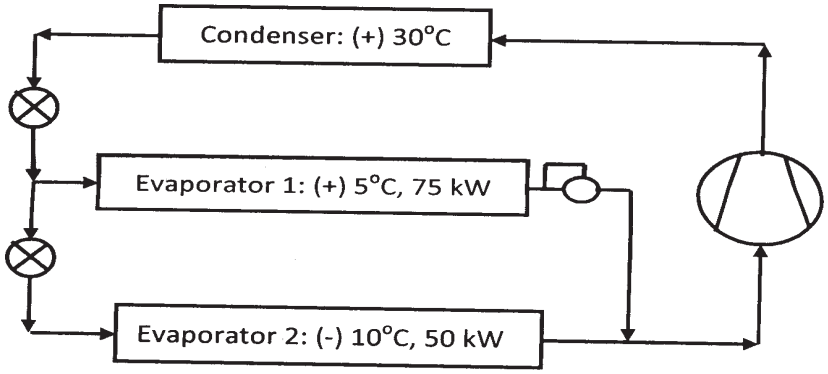


Figure C

Plot the cycle on P-h and T-s thermodynamic chart.

Further discuss the merits and areas of applications of this system in detail. **[18]**

Q7) Calculate an intermediate saturation pressures of heat rejection and heat absorption for maximum energy efficiency, combined cycle COP, individual compressor power consumption in kW and heat rejection to ambient for the cascade refrigeration system employed to get 1 kg/s chilled brine at (-) 50ºC from the return chilled water temperature (-) 45ºC. The cooling tower water is continuously available to high side water cooled condenser at 35ºC.

Assume: R22 on low pressure side and R717 on high pressure side of the system, specific heat of brine is 3.4 kJ/kg-K, compressor isentropic efficiency 65% and volumetric efficiency 89% and other necessary data required for the design of the cascade refrigeration plant. **[18]**

Q8) Design the refrigeration system for the pasteurization of milk. Every day, 50000 liter milk is received at the dairy from the various collection centers at average 20ºC temperature. On receiving, the milk is precooled to 4ºC and stored at constant temperature in insulated vessels and supplied at constant head to the pasteurization process. In the pasteurization system, the plate heat exchanger of 75% effectiveness is used. In the pasteurization process, the milk is suddenly cooled from 65ºC to 4ºC in 10 seconds using the brine of (-) 3ºC. The entire process from milk precooling to pasteurization is completed in 4 hours of period. The specific heat of milk is 3.89 kJ/kgK and of the brine is 3.25 kJ/kgK. The dairy has very good supply of fresh water. The plant is located at Aurangabad, where most of the time the relative humidity is less than 65%. Assume: isentropic and volumetric compressor are available in the displacement capacities: 150 CC, 200 CC, 250 CC and 300 CC.

Calculate actual COP, actual cooling capacity of the evaporator and actual compressor power consumption of the compressor. Plot the cycle on the P-h chart. **[18]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

[3965] - 503

P1703

M.E. (Mechanical) (Heat Power Engineering)

I.C. ENGINES - FUELS & COMBUSTION

(2008 Course) (Elective - III) (502111 (A))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) a) Explain the effect of volatility, antiknock quality, gum deposit, sulphur content in gasoline and diesel on SI and CI engine respectively. **[8]**

b) Discuss the suitability of the following fuels in diesel engines. **[8]**

i) Alcohols.

ii) Vegetable oils.

iii) Bio gas.

Q2) a) Methanol is burned in an engine with air at an equivalence ratio of $\varphi = 0.75$. Exhaust pressure and inlet pressure are 101 kPa. Write the balanced chemical equation for this reaction and calculate **[8]**

i) air fuel ratio.

ii) dew point temperature of the exhaust if the inlet air is dry.

iii) dew point temperature of the exhaust if the inlet air has a relative humidity of 45% at 25°C.

iv) antiknock index of methanol.

Methanol RON = 106 and MON = 92.

b) Explain: Fuel rating of CI and SI engine. **[8]**

P.T.O.

Q3) a) Explain the various stages of combustion in SI and CI engine with neat diagram. **[8]**

b) Describe the SI engine in terms of the followings. **[8]**

Combustion cycle, fuel, fuel injection system, ignition, compression ratio, speed, thermal efficiency, weight, air charging system (turbo and supercharger.

Q4) a) A spark plug is fired at 18º bTDC in an engine running at 1800 rpm. It takes 8º of engine rotation to start combustion and get into flame propagation mode. Flame termination occurs at 12º a TDC. Bore diameter is 84 mm and the spark plug is offset 8 mm from the centerline of the cylinder. The flame front can be approximated as a sphere moving out from the spark plug. Calculate the effective flame front speed during flame propagation.

If the engine speed is increased to 3000 rpm so that flame front speed increases at a rate $V_f \alpha$ 0.85 N. Calculate how much ignition timing must be advanced such that flame terminated at 12º aTDC and time for flame development after spark plug fire is same. **[10]**

b) What are the potential sources of biodiesel in India? Explain how it is produced. Also explain feasibility of it using in India. **[8]**

SECTION - II

Q5) a) A four cylinder, 3.2 liter engine running at 4500 rpm has swirl ratio of 6. The stroke and bore are related as S = 1.06 B. Calculate angular velocity of gas mixture in the cylinder, average piston speed and tangential speed of rotating gas. **[6]**

b) Compare induction swirl and compression swirl in CI engine stating its advantages and disadvantages. **[6]**

c) What do you understand by transient mixture requirements? **[6]**

Q6) a) Two engine options are to be offered in a new automobile model. Engine A is naturally aspirated with the compression ratio of 10.5:1 and cylinder inlet conditions of 60ºC and 96 kPa. Engine B in supercharged with aftercooling and has cylinder inlet conditions of 80ºC and 130 kPa. To avoid the knock problems, it is desirable to have the air - fuel temperature at the start of combustion in engine B to be same as in engine A. Calculate

i) temperature at the start of combustion in engine A, using air standard otto cycle analysis.

ii) compression ratio of engine B which would give the same temperature at the start of combustion.

iii) temperature reduction in the aftercooler of engine B if the compressor has an iscentropic efficiency of 82% and inlet conditions are the same as in engine A. **[10]**

b) Explain with neat sketches and compare the different types of compressors for power boosting. **[6]**

Q7) a) What are the air - fuel mixture requirements during the following range of operation of SI engine? **[8]**

i) idling and no low load.

ii) normal power range.

iii) maximum power range.

b) What are the various methods of turbocharging? Explain advantages and disadvantages over each other. **[8]**

Q8) a) Explain the latest trends in CI engine in terms of performance enhancement and emission reduction. **[8]**

b) An eight cylinder turbocharged aftercooled four stroke cycle diesel engine operates with an inlet pressure of 182 kPa at its maximum rated power at 2000 rpm. Bore = 120 mm, stroke = 140 mm, volumetric efficiency = 0.9 (based on inlet manifold conditions of 182 kPa and 325 K after the aftercooler). The compressor iscentropic efficiency is 0.7. Calculate **[8]**

i) the power required to drive the turbocharger compressor.

ii) if the exhaust gas temperature is 650°C and turbocharger iscentropic efficiency is 0.65, estimate the pressure at the turbine inlet. The turbine exhausts to the atmosphere.



Total No. of Questions : 8] [Total No. of Pages : 2

P1704

[3965] - 505

M.E. (Mech.) (Heat Power)

NON - CONVENTIONAL POWER PLANTS

(2008 Course) (502111 (C)) (Elective - III)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain CO_2 reduction potential of renewable energy sources. **[8]**

b) Discuss the challenges in commercialization of renewable energy based conversion systems in India. **[8]**

Q2) a) Enlist the solar concentrators and explain any one of its with a neat sketch. **[8]**

b) Compare the solar thermal power plant with the conventional coal based thermal power plant. **[5]**

c) Draw a neat sketch of solar thermal power plant. **[4]**

Q3) a) Discuss the economic feasibility of photovoltaic system and explain its design with the supporting figure. **[9]**

b) Explain the concepts of energy wheeling and banking. **[8]**

Q4) Write notes on: **[16]**

a) Indian wind energy scenario.

b) Solar flat plate collector.

c) Solar Chimney.

d) Social barriers in acceptance of renewable energy sources.

P.T.O.

SECTION - II

Q5) a) What are the different types of methods to produce gas from biomass? Illustrate one method using a neat sketch. **[8]**

b) Explain the meaning of the words 'Availability' and 'Potential' for Hydro power as a renewable source for India (as a specific case). **[8]**

Q6) a) A tidal power station has 24 generators each of 10 MW operating at a maximum head of 13.5 m. It generates for two 6-hour periods per day. Calculate the basin capacity in m^3, and annual energy production (in GW-h). Assume efficiencies for turbine and generator as 93% each. Density of water is 1025 kg/m^3. **[8]**

b) List the energy conversion technologies in geothermal energy and differentiate them by a one/two line/s explanation. Use of diagram is necessary. **[8]**

Q7) Define the following terms with ONE example each: **[16]**

a) Environmental impacts of nuclear power plants.

b) Economic and social considerations while writing the DPR.

c) Method of deciding the feasibility of a hydro power plant.

d) Carbon credits and their trading.

Q8) Write short notes on (Any Two) **[18]**

a) Potential of Wind and biogas energy envisaged in XI plan.

b) Environmental impacts of conventional power plants.

c) Clean development mechanism (CDM)



P1706

[3965] - 527

M.E. (Mechanical - Mechatronics)

APPLIED NUMERICAL METHODS & COMPUTATIONAL TECHNIQUES

(Sem. - I) (2008 Course) (502801) (Part - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to each section should be written in separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) Find approximate value of y at $x = 4$. The governing differential equation is

$$\frac{dy}{dx} = -2x^3 + 12x^2 - 20x + 8.5$$

The initial conditions are $x = 0$ and $y = 1$. Find the percent relative error when exact solution is given by

$$y = -0.5x^4 + 4x^3 - 10x^2 + 8.5x + 1$$

Use Eular Method with step size of $h = 0.5$ **[18]**

Q2) Solve the following set of differential equations using Eular's method. Given $x = 0$, $y_1 = 4$ and $y_2 = 6$. Integrate to $x = 2$ with step size $h = 1$

$$\frac{dy_1}{dx} = 0.5\, y_1$$

$$\frac{dy_2}{dx} = 4 - 0.3\, y_2 - 0.1\, y_1$$ **[16]**

Q3) a) Compute L and U matrices for the following matrix. **[8]**

$$\begin{bmatrix} 10.00 & 2.00 & -1.00 \\ -3.00 & -6.00 & 2.00 \\ 1.00 & 1.00 & 5.00 \end{bmatrix}$$

b) Calculate inverse of the matrix in Q3 (a) using suitable numerical method. **[8]**

P.T.O.

Q4) a) Discuss linear regression algorithm with respect to data, method and output. **[6]**

b) Given $x = 1, y = 19, \frac{dy}{dx} = 22$ and $x = 2, y = 57, \frac{dy}{dx} = 57$ Using Hermite interpolation polynomial method, fit cubic algebraic polynomial and obtain y at $x = 1.5$. **[10]**

Q5) a) Discuss algorithm for Lagrange Interpolation Polynomial. **[8]**

b) Discuss algorithm for Gauss Quadrature for Double Integration. **[8]**

SECTION - II

Q6) Temperature of heated plate is given by **[18]**

$$T(x, y) = 2xy + 2x - x^2 - 2y^2 + 72$$

The plate is 0.08 m (x dimension) and 0.06 m (y dimension). Compute average temperature using trapezoidal rule with two steps along x and y axis.

Q7) Fox axially loaded column, it follows that, **[16]**

$$\frac{d^2y}{dx^2} = \frac{M}{EI}$$

with usual notations. As M = – Py it reduces to

$$\frac{d^2y}{dx^2} + P^2y = 0, p = \frac{P}{EI}$$

For E = 10(10^9) Pa, I = 1.25 (10^{-5}) m^4, L = 3 Determine eigen values of two interior nodes using polynomial method.

Q8) a) Discuss four steps of Finite Element Method. **[8]**

b) Applications of Fourier Transforms in Vibration Analysis. **[8]**

Q9) a) Use Modified Eular Method to calculate y at $x = 4$ with step size $h = 0.5$ and initial conditions as $y = 0$ at $x = 0$ for the differential equation. **[8]**

$$\frac{dy}{dx} = 12x^2 - 20x + 8.5$$

b) Discuss Shooting Method with algorithm. **[8]**

Q10)a) Compare Simpson's One Third rule and Simpsons 3/8 rule used for numerical integration. **[8]**

b) Write a short note on Implicit method to solve partial differential equations. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1707

[3965] - 561

M.E. (Mechanical Engineering) (Automotive)

ADVANCED HYDRAULICS AND PNEUMATIC SYSTEMS

(2008 Course) (502302(C)) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronics pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Name different components of Hydraulic and Pneumatic systems. What are their functions? **[8]**

b) A power transmission system employs 25m of 20 mm bore tube with oil of density 870 kg/m^3 and kinematic viscosity of 40 cSt. For a flow rate of 0.314 *l*/s determine the pressure loss in the tube. If the flow rate is increased to 2.512 *l*/s determine the new pressure loss. Assume that, for turbulent flow, the friction coefficient $f = 0.08\ (Re)^{-0.25}$ in the expression $\Delta p = 4fl\rho v^2/2d$. **[6]**

c) What are the factors affecting selection of packing and seals? **[4]**

Q2) A variable capacity hydraulic pump is used to power a fixed capacity motor. The details of the two units are as follows. **[16]**

Pump

Maximum capacity = 164 ml/rev

Constant shaft speed = 25 rev/s

The drive is from an electric motor directly coupled to the pump shaft.

Leakage coefficient = 0.9 ml/bar s

Mechanical efficiency = 85 %

Motor

Capacity = 65 ml/rev.

Leakage coefficient = 0.9 ml / bar s

Mechanical efficiency = 85%.

The motor load is pure inertia of value 1.0 kg m^2

Neglecting oil compressibility and pipe friction losses determine

P.T.O.

a) The acceleration of the hydraulic motor when its speed 33 rev/s and the pump capacity is at 60% maximum.

b) The power output of the electric motor at the conditions stated in (a).

c) The time taken for the load to reach 63% of its maximum speed when the pump capacity is subjected to a step-change from 0 to 50% of its maximum value.

Q3) a) A system is required to deliver 500 ml of oil over a period of 0.1 s with a minimum time between demands of 30 s. Determine the necessary accumulator size if the pump associated with the system has a delivery of 200 ml/s and a maximum delivery pressure of 75 bar. The minimum system pressure is to be 10 bar. What capacity pump would be required for this system if no accumulator were to be included? **[10]**

b) Compare characteristics of Gear, Vane and Piston pumps. **[6]**

Q4) a) Explain any two applications of hydraulics in Automobiles. **[6]**

b) Explain constructional details of Hydraulic power unit with the help of a neat diagram. **[10]**

SECTION - II

Q5) a) What are the advantages of pilot operated systems? Explain any typical pilot operated pneumatic circuit. **[8]**

b) What are the different valve actuation methods available in direction control valves used in hydraulics? Explain applications of such direction control valves with different actuation methods. **[8]**

Q6) a) What is the difference between a back pressure sensor and a proximity sensor? **[4]**

b) What must be done to fluidic systems to insure that they will operate reliably? **[6]**

c) Using DeMorgan's theorem, Design a NOR circuit to generate the function:

$Z = \overline{A} + \overline{B} + \overline{C}$. **[6]**

Q7) a) Two identical cylinders A and B are to be operated simultaneously. The cylinder A moves against the load of 25 kN while the cylinder B has a load of 20 kN. Both the cylinders have a stroke of 1 m. The working stroke is to be completed in 20 sec time. The return stroke of the cylinder B to start only after the cylinder A is completely retracted. The return speeds are to be as fast as possible. Draw a circuit, which will fulfill these requirements. Mention the ratings of the components used. **[10]**

b) Explain a typical set - up and procedure to test any pressure control valve. **[8]**

Q8) a) Draw a circuit for milling machine for the following movements. Three cylinders are to be used: **[8]**

i) Cylinder A for bed movement in X direction.

ii) Cylinder B for bed movement in Y direction.

iii) Cylinder C for tool movement.

For feed/speed control, use a standard manifold.

b) Explain with neat sketch 'Dual pressure hydraulic systems'. **[8]**

Total No. of Questions : 10] **[Total No. of Pages :3**

P1709

[3965] - 568

M.E. (Mech. - Automotive)

NOISE, VIBRATIONS AND HARSHNESS

(2008 Course) (502309 A) (Elective - III)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain following types of windowing with their time window and application of use. **[8]**

i) Uniform.
ii) Hanning.
iii) Force and
iv) Exponential.

b) Describe the different types of accelerometer mountings for vibration measurements with their advantages and disadvantages. Draw the frequency response characteristics of each mounting. **[8]**

Q2) a) Describe with suitable sketch, free single degree of freedom vibration of cantilever beam exhibits simple harmonic motion. With this, derive the formulation of the eigen values and eigen vectors calculation for single degree of freedom system. **[8]**

b) Describe with sketch, the power relations informing half power bandwidth, quality factor and damping ratio. **[8]**

Q3) Two structures A and B are assembled as shown in Fig-1. The entire assembly is vibrating at a fixed rate. The vibration of structure A is twice that of structure B. The vibration velocity of all surfaces for an individual structure is the same. The vibration velocity of structure B is 3 mm/s. Calculate the total sound power and vibration level generated by the assembly for this velocity. Also calculate the percentage contribution of each of the structures, A and B towards the total assembly noise.

P.T.O.

If sound power level of this assembly is to be reduced by 3dB, which components need vibration reduction on priority and in that case, what is its desired percentage vibration reduction. Assume radition efficiency of both structures to be unity. **[16]**

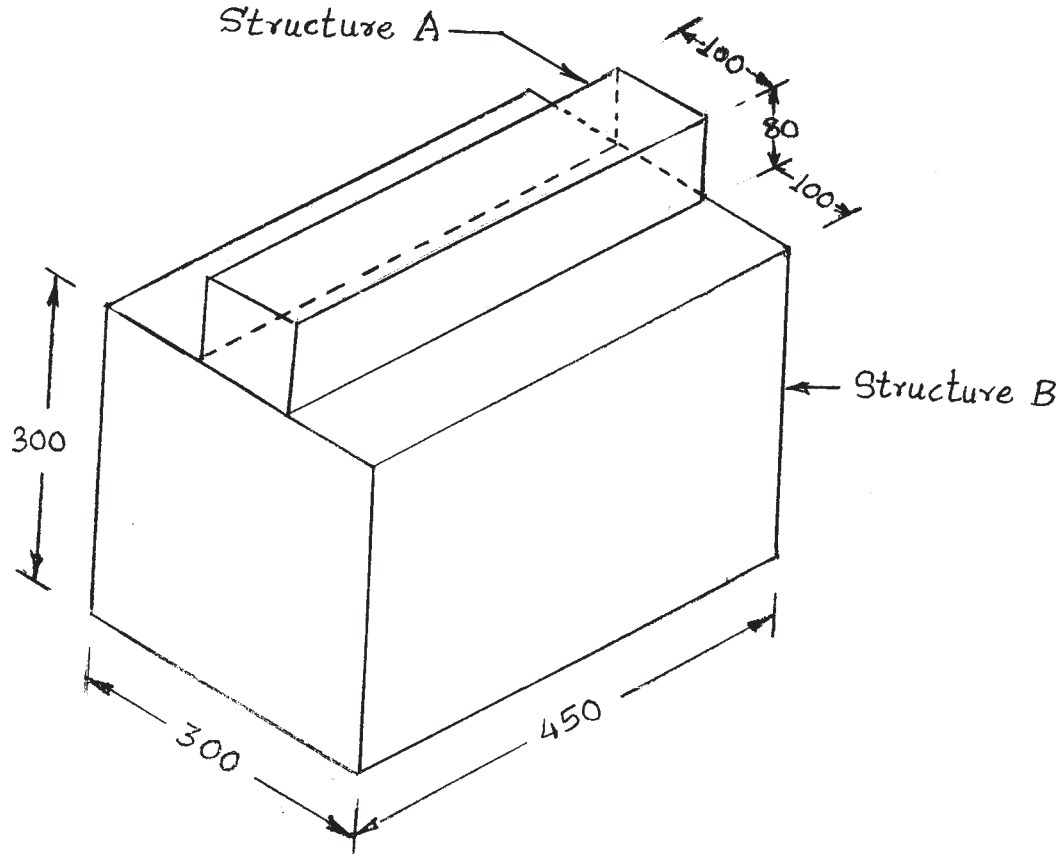


Fig. 1 [For Q.3]

Q4) a) Explain the following with neat sketch sampling. Nyquist criteria, Aliasing and Leakage with respect to the data acquisition. **[8]**

b) Write a note on structure borne and Air borne noise sources of a passenger car. **[8]**

Q5) Write short notes on any three of the following: **[18]**

a) Condenser type microphone.

b) Octave bands and their significance in NVH.

c) Laser Vibrometer.

d) Effects of noise on human being.

SECTION - II

Q6) a) Explain in detail, construction and working formulations of P-P type sound intensity probe. **[8]**

b) Write note on Waterfall plot and Campbell diagram with sketch and their advantages over each other. **[8]**

Q7) a) Explain Maxwell's reciprocity theorem with suitable sketch. **[8]**

b) Explain with sketch, the different types of excitation methods used in structural modal testing. **[8]**

Q8) With the help of a numerical example, prove that in a free field, the Sound Pressure and Sound Intensity Levels are nearly the same. **[16]**

Q9) a) What is meant by sound absorption by a material. Explain with frequency response curves, the relation of sound absorption coefficient with material properties like density, porosity and thickness. **[8]**

b) Write note on sound absorbers of following type **[8]**

i) porous.

ii) Membrane.

iii) cavity.

iv) perforated type of cavity.

Also draw frequency response curve for each type.

Q10) Write short notes on any three of the following: **[18]**

a) Inverse square Law.

b) Acoustic Holography.

c) Pass - by Noise Measurement.

d) Types of Sound Fields.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1710

[3965] - 630

M.E. (E & TC) VLSI & Embedded System

MACHINE INTELLIGENCE

(2008 Course) (504184) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain briefly the biological neural network. **[6]**

b) Explain: **[6]**

i) Inner and outer products with reference to ANN mapping.

ii) Linearity.

c) In context to neural network learning, distinguish between. **[6]**

i) Memorization & Generalization.

ii) Supervised learning & unsupervised learning.

iii) Recurrent & Non recurrent n/ws.

Q2) a) Explain Kohonen's SOFM. Explain how learning rate & neighbourhood are determined. **[8]**

b) What are the main differences among the three models of ANN, namely, Mc-culloch-pitts, perceptron & ADALINE. **[8]**

Q3) a) Explain the learning process in a Radial Basic Function n/w. **[8]**

b) What do you mean by principal component analysis? List the steps involved in the development of neural network for principal component analysis. **[8]**

P.T.O.

Q4) a) What are limitation of simple perceptron. **[4]**

b) Discuss Generalised Delta Rule. **[6]**

c) Explain principle involved in linear vector Quantization? With architecture, describe how LVQ nets are trained? **[6]**

SECTION - II

Q5) a) What are the various types of Fuzzy composition techniques? Explain. **[4]**

b) Obtain Fuzzy relation $\underset{\sim}{T}$ as a composition between the fuzzy relations given by $\underset{\sim}{R}=\begin{bmatrix} 0.6 & 0.3 \\ 0.2 & 0.9 \end{bmatrix}$ & $\underset{\sim}{S}=\begin{bmatrix} 1 & 0.5 & 0.3 \\ 0.8 & 0.4 & 0.7 \end{bmatrix}$ **[6]**

c) Compare & contrast the fuzzy inference techniques of Mamdani, sugeno & Tsukamoto. **[6]**

Q6) a) What are different defuzzification methods used to obtain crisp output? Discuss the criterion for comparison & evaluation of these defuzzification methods. **[8]**

b) What is meant by genetic algorithm? State the importance of genetic algorithm. Explain the application of genetic algorithm? **[8]**

Q7) a) What are the steps involved in the system identification? Draw & explain the block diagram for parameter identification. **[8]**

b) Define membership function & state its importance in fuzzy logic? Explain the features of membership functions? How can a membership function be normalised. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Derivative Based optimization.

b) Advanced Neuro - fuzzy Modelling.

c) Soft computing characteristics.

d) Reinforcement learning.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1712

[3965] - 654

M.E. (E & T/C) (Signal Processing)

VLSI IN SIGNAL PROCESSING

(2008 Course) (504509) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Compute the iteration bound using LPM algorithm for the DFG shown in the fig.Q.1a. Assume that the adder and the multiplier requires 1 and 2 u.t. respectively. **[8]**

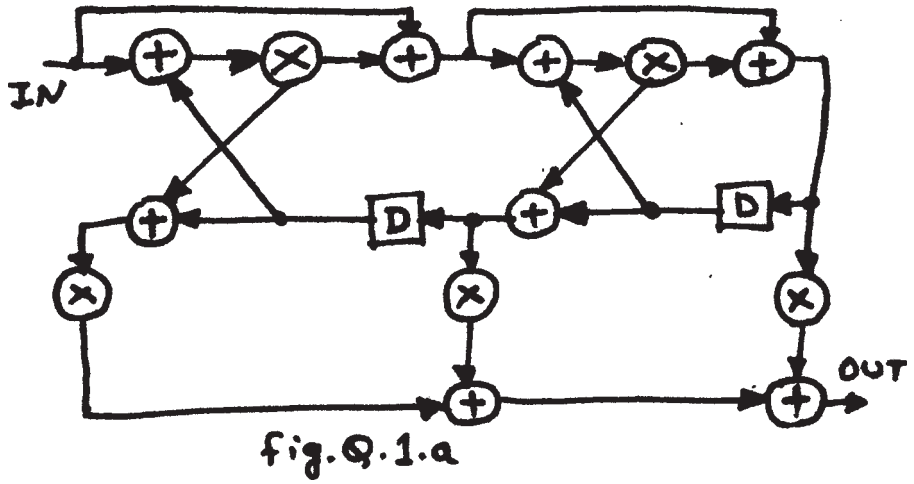


fig.Q.1.a

b) Consider the 6th order FIR filter $y(n) = ax(n)+bx(n–4)+cx(n–6)$. Draw the block architecture for the structure for block size of 3 such that the clock period is one-forth of the a multiply-add time. Assume multiply computation time is three times the a addition computation time. **[8]**

Q2) a) Calculate the power reduction of a computation if it is pipelined by 4 stages and processed using a block structure with block size 4, but is operated with the same sample rate as the original system. Assume that the original system was operated at a supply voltage of 5V, and assume the threshold voltage Vt of the CMOS process to be 0.4V. Calculate the power consumption of the parallel-pipelined system as compared with the original system. **[8]**

P.T.O.

b) Explain with the help of an example, the algorithm to retime a DFG for clock minimization. **[8]**

Q3) a) Draw the DFGs for the data broadcast form of the FIR filter $y(n) = ax(n) + bx(n–2) + cx(n–5)$ Unfold the DFG using unfolding factor J = 4. **[10]**

b) Consider the DG for a 3-tap FIR filter $y(n) = w_0x(n) + w_1x(n–1) + w_2x(n–2)$ This DG has 3 fundamental edges: input moving upward, coefficient moving towards right and results moving $[1\ -1]^T$. Draw block diagram, low level implementation diagram and space-time representation for the same for Design R1 ($d^T[1\ -1]$, $p^T[1\ 1]$, $s^T[1\ -1]$). **[8]**

Q4) a) Explain method of selection of scheduling vector based on scheduling inequalities. **[6]**

b) Write a short note on DSP Application demands and Scaled CMOS technologies. **[6]**

c) What are the properties of Unfolding, briefly explain each. **[4]**

SECTION - II

Q5) a) Explain parallel multipliers with modified Booth recoding. **[8]**

b) Describe bit serial multiplier using systolic mappings. **[8]**

Q6) a) Explain various integrated design resources and routing resources made available in FPGAs. Also elaborate how these resources helps in implementing DSP applications. **[8]**

b) Describe various clock distribution strategies for SoC designs. Explain in brief the merits and demerits of each. **[8]**

Q7) a) Explain how floating point arithmetic is implemented on FPGAs. **[8]**

b) What are the different ways binary numbers are represented in bit level arithmetic architectures? Explain how the sign bit is taken care. **[8]**

Q8) Write short notes on any THREE. **[18]**

a) VLSI Design flow for implementation on FPGAs.

b) Application of DCM available on FPGA.

c) Filter implementation on DSP Processors Vs. Implementation on FPGA.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1713

[3965] - 661

M.E. (Electronics) (Digital System)

MICROELECTRONICS

(2008 Course) (504195) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronics pocket calculators is allowed.***
4) ***Assume suitable data, if necessary.***

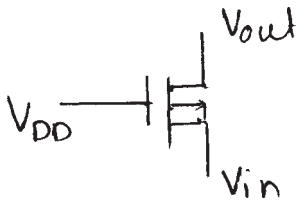
SECTION - I

Q1) a) Explain CMOS inverter & its transfer characteristics in details. How to achieve symmetry in these characteristics. **[8]**

b) Design 4:1 Multiplexer using transmission gate. Compare this Schematic with the conventional gates. **[8]**

Q2) a) What do you mean by λ parameter? What is technology scaling? How does it affect on power dissipation, parasitics and speed. **[8]**

b) Suppose $V_{DD} = 1.2V$, $V_{threshold} = 0.4V$. Determine V_{out} in figure for
i) $V_{in} = 0V$, ii) $V_{in} = 0.6V$ (Neglect body effect) **[4]**



c) Sketch stick diagram for static CMOS gate computing Y = (A+B+C).D. Estimate cell width and height. **[6]**

Q3) a) Explain data flow of place and route process. **[8]**

b) The logic circuit consumes more power if operated at higher clock frequency. Justify. What is power delay product. **[8]**

Q4) a) What is need of VITAL? Explain features available with VITAL. **[8]**

b) Comment on advantages and disadvantages of H-tree and clock grids. **[8]**

P.T.O.

SECTION - II

Q5) a) Sketch 3-input XOR function using each of the following circuit technique.
i) Static CMOS.
ii) Domino logic. **[6]**

b) Why behavioral modeling is used widely? **[4]**

c) What is difference between signal and variable? **[6]**

Q6) a) What do you mean by data types? Explain various data types used in VHDL. **[8]**

b) Draw the state diagram and write the VHDL code for the traffic light controller. **[8]**

Q7) a) Explain MOS implementation of a current sink along with its IV Characteristics. **[10]**

b) What are ideal properties of packaging? Which type of packaging is used for high performance system? Explain in detail. **[6]**

Q8) Write a short note on (Any three) **[18]**

a) NAND ROMs

b) Ultra fast VLSI.

c) Floor Planning.

d) NOR ROMs.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1715

[3965] - 707
M.E. (Production)
ENGINEERING ECONOMICS & ACCOUNTING
(2008 Course) (511105) (Elective - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate between Micro-economics and Macro-economics. **[7]**

b) What do economists mean when they state that a good is scarce? **[7]**

c) The price of an airline ticket from Denver to Washington. D.C. is $600. A bus ticket is $150. Traveling by plane takes six hours, compared with 36 hours by bus. Other things constant, an individual would gain by choosing air travel if, and only if, his time were valued at more than **[4]**

i) $6 per hour. ii) $8 per hour.

iii) $10 per hour. iv) $15 per hour.

Q2) a) Discuss main four factors which affect the consumer demand. **[8]**

b) Distinguish between the Substitution Effect and the Income Effect on demand of an item when there is price reduction. **[4]**

c) Explain the assumptions concerning consumer behaviour. **[4]**

Q3) a) Explain the positive points and limitations of the mechanism adopted in India for the determination of market prices for petroleum sector. **[8]**

b) How the pricing decisions defer in the Private Sector and Public Sector? Is it justifiable? **[8]**

Q4) Write short notes on any four of the following: **[16]**

a) Economics and managerial decision making.

b) Law of Demand.

c) Elasticity of Demand and its use.

d) Oligopoly.

e) Perfect Competition.

P.T.O.

SECTION - II

Q5) a) Can we use the technique of Cost Benefit Analysis for small businesses? If so or otherwise can we base our decisions just on the basis of this analysis? **[8]**

b) Discuss the meaning of 'Public Goods' in brief. **[8]**

Q6) a) Discuss the different ways in which costs can be classified. What is the purpose of cost classification? **[8]**

b) Discuss the assumptions made in the Cost Volume Profit relationship. **[8]**

Q7) a) Differentiate between Absorption Costing and Marginal Costing. **[8]**

b) What are the positive aspects of Payback period analysis? What are its limitations? **[8]**

Q8) Write short notes on any three of the following: **[18]**

a) Limitations of Discounted Cash flow.

b) Depreciation - a non cash expenditure.

c) Standard Cost - definition and importance.

d) Forecasting business changes.

Total No. of Questions : 10] [Total No. of Pages :3

P1716

[3965] - 711
M.E. (Production Engineering)
PLASTICS PROCESSING
(2008 Course) (Elective - III) (511111)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain the selection of Plastic for strength & Stiffness at minimum cost. **[8]**

b) Explain the characteristics of some important plastics any two. **[8]**

Q2) a) A ball-point pen made from polypropylene has he clip design shown in Fig. 1. When the pen is inserted into a pocket, the clip is subjected to a deflection of 2 mm at point A. if the limiting strain in the material is to be 0.5% calculate

i) A suitable thickness, d for the clip.
ii) The initial stress in the clip when it is first inserted into the pocket and
iii) The stress in the clip when it is has been in the pocket for 1 week.

The short term modulus of polypropylene is 1.6 GN/m^2. **[8]**

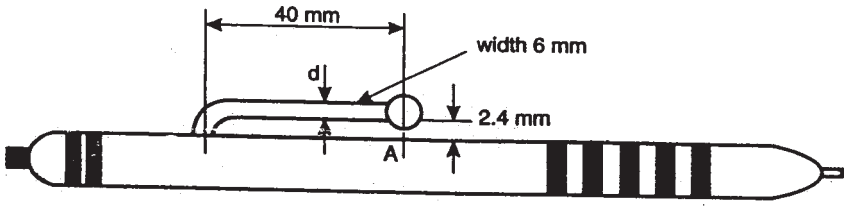


Fig. 1 Ball-point pen clip design

b) Explain general features of twin screw extruder. **[8]**

P.T.O.

Q3) a) Explain in brief transfer Moulding. **[8]**

b) The runner layout for an eight cavity mould is illustrated in Fig. 2. The mould is to designed so that the pressure at the gate is the same in all cases, determine the radius of the runner in section A. The flow may be assumed to be isothermal. **[8]**

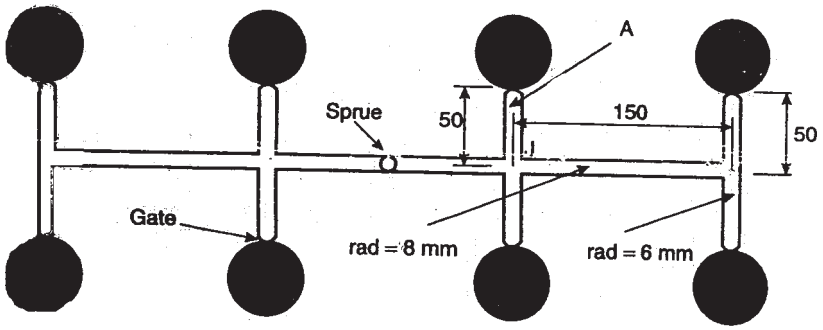


Fig 2 Lay-out for eight cavity mould

Q4) a) Explain with neat sketch transfer moulding of thermosetting materials. **[8]**

b) Explain constructional features of core and cavity plates. **[8]**

Q5) Write short notes on (Any three) **[18]**

a) Bag moulding reaction moulding.

b) Injection Moulding.

c) Thermoforming.

d) Layout of runners.

SECTION - II

Q6) a) Explain the standards of tolerances on molded articles for Epoxy material. **[8]**

b) Explain the overall advantages of ribs and drafts in the design of a molded articles. **[8]**

Q7) a) Explain how to avoid warpage for part design and mold design with suitable example. **[8]**

b) Explain steel molds for plastics. **[8]**

Q8) a) Explain in detail design of cooling system for plastic molds. **[8]**

b) Explain the anchorage of special inserts. **[8]**

Q9) a) Explain various software available defect analysis. **[8]**

b) Explain the design of component for balanced flow. **[8]**

Q10) Write short notes on (Any three) **[18]**

a) Economical number of cavities.

b) Ejection Forces.

c) temperature control of injection mold.

d) optimum gate location.

Total No. of Questions : 10] **[Total No. of Pages :3**

P1717

[3965] - 719
M.E. (Production) (CAD/CAM)
COMPUTER AIDED DESIGN
(2010 Course) (511201) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat self - explanatory sketches wherever required.***
4) ***Use of pocket calculators is allowed.***
5) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) A software is to be developed through which following entities are to be drawn and to be manipulated. Design Graphic User Interface (GUI) for the same. Entities are as follows: **[16]**

a) Line. b) Circle.
c) Polygon. d) Ellipse.

Q2) a) Why parametric representation of geometrical entities are preferred in CAD software? Explain your answer with non-parametric and parametric equations of appropriate geometric entity. **[8]**

b) What is Homogeneous Co-ordinate system? Explain the necessity of Homogeneous Co-ordinate system for transformations of geometric entities using suitable examples. **[8]**

Q3) a) Show that the midpoint of a line transforms to the midpoint of the transformed lines. **[8]**

b) A point is rotated about Z axis by two successive angles θ_1 and θ_2. Show that this is equivalent to rotating the point about the same axis once with an angle $\theta = \theta_1 + \theta_2$. **[8]**

Q4) a) Find the equation of a closed B spline curve defined by four control points. **[8]**

b) What is blending of curves? Explain how two Bezier segments can be blended with suitable numeric example. **[8]**

P.T.O.

Q5) Write short notes (any three): **[18]**

a) Manipulation techniques used in Spline.

b) CAD-CAM Product Cycle.

c) Wire Frame Modelling.

d) Computer configuration for CAD application.

SECTION - II

Q6) What is the liaison diagram and precedence diagram? Develop the liaison diagram and precedence diagram for the assembly shown in figure 1. **[16]**

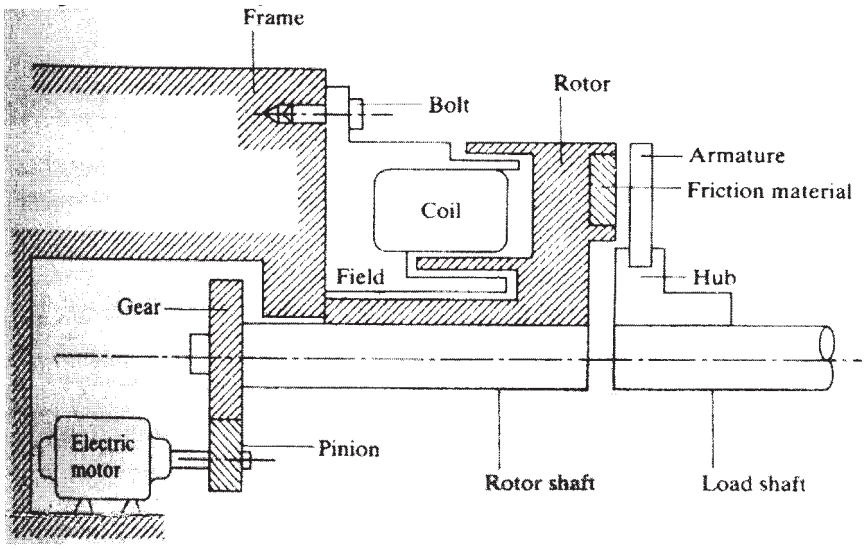


Fig. 1 Electric Clutch Assembly

Q7) a) Find the tangent and normal vectors to a surface of revolutions in terms of its profile equation. **[8]**

b) Find the minimum distance between: **[8]**

i) A point and a surface.

ii) A curve and a surface.

iii) Two surfaces.

Q8) a) How a solid fillet can be created using unbounded half-spaces? **[8]**

b) What sweep representation scheme used for representation of a solid? **[8]**

Q9) a) Derive the principal moments of inertia of an object given its moments about a co-ordinate system. **[8]**

b) A sphere with a radius R and a center at (X_0, Y_0, Z_0) is described by the following equation: **[8]**

$$P(u,v)=\begin{bmatrix} x_0+R\cos u\cos v \\ y_o+R\cos u\sin v \\ z_0+R\sin u \end{bmatrix}, \begin{cases} -\pi/2\le u\le \pi/2 \\ 0\le v\le 2\pi \end{cases}$$

For R = 1 and center at (I,I,I), calculate the surface area and the centroid exactly, use the three - point Gauss quadrature. Compare the results.

Q10) Write short notes (any three): **[18]**

a) Types of Animation.

b) Boundary representation Scheme.

c) Shading Algorithms.

d) Hidden line removal Algorithm.



Total No. of Questions : 12] [Total No. of Pages : 2

P1718

[3965]-724

M.E. (Production) (CAD/CAM)

INDUSTRIAL ROBOTICS & ARTIFICIAL INTELLIGENCE

(Elective - I) (2010 Course)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

UNIT - I

Q1) a) Explain how robots are classified? Explain with figures robot configurations. **[9]**

b) Explain precision of movement in detail. **[9]**

OR

Q2) a) Explain different servo control modes used in robotics. **[9]**

b) What are different applications of robots. **[9]**

UNIT - II

Q3) a) What are different tactile sensors used in robots? What are different tactile sensing materials. **[8]**

b) What are the different types of end effectors? Explain magnetic and adhesive end effectors in brief. **[8]**

OR

Q4) a) What are the different factors considered in gripper selection and design. **[8]**

b) Explain proximity and Range sensors in brief. **[8]**

P.T.O.

UNIT - III

Q5) a) Explain different methods of defining position in space. **[8]**

b) What is branching in Robot programming? Explain with example. **[8]**

OR

Q6) a) Explain different programming languages used for robots in industries. Explain any two with its features. **[8]**

b) Explain different characteristics of task level languages. **[8]**

SECTION - II

UNIT - IV

Q7) a) Explain simple reflex agents and model based reflex agents with schematic diagrams. **[9]**

b) Explain foundations of AI in contest with philosophy, mathematics, Economics and Neuroscience. **[9]**

OR

Q8) a) Explain forward and backward reasoning in breif. **[9]**

b) How problem solving performance is evaluated? Explain with example. **[9]**

UNIT - V

Q9) a) What are uniform search strategies? Explain. **[8]**

b) Explain simulated search algorithm with your own example. **[8]**

OR

Q10)a) Explain heuristic function with example. What is the effect of heuristic accuracy on performance. **[8]**

b) What are the stages in greedy best - first search? **[8]**

UNIT - VI

Q11)a) Explain how to solve inferential frame problem. **[8]**

b) What is semantic Network? **[8]**

OR

Q12)a) Explain what are different resolution strategies. **[8]**

b) Explain with block diagram a simple backward chaining algorithm. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1719

[3965] - 733

M.E. (Production) (CAD/CAM)

PRODUCT LIFE CYCLE MANAGEMENT

(2010 Course) (Elective - III) (511211)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Why & How PLM is implemented? And explain its benefits. **[8]**

b) How PLM strategy developed & implemented to achieve a PLM vision? **[8]**

Q2) Write short notes on: **[16]**

a) Design for Manufacturing.

b) Design for Assembly.

c) Design for Six Sigma.

Q3) a) Define product modeling & explain its Fundamental issues. **[8]**

b) What are the different types of product models? **[8]**

Q4) a) What do you mean by PLM vision? And what factor should be consider in developing PLM vision? **[6]**

b) Explain in short integrated product development process. **[6]**

c) The strategy development process will probably lead to the need for change. Explain how this change will be accepted by management. **[6]**

P.T.O.

SECTION - II

Q5) a) In DFM explain the 'Rules of Thumb' or 'Design Rules' that are used to reduce the cost of component. **[8]**

b) What factors are considered to reduce the cost of assembly. **[8]**

Q6) a) What are the basic reasons of implementing Product Data Management (PDM) system. **[8]**

b) What are the benefits of reuse of information? **[8]**

Q7) a) What is mean by intelligent information system? Explain it. **[8]**

b) Explain how soft computing facilities are used in product development process. **[8]**

Q8) Write short notes on any three: **[18]**

a) Taguchi method for design of experiment.

b) FMEA.

c) Component of PDM system.

d) Advanced Database Design for Integrated manufacturing.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1721

[3965] - 746
M.E. (Computer)
WEB SERVICES AND SOA
(Theory) (2008 Course) (Elective - II) (510105)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write in brief on following: **[16]**

a) Define SOA, explain your definition.

b) How are services governed, by whom.

c) How services lead to reusability and reusable enterprise resources.

d) What is the difference between services and API's.

Q2) a) Explain what you understand by distributed systems. **[4]**

b) State what happens in SOA design phase. **[4]**

c) Give example of technical constraints. **[4]**

d) What are service contracts. **[4]**

Q3) a) Explain with any example of your choice the following three steps in SOA lifecycle. Service oriented analysis, service design, mapping to technology like .NET or J2EE. **[8]**

b) Explain what you understand by following terms. **[8]**

i) Agile strategy.

ii) Service Layers.

iii) Candidate services.

iv) Messaging.

P.T.O.

Q4) Write Short Notes on (Any Three): **[18]**

a) Real SOA.

b) Organizations behind SOA standards.

c) IBM On Demand operating environment.

d) How SOA is better than traditional middleware like CORBA/DCOM.

e) REST based SOA.

f) Software architecture.

SECTION - II

Q5) Write in brief on: **[16]**

a) What is relation between web services and world wide web.

b) What are three tier client server systems.

c) Compare HTML and XML.

d) What is the use of Javascript (Hint client side validations....)

Q6) Imagine that you have to design a hypothetical website for IPL cricket matches. For this website discuss. **[16]**

a) What features could you have for your site (Hint: live scores, high speed videos...)

b) Mention some of the services you could identify (Hint: service to 'register a member, service to 'place an order...)

c) How can HTML, and AJAX be used for your website.

d) How can RSS be used for the website (Hint : to give some nice features for members?)

Q7) Illustrate the following concepts with examples of your own. **[16]**

a) Composing of web services.

b) XML DTD and XML schema.

c) Information hiding as a design principal (Hint: OO principal...)

d) Service level agreements and QOS.

Q8) Write short notes on (Any Three): **[18]**

a) WEB services and protocols involved (Hint : SOAP....)

b) Interfaces.

c) Quality factors : portability, response time.

d) Java technology for Internet application development (Hint : JSP...)

e) Use of Internet for businesses (Hint : shopping...)

f) Why SOA is growing in importance.

Total No. of Questions : 8] [Total No. of Pages : 2

P1722

[3965] - 784

M.E. (Chemical Engineering)

FLUIDIZATION ENGINEERING

(2008 Course) (Elective - II) (509105)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define fluidized state and discuss the hydrodynamics of fluidization system. **[8]**

b) What are the industrial applications of fluidization? **[8]**

Q2) a) Discuss the generalized fluidization of poly-dispersed system. **[8]**

b) Mechanism of bubble formation. **[8]**

Q3) Explain the Davidson Model for gas flow and write all corresponding equations needed for the model. **[16]**

Q4) a) A fluidized bed consisting spherical particles is fluidized by water of density 900kg/m^3 and viscosity 1 mN-s/m^2. The diameter of particles is 1.6 mm and density of particle is 2500 kg/m^3. Determine the minimum Fluidization velocity for laminar flow. **[10]**

b) Derive the equation for minimum fluidization velocity. **[8]**

SECTION - II

Q5) Derive the kinetic model for conversion of shrinking and growing particle in Fluidization. **[16]**

P.T.O.

Q6) Explain in details about. **[16]**

a) Modeling by bed collapsing.

b) Semi - fluidized bed system.

Q7) Discuss the following in details; **[16]**

a) Incipient fluidization.

b) Three phase fluidization and Inverse fluidization.

Q8) Write short notes on: **[18]**

a) Geldart's classification for power assessment.

b) Conical fluidized bed.

c) Draft tube system.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1725

[3965]-814

M.E. (Petroleum Engineering)

NUMERICAL METHODS AND SIMULATION IN PETROLEUM ENGINEERING

(2008 Course) (512101) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non - programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) For the following system of equations, find *x, y, z* using SOR, Gauss and Gauss Jordon method. w = 1.1

$x + y + z = 6$

$2x + 3y + z = 13$

$x - y + z = 2.$ **[25]**

Q2) a) Solve the following system of equations by Newton Raphson method

$x^2y + \cos(x^2y) = 54$

$\sin(x^2y) + xy = \cos y.$

b) Find the roots of the equation by Graeffe method:

$x^3 + 4x^2 + 5x - 4 = 0.$

[25]

Q3) Solve $y' = xy + \cos(x) + 4$, $y(1) = 5$, using Heun RK –4 and Adam Bashforth predictor corrector method. **[25]**

P.T.O.

SECTION - II

Q4) Given a 1 D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 50 psi for one well and 6000 psi at the other well, both at each boundary. Length of the reservoir are 400ft. Assume delx = 100 ft Pi = 5000 psi. Solve by explicit, crank-nicolson and implicit method. Only set up the matrix. **[25]**

Q5) Find the finite difference approximations for the following: **[25]**

a) First derivative forward of order del x squared.

b) Second derivative backward of order del x squared.

c) Second derivative central of order del x squared.

Q6) Derive the IMPES method. **[25]**

Total No. of Questions : 6] **[Total No. of Pages : 1**

P1727

[3965]-819

M.E. (Petroleum Engineering)

OIL & GAS FIELD DEVELOPMENT

(Elective - I (C)) (2008 Course) (512104)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer-books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Explain how drive mechanisms affect planning and development of the filed? **[25]**

Q2) Explain how material balance calculations can be used for development of an oil field. **[25]**

Q3) What core data is required for an oil field development assuming one well is drilled where oil has been found? **[25]**

SECTION - II

Q4) How is reservoir simulation used in field development? **[25]**

Q5) Explain the special development of Offshore Marginal Oil Fields. **[25]**

Q6) How can the Field development be influenced by water flooding and EOR? **[25]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1728

[3965] - 822
M.E. (Petroleum)
WELL DESIGN AND ENGINEERING
(2008 Course) (Elective - II) (512105)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Q.No. 2 and Q.No. 5 are compulsory. Out of the remaining attempt two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Prepare, Geo Technical order for a vertical gas well using following data: **[16]**
Longitude : 10º 21' 38", Latitude : 99º 08' 40"
Well depth : 4000M, Age is Eocene up to 2500 M
Further 1000M Paleocene, rest is upper cretaceous lithology is clay stone, shale, clay stone, limestone, Basalt (Depth same as age) Casing policy 20" – 500M 13 3/8" – 2100M, 95/8" –2950M and rest is 7" casing. Pay zone 3850M, 3925M, Assume suitable mud policy.

Q2) a) What is D-exponent? Using D-exponent Curve and bulk density plot, find pore pressure at 2400M, 2600M, 2800M, 3000M, 3200M normal pressure at 2400M is 1.30 gm/cc. **[10]**

2600M is 1.35 gm/cc
2800M is 1.50 gm/cc
3000M is 1.60 gm/cc
3200M is 1.72 gm/cc

b) Discuss 'formation integrity test' and it's significance to vertical and directional well in brief. **[8]**

Q3) a) Prepare 'AFE sheet' to approve budget for a vertical well of depth 3800M. Assume relevant cost for the same. **[8]**

b) Discuss 'Break even analysis' for optimization of drilling parameters to reduce the cost. **[8]**

P.T.O.

Q4) a) Draw a land drilling site plan with 33% resume for green belt. **[8]**

b) Discuss 'Drill Stem Test' in brief. **[8]**

SECTION - II

Q5) Write short notes on: **[18]**

a) Reservoir evaluation by simulators.

b) Rig design considerations.

c) Casing seat selection.

Q6) a) Discuss purpose of 'well report' and how to prepare final 'well report' in detail. **[8]**

b) What are the different types of BHA's? Draw the schematic sketch and explain the principle of each. Also explain variation of torque and drag forces applicable to these BHA's. **[8]**

Q7) Describe in detail any one case study pertaining to well planning of horizontal or multilateral well. Discuss various factors considered in the design and planning of well trajectory. Write various equations, application of this drilling technology and show graphs to explain the planning measures in field development. **[16]**

Q8) Write a short notes on (Any Four): **[16]**

a) Drilling fluid selection and planning for a well.

b) Bit selection criteria.

c) Types of wells.

d) Rig selection.

e) Methods of well cementation.

Total No. of Questions : 6] **[Total No. of Pages : 1**

P1729

[3965]-823

M.E. (Petroleum Engineering)

WELL TESTING AND ANALYSIS

(2008 Course) (Elective - II) (512105)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non - programmable calculator, log-log, semi-log paper is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Derive the diffusivity equation in cartesian coordinate system. **[25]**

Q2) Write an essay and give suitable examples of Derivative Plots. **[25]**

Q3) Derive the Bessels solution to the diffusivity equation. **[25]**

SECTION - II

Q4) State the complete methodology in analysis of a Pressure Build up Test. **[25]**

Q5) State the complete methodology in analysis of Naturally fractured wells. **[25]**

Q6) Explain Drawdown test for gas wells using pseudo pressure, pressure squared and pressure analysis. Which is the best and why. **[25]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1730

[3965] - 824
M.E. (Petroleum)
WELL CONTROL

(2008 Course) (512105) (Elective - II (d))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Q. 1 and Q. 5 are compulsory. Out of the remaining attempt two questions from Section I and two questions from Section - II.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe in detail indications and reasons of influx into the well bore. **[12]**

b) Determine the height in feet of the influx using following data: **[6]**

Pit gain = 35 bbl.
Hole size = 8.5 in
Drill collar OD = 6.5 in
Drill collar length = 590 ft.
Drill pipe OD = 5.0 in

Q2) a) Explain basic methods of well control, in brief. **[4]**

b) Explain any two rheological properties of drilling fluid. **[4]**

c) 760 ft., of 13 3/8" surface casing is to be set in 16" hole. The slurry yield is 1.19 cubic ft/sack & 69% excess is needed. The cement slurry weight is 14 ppg & requires 6.2 gal/sack of water. Cement is circulated to the surface. Capacity of the annulus to be cemented is 0.42805 cubic ft/ft. Capacity 13 3/8" Casing is 0.1497 bbl/ft. Calculate **[4]**

i) No. of sacks.
ii) volume of water in bbl & in litrs.

d) While pulling out, driller forgot to fill the hole and 30 stands of drill pipes were pulled out dry. Use the given data and calculate reduction in bottom hole pressure if,.

Well depth = 8900 ft. (TVD), Casing shoe depth = 5000ft. (TVD) Mud weight = 15 ppg., Open hole capacity = 0.1482 bbl/ft. Casing capacity = 0.1610 bbl/ft., Drill pipe metal displacement = 0.0076 bbl/ft., Length of one stand = 93 ft. **[4]**

P.T.O.

Q3) a) Explain the design considerations for well to be drilled to stop the blow out. **[8]**

b) Explain in brief, the generic nature of graph to indicate pressure variation across drill pipe and across the annulus due oil kick during well killing operation. **[8]**

Q4) Write short notes on: **[16]**

a) Geo Technical Order.

b) Well completion.

c) Well kick through drill pipe.

d) Factors affecting ROP during drilling.

SECTION - II

Q5) Calculate, **[18]**

No.of strokes required to pump kill mud from surface to bit & bit to surface.

Kill mud density

Initial circulating pressure

Final circulation pressure

Time for one complete circulation

Plot step down plan for driller's method

Total annular volume.

Following data is given:

Hole size – 12.25" Hole depth 6000ft TVD

Casing : 13-3/8" set at 5200 ft TVD

Drill pipe : 5" Capacity 0.0178 bbls/ft

Drill collar : 8.3", 530 ft long, capacity 0.0089 bbls/ft

Mud wt. : 12.4 ppg

Capacities:

Drill collar in open hole : 0.0836 bbl/ft

Drill pipe in open hole : 0.1215 bbls/ft

Drill pipe in casing : 0.1353 bbls/ft

Mud pump output = 0.119 bbls/stroke

Slow circulation rate = 440 psi at 30 SPM

SIDP = 440 psi

SICP = 310 psi

Pit gain = 14 bbls.

Q6) a) Determine the type of influx using following data. **[4]**

SICP = 1184 psi
SIDPP = 670 psi
Height of influx = 380 ft.
Mud weight = 18.00 ppg.

b) Write a note on, **[12]**

i) Fracture gradient.
ii) Offshore safety.

Q7) a) Discuss in brief procedure of well control for two methods. **[12]**

b) A well is being drilled with 12.5 ppg mud. How much barite is required to increase the mud density to 14 ppg? **[4]**

Hole volume = 879 bbl. Surface volume = 350 bbl.

Barite density is 35.4 ppg.

Q8) Write short notes on: **[16]**

a) Christmas tree.

b) Types of BOP.

c) Subsurface safety valves.

d) Well head equipment and components.

Total No. of Questions : 6] **[Total No. of Pages : 1**

P1731

[3965]-828

M.E. (Petroleum Engineering)

ARTIFICIAL LIFT TECHNIQUES

(2008 Course) (512111) (Elective - III (a))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer two questions from each section.***
2) ***Answers to the two sections msut be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Explain gravel pack sand control Operations. **[25]**

Q2) Draw the IPR, Outflow Performance and Tubing in-take Curves and explain in detail. **[25]**

Q3) Explain in detail the design of continuous Gas Lift. **[25]**

SECTION - II

Q4) Explain the problems of SRP with reference to Dynagraph card. **[25]**

Q5) Explain hydraulic fracturing design. **[25]**

Q6) What is Nodal analysis? How is it used to solve Petroleum Engineering Problems. **[25]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1734

[3965] - 838

M.E. (Information Technology) (CSE - IT)

SOFTWARE ARCHITECTURE

(514404) (Theory) (2008 Course) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer ANY THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write Short Notes on ANY THREE. **[18]**

a) IS2000 system.

b) How does EAI help customer relationship management, supply chain relationship management, mergers and acquisitions.

c) Distributed systems : applications, technologies.

d) View of architecture : conceptual.

e) Service extension patterns (Hint : visitor.....).

f) Design patterns.

Q2) Explain the following concepts with examples. **[16]**

a) Singleton pattern.

b) Repository (Hint : Enterprise application architecture pattern)

c) Foreign key, foreign key mapping.

d) ARCHITECTURAL STYLES.

Q3) Write in brief on ANY FOUR. **[16]**

a) CORBA.

b) Broker pattern.

c) Documenting design patterns.

d) LOOKUP as resource management pattern.

e) Patterns for Adaptable systems.

f) Class diagrams.

P.T.O.

Q4) Explain ANY FOUR terms and concepts in brief. **[16]**

a) OR mapping.
b) Business Archetypes.
c) Applications of Iterator pattern.
d) Execution architecture view.
e) Archetype pattern : Quantity.
f) Creational patterns.

SECTION - II

Q5) In brief state the concept/term; illustrate with good examples for ANY FOUR of the following concepts. **[16]**

a) HTML, CSS.
b) HTTP (as a connector in Internet applications)
c) Compare and Contrast, Interprocess communication and RPC.
d) APIs, Libraries, DLLs.
e) Static and dynamic websites.

Q6) Write short Notes on ANY THREE. **[18]**

a) Java servlets and applets (Hint client side, server side technologies....).
b) Why is security important in web applications?
c) Object oriented principals (Hint polymorphism...).
d) Java middleware : JDBC and its advantages.
e) Enterprise applications in automobile industry (Hint sales, inventory...)
f) Layered approach to architecture (Hint database layers).

Q7) What do you understand by the following concepts. **[16]**

a) Classes, Components, Interfaces.
b) Synchronous and asynchronous communications (Hint : queues based messaging...).
c) Software modules and decomposition of applications (Hint : modularity).
d) Reusability in software development (Hint: using components, APIs, frameworks..).

Q8) Write in brief on ANY FOUR of the following **[16]**

a) XML, Integration of applications using XML.
b) What are three tier WEB applications.
c) Design pattern : proxy.
d) Quality factors of a software system : performance and scalability.
e) What is UML?
f) Fault tolerance and exception handling.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1735

[3965] - 843
M.E. (IT)
GEOGRAPHICAL INFORMATION SYSTEMS
(2008 Course) (Elective - II) (514405)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Question No.s 4 and 8 are compulsory. Out of the remaining attempt two questions from Section I and two questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is cartography? What is qualitative and quantitative mapping? Explain common methods of data classification. **[8]**

b) Explain visual hierarchy in detail. How colors are used in map productions? **[8]**

Q2) a) Write a note on different geographical data collectors and data providers. **[8]**

b) Explain with suitable examples, different types of operations in raster data analysis. **[8]**

Q3) a) What are imaging sensor systems? Classify the imaging sensor systems and explain their basic principles with suitable diagrams. **[9]**

b) Explain SLAR systems with suitable diagrams. **[7]**

Q4) Write short notes on the following:

a) Overlays. **[6]**

b) Types of maps. **[4]**

c) Sources of errors in spatial data. **[4]**

d) Spectral resolution. **[4]**

P.T.O.

SECTION - II

Q5) a) Explain the various correction methods used in preprocessing of remotely sensed raw data. **[9]**

b) Explain the basic elements of image interpretation. **[7]**

Q6) a) Explain the global and local methods of interpolation. Emphasize on common data transformations. **[8]**

b) Explain the basic steps in kriging. List out the different types of kriging. **[8]**

Q7) a) Explain the importance of remote sensing and GIS in urban planning and development. **[8]**

b) Explain the various special filtering techniques with reference to remotely sensed images. **[8]**

Q8) Write short notes on the following:

a) Indian remote sensing satellite. **[4]**

b) Drainage patterns. **[4]**

c) Triangular Irregular Network. **[4]**

d) Uses of digital elevation models. **[4]**

e) Sources of GIS data collection. **[2]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1738 **[3965] - 884**

M.E. (Instrumentation & Control) (Process and Biomedical)

FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION

(2008 Course) (Elective - I) (5061201 (A))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw an arterial pressure wave indicating systole and diastole. Explain blood pressure measurement system based on korotkoff sound. **[10]**

b) Explain the basic types of bio electrodes with their materials. What is importance of Electrolytic Jelly in the biopotential measurement. **[8]**

Q2) a) Draw neat labeled spirogram. Draw and explain wedge type spirometer in detail. **[10]**

b) What is Evoked response? State any one application of it. **[6]**

Q3) a) Explain the function of the following in the cell: **[8]**

i) Mitochondria.

ii) Endoplasmic reticulum.

iii) DNA.

iv) Golgi Apparatus.

b) Discuss coulter counter method for counting of various blood cells associated with blood. **[8]**

Q4) a) Draw and Explain detail block diagram of ECG machine. **[8]**

b) What is fibrillation state of Heart? Draw and explain circuit diagram of machine used to correct the same problem. Also list out various electrodes used with it. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain Ultrasound blood flow measurement technique based on Doppler Shift principle and Transit Time principle. **[10]**

b) Write functions of following: **[8]**

i) Cerebellum.

ii) Pons.

iii) Medulla oblongata.

iv) Spinal Cord.

Q6) a) What is EEG? Enlist various electrodes for EEG. **[8]**

b) Explain the EEG 10-20 montage system. Discuss various waveforms in EEG with their significance and frequency. **[8]**

Q7) a) What are the three main sectors of Human auditory system? Explain the function performed by each section in human hearing system. Name the instrument use to diagnose auditory system performance. **[10]**

b) What is Intraocular pressure (IOP). Explain the instrument used for measurement of IOP? **[6]**

Q8) a) Define the followings: **[8]**

i) Gross Shock.

ii) Micro current shock.

iii) Let go current.

iv) Hold on current.

b) State advantages of hemodialysis over peritoneal dialysis. With simplified diagram explain the operation of hemodialysis. **[8]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1740

[3965]-606

M.E. (E & TC) (Microwave)

ELECTROMAGNETICS AND ANTENNA THEORY

(2008 Course) (504222) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

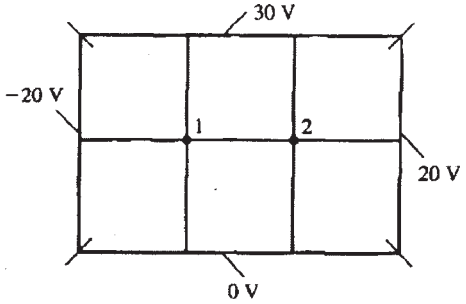
1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are various numerical techniques to compute electric and magnetic fields? Explain finite difference method with suitable example. **[10]**

b) Using method of moments, derive expression for field distribution using integral form of potential equation. **[15]**

Q2) a) Use FDM to calculate the potentials at nodes 1 and 2 in the potential system shown in the following figure. **[15]**



b) Write a short note on 'Yee's FD Algorithm' **[10]**

Q3) a) The radiation intensity of an antenna is given by $U(\theta, \Phi) = \cos^3 \theta \sin^2 \Phi$ For $0 \leq \theta \leq \pi/2$ and $0 \leq \Phi \leq 2\pi$ (in upper half space). It is zero in the lower half space. Find **[15]**

i) Exact directivity.

ii) Elevation plane half power - beam width (in degrees)

b) Derive the expression for electric and magnetic field for the far field region, also find the radiated power and radiation resistance for Hertzian Dipole. **[10]**

P.T.O.

SECTION - II

Q4) a) What are the major differences between finite difference and finite element methods? Explain. **[5]**

b) Use the Green's function to solve the following differential equation.

$$\frac{d^2\phi}{dx^2} = -S(x) \text{ with}$$

$$S(x) = \begin{cases} 1 & for\ 0 \le x \le 1 \\ 0 & otherwise \end{cases}$$

Subject to the boundary conditions $\phi(0) = 0$; $\phi(1) = 2$. **[20]**

Q5) a) Draw the radiation pattern of a 10 element broadside array by finding the directions of main lobe, side lobes, and nulls. Assume uniform amplitude distribution and inter elements spacing to be half wavelength. **[15]**

b) A micro strip antenna with overall dimensions of L = 0.906 cm, W = 1.186 cm, substrate with height h = 0.1588 cm and dielectric constant Cr = 2.2, is operating at 10 GHz. Find. **[10]**

i) The input impedance.

ii) The position of the feed point where input impedance is $50\,\Omega$.

Q6) a) Design rectangular micro strip antenna using substrate with dielectric constant of 2.2, h = 0.1588 cm, so as to resonate at 10 GHz. Give the design procedure. **[10]**

b) Write notes on the following antennas, explaining its frequency of operation, construction details, features, advantages, disadvantages, applications and radiation pattern. **[15]**

i) Yagi - Uda Antenna.

ii) Helical Antenna.

iii) Loop antenna.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1745

[3965]-600

M.E. (Electrical) (Power Systems)

HIGH VOLTAGE POWER TRANSMISSION

(2008 Course) (503210) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any <u>two</u> questions from each section.***
2) ***Answers to the two sections must be written on separate answer-books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Discuss the problems encountered in HVAC transmission. Explain how some of these problems are overcome in HVDC transmission. **[15]**

b) The a.c. line voltage of a 3-phase, hvdc bridge inverter is 165 kV with the extinction angle of 21° and an overlap angle of 18°. Calculate the d.c. voltage at the inverter terminals. Determine the necessary extinction angle to maintain the a.c. line voltage at 165 kV if the d.c. voltage drops to 90% of the original value. Assume that the overlap angle remains unchanged. **[10]**

Q2) a) Describe the different types of multiterminal hvdc systems proposed in the literature. Bring out the advantages and disadvantages of such systems. Draw line diagrams wherever necessary. **[15]**

b) A 3-phase, 6 pulse, hvdc bridge converter has an input voltage (ac) 342 kV (line to line). The source inductance is 0.45 H. The voltage and power requirements on the d.c. side of converter operating in the rectifier mode is 275 kV and 300 MW respectively. Calculate the delay angle and overlap angle of the converter. **[10]**

Q3) Write short notes on the following:-

a) Control characteristics of hvdc converters; **[8]**

b) twelve pulse operation of hvdc converter; **[8]**

c) hvdc links. **[9]**

P.T.O.

SECTION - II

Q4) a) Discuss the effects of high electrostatic fields on human beings, animals and plants. **[12]**

b) Describe the different methods of voltage control employed in EHVAC transmission. **[13]**

Q5) a) A transformer winding has a surge impedance of 1000 ohm. It is connected to an overhead line with $Z_0 = 380\,\Omega$. A lightning surge having a peak value of 1500 kV is coming in the line and the transformer voltage is to be limited to 825 kV peak. Suggest an alternative to a lightning arrester. What will be its surge impedance and voltage rating? **[12]**

b) Using the travelling wave concept, obtain an expression for the step input response of an open-circuited, lossless line. Sketch the response and state your conclusions. Draw the modified response if losses and attenuation are to be included. **[13]**

Q6) a) A transmission line of 400 km length has an inductance of 1mH/km and shunt capacitance of 11 nF/km. The conductor plus ground resistance amounts to $0.4\,\Omega$/km. Calculate **[12]**

i) Velocity of propagation;

ii) Surge impedance;

iii) Attenuation factor in dB; and

iv) Maximum value of open-end voltage.

b) Write a note on corona and its effects. **[13]**

Total No. of Questions : 8] [Total No. of Pages : 2

P1746

[3965] - 675

M.E. (Elex - Digital Systems)

EMBEDDED VIDEO PROCESSING

(2008 Course) (Elective - III) (504204)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain spatial, temporal & psycho visual redundancy & state the impact they have on image and video compression. **[6]**

b) What is the advantage possessed by color models that decouple the luminance component from color components? **[5]**

c) What is the problem with the objective visual quality measure of PSNR? **[5]**

Q2) a) State & explain the different types of data structures which may be employed for entropy based coding of pixels in JPEG. **[8]**

b) Explain the different factors which decide the design of Q-matrix suggested in JPEG standard. **[8]**

Q3) a) Discuss six layered syntax video coding model suggested in MPEG - 1. In case of data loss due to channel. What care has been taken for errorless recovery in the MPEG decoder? **[8]**

b) A frame in HDTV has resolution of 1920 × 1152 with typical frame rate of 30 fps. Calculate the computational complexity for motion estimation when full search & two dimensional search algorithms are used. **[8]**

Q4) a) Explain the concept of audio - visual objects in MPEG - 4. How does it offer an interactive feature to the user of MPEG - 4 decoder. **[8]**

P.T.O.

b) Explain the following terms wrt image / video compression. **[10]**

i) PDC criterion.

ii) Profiles & levels.

iii) Buffer & rate control.

iv) Random access & frame types.

SECTION - II

Q5) a) State the factors that can be exploited to reduce the computational complexity of block matching algorithm? Compare the performance of fast block matching algorithm with the full search method. **[8]**

b) For the broadcast TV with resolution of 720 × 480 with frame rate 30 frames/sec, if the motion estimation is to be used with 16 × 16 macroblock & p = 15, estimate the no of operations/sec at all levels. Assume suitable block matching algorithm & criterion at the levels. **[8]**

Q6) a) What are the QoS requirements for coded video? **[5]**

b) State the design goals of hardware & software CODEC. **[5]**

c) With the help of neat block diagram explain image/video CODEC in detail. **[8]**

Q7) a) Discuss the different steps to test the different blocks of hardware CODEC. **[6]**

b) What are the enhancements of H.263 over H.261? Describe the applications of each enhanced tool of H. 263. **[10]**

Q8) Write notes on: **[16]**

a) Arithmetic coding.

b) Objectives & features of JPEG - 2000.

c) Video signal processors.

d) HVS model.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1749

[3965]-175

M.E. (Electrical Power Systems & Control Systems)

MICROCONTROLLER & APPLICATION IN POWER SYSTEM

(2002 Course) (503107)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the internal RAM structure of 8051 μc. **[8]**

b) Explain the port structure of 8051 μc. **[8]**

c) Explain the different addressing modes of 8051 μc. **[9]**

Q2) a) Explain the interrupt according to their priority and vector location. How the priority can be changed? **[10]**

b) Explain the different modes of timers & Internal structure of T0 and T1. Explain the SFR used. **[15]**

Q3) a) Explain the various modes of serial data transmission and Reception in 8051. Explain the SFR's used. **[10]**

b) Explain the given functions. **[15]**

i) MOVX @ DPTR, A.

ii) SUBB A , @ R_1.

iii) JMP @ A + DPTR.

iv) DJNZ add, radd.

v) CJNE A, #data, radd.

P.T.O.

SECTION - II

Q4) a) Write short notes assembler, simulator, emulator, compiler and cross assembler. **[10]**

b) Explain the rotation of stepper motor using 8051 with block diagram. Write the program for clockwise rotation. **[15]**

Q5) a) Write short notes on (program not expected) **[25]**

i) DC motor control using 8051.

ii) Salient features of MCS - 51 family.

iii) Temperature measurement using 8051.

Q6) a) Draw block diagram of 8096. Write short notes on an internal memory structure of 8096 family. **[15]**

b) Explain the PWM output generation using 8096. **[10]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1767 **[3965]-137**

M.E. (E/TC) (VLSI & Embedded System)

ASIC DESIGN AND MODELLING

(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the design flow for an ASIC design process and explain each step.

b) Write short notes on structural, behavioral and data flow modeling techniques used in VHDL. What do you mean by RTL modeling, explain. **[18]**

Q2) a) What are different simulation modes in simulators. Explain in detail static timing analysis. **[8]**

b) What is error masking problem in BIST. Derive the equation to define probability of error masking to calculate with length of test sequence = 3 and length of signature = 16. **[8]**

Q3) a) Explain in detail clock tree insertion and methods to minimise clock skew in clock tree synthesis. **[8]**

b) Explain memory BIST insertion design in detail. **[8]**

SECTION - II

Q4) a) List out goals and objectives for each physical design step of ASIC design?

b) What are the factors contributes to best floorplanning? Explain in detail. **[18]**

P.T.O.

Q5) a) Explain the following terms: **[8]**

i) Back Annotation.

ii) Logic synthesis.

b) Classify placement algorithm on constructive method. **[8]**

Q6) Write short note on (Any Three): **[16]**

a) Random Testing.

b) Issues in verification.

c) Stick diagram.

d) Semiconductor intellectual property core.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1774

[3965]-475

M.E. (Civil) (Environmental Engg.)
PHYSICO-CHEMICAL PROCESS FOR WATER AND WASTEWATER TREATMENT
(2010 Course) (501503) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Use of non programmable calculators are allowed.***
3) ***Neat sketches to be drawn wherever necessary.***
4) ***Make suitable assumptions if necessary.***
5) ***Figures to the right indicates full marks.***

SECTION - I

Q1) Discuss the principle of suspended growth process for wastewater treatment. Explain in brief various operational problems commonly encountered in activated sludge treatment plants and discuss suitable remedial measures for the same. **[16]**

Q2) a) Derive an expression for settling velocity of a discrete particle governed by Stoke's Law. Determine the basin dimensions, power required, paddle configuration, and rotational speed for a flocculator that processes 15 MLD of raw water. By Jar test, the optimum Gt value was found to be 45,000. **[10]**

b) Discuss the double layer theory of particle destabilization. **[8]**

Q3) a) Discuss the significance of drinking water quality criteria and its importance in the design of drinking water quality standards. **[10]**

b) What is Langlier Index? Explain its significance. **[8]**

Q4) a) Classify and compare types of trickling filters. **[8]**

b) Discuss the different types of resins used in ion exchange process. **[8]**

P.T.O.

Q5) Write short note on: **[4 x 4 = 16]**

a) Contact stabilization.

b) Stream standard and effluent standard.

c) Nano filtration.

d) Perikinetic flocculation and orthokinetic flocculation.

SECTION - II

Q6) Explain with the help of neat diagram various methods of aeration. Discuss its merits and limitations. **[16]**

Q7) a) Sketch and explain the various types of clarifier. **[8]**

b) What is the necessity of back washing in rapid sand filter. State the criteria adopted to decide the backwashing of rapid sand filter. **[10]**

Determine the filter area required for:

i) Slow sand filter.

ii) Rapid sand filter and

iii) Dual media filter to treat a flow of 0.5 MLD. Also state the characteristics and depth of media used in the filters.

Q8) a) Explain the factors affecting adsorption. Differentiate between physical and chemical adsorption. **[10]**

b) A treated wastewater with a flow rate of 1000 L/min is to be treated with PAC to reduce the concentration of total organic carbon from 5 mg/L to 1.5 mg/L. The removal follows Freundlich adsorption isotherm in which adsorption capacity factor and intensity. Parameter are 150 (mg/g) $(L/mg)^{1/n}$ and 0.5 respectively. Determine PAC dosage, PAC requirement and Annual PAC cost. Assume PAC cost to be Rs. 20 per kg. **[8]**

Q9) a) Classify methods of disinfection compare and contrast these methods. **[8]**

b) Explain the relationship between activated sludge settleability and operating food to microorganism ratio for various types of activated sludge process. **[8]**

Q10) a) A Settling column analysis is run on a type 1 suspension. The settling column is 1.2 m high. Results of the analysis are given below:

Setting time, min	15	30	45	60	90	180
Weight fraction remaining	0.95	0.80	0.60	0.45	0.25	0.05

What is the theoretical removal efficiency in a settling basin with a loading rate of 40 $m^3/m^2/d$? **[10]**

b) Explain with neat sketch the various zones of settling occurring in secondary settling tank of activated sludge process. **[8]**



Total No. of Questions : 10] **[Total No. of Pages : 2**

P1799

[3965]-478

M.E. (Civil) (Environmental Engg.)

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

(2010 Course) (Elective - I) (501504)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from Section - I and any 3 questions from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Briefly discuss the methodologies for evaluation of EIA. **[16]**

Q2) Write short note on: **[16]**

a) Interaction matrix methodologies.

b) Network methodologies.

c) Baseline studies.

d) Life cycle assessment.

Q3) Briefly discuss about environmental indices and indicators for describing affected environment. **[16]**

Q4) a) What are the existing air quality and air quality standards? **[9]**

b) Write in detail about identification of type and quality of air pollutants. **[9]**

Q5) Write in details about existing noise level and standards also about prediction of noise level and assessment of impact. **[16]**

P.T.O.

SECTION - II

Q6) Discuss the water quality standard for surface and ground water also discuss the impact and assessment along with mitigations. **[16]**

Q7) Discuss in brief about soil environment, soil standards, prediction and assessment of impact for soil and its mitigation. **[16]**

Q8) a) Write about rules and regulations for cultural resources. **[8]**

b) What do you mean by socio-economic environment? Describe existing socio-economic environment with prediction and assessment of impact. **[8]**

Q9) Write notes on: **[18]**

a) Procedure for environmental clearance for industries.

b) Procedure for conducting environmental impact assessment report.

c) Post environmental monitoring.

Q10) Discuss in brief any one case study related to environment impact assessment. **[16]**



Total No. of Questions : 10] **[Total No. of Pages :3**

P1802

[3965] - 839
M.E. (IT)
REAL - TIME AND EMBEDDED SYSTEMS
(2008 Course) (514404) (Elective - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Atnswer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the behavioral description with respect to state machine diagram and sequence diagram with suitable example. **[8]**

b) Explain interrupt mechanism in ARM processor. List interrupts sources in ARM processor with brief description. **[8]**

Q2) a) What are embedded system design issues and problem? Discuss in brief. **[8]**

b) Discuss various modes of operation of ARM processor with respect to their operational usability. **[8]**

Q3) a) List the key features of SHARC processor and discuss the targeted application areas for this processor. **[8]**

b) Draw the functional diagram of SHARC processor. Explain the functionality of each of the peripheral therein in brief. **[8]**

Q4) Design a cellular service provider's customer care queuing token system. **[18]**

a) The master device contains microcontroller board with keyboard and printer attached to the device. The token slip is issued to the customer with token number, date and time stamp. The token is put in dispatch queue. The RS 485 bus is used to connect the slave devices provided on the customer care counters. The master gets token request from the slave devices. Upon getting this command the master dispatches the next token number from the dispatch queue.

b) The slave device contains microcontroller board with keyboard, and RS 485 trans-receiver for communication. The slave device drives seven segment LED panel for showing current token number the counter is serving. The operator requests the next token number for serving by pressing NEXT key on the device.

P.T.O.

Expected Design level:

i) Design the Master device showing front panel and system block diagram.

ii) Design the processes necessary to execute the desired master functionality.

iii) Design the Slave device showing front panel and system block diagram.

iv) Design the processes necessary to execute the desired Slave functionality.

v) Design the communication protocol for master slave operation.

Q5) Write short note on ANY FOUR. **[16]**

a) Microprocessor in Circuit Emulator.

b) Concurrent Engineering.

c) Key features of Embedded System.

d) ARM CPSR.

e) Debugging tools in embedded system.

SECTION - II

Q6) a) Calculate a message delay for 12C bus operating at 400 kilobits per second. The data size of the message is 4 bytes. **[8]**

b) Discuss SIMD computational engine of the SHARC processor. **[8]**

Q7) a) What are advantages and disadvantages of cyclic scheduler? **[8]**

b) Compare and contrast 12C, CAN serial buses with respect to special features, data rates, wire length and no of devices it can handle. **[8]**

Q8) a) Explain waterfall and spiral development module. Which one is suitable for embedded system development? **[10]**

b) What is CRC card? Describe stages for CRC card methodology. **[8]**

Q9) a) Discuss the rules to compute effective release time and effective deadline for Uni-processor system. **[8]**

b) What are assumptions for clock driven scheduling? Explain cyclic scheduler in detail. **[8]**

Q10) Write short notes on ANY FOUR. **[16]**

a) Schedulable set of jobs and optimal scheduling.

b) Set - Top Box.

c) DMA in SHARC processor.

d) ID filtering in CAN Bus.

e) Arbitration in CAN bus.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1806

[3965] - 494

M.E. (Mechanical & Heat Power)

ENERGY CONSERVATION AND MANAGEMENT

(2008 Course) (Elective - I) (502104)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer of two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator Log tables and electronic calculator is allowed.***

SECTION - I

Q1) a) List down the Objectives of the Energy Management. **[8]**

b) What is the significance of energy conservation act 2003? What are the various steps in implementation of the energy management in an organization. **[8]**

Q2) a) Explain the role of training and awareness in energy management program. **[8]**

b) What are the benefits of benchmarking the energy consumption. **[8]**

Q3) a) With the help of example explain life cycle costing and payback period. **[8]**

b) Write in short the steps involved in energy audit of refrigeration system. **[8]**

Q4) Write a short note on (Any three) **[18]**

a) Sources of world Energy.

b) Energy audit of Boiler.

c) Energy analysis of air compressor system.

d) Energy audit (Types and Methodology)

e) Instruments used in energy audit.

P.T.O.

SECTION - II

Q5) Explain any three of the following: **[18]**

a) Energy efficient lighting.

b) Salient features of Electricity act 2001.

c) Importance of performance monitoring.

d) Automatic power factor controller.

Q6) a) Write notes on (any two) **[8]**

i) Lighting levels in various applications.

ii) Efficient options in lighting system.

iii) Energy efficient windows.

b) Find the simple pay - back period required when Rs 10,000/- is required to invest for replacing 20 incandescent lamps (40W) by 9W CFLs (20 nos.) producing same lumen output. Assume 10 hrs of operations per day and electric charge of Rs 4/- per kWh. **[8]**

Q7) a) List the factors affecting on energy efficiency of electric motors. Explain the speed control of an electric motors. **[8]**

b) Explain the energy conservation opportunities in furnaces. **[8]**

Q8) a) Explain in detail four types of topping cycle cogeneration systems. **[8]**

b) List the advantages and limitations of cogeneration in steam power plant and diesel generating sets. **[8]**

Total No. of Questions : 6] **[Total No. of Pages : 4**

P1808

[3965]-827

M.E. (Petroleum Engineering)

ADVANCED NATURAL GAS ENGINEERING

(2008 Course) (Sem. - II) (512110)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Define the properties Bg, z, μg, Ppc, Tpc, EOS, S and explain how these properties are obtained by some suitable correlation. **[25]**

OR

Following surface conditions are given:

a) API gravity of condensate = 50.
b) GOR in the first separator = 10,500 sef/stb.
c) Pressure in the first separator = 550 psi.
d) Temperature in the first separator = 90 deg F.
e) Specific gravity of gas in the first separator = 0.69

Calculate the wellstream specific gravity, and critical properties of gas.

Q2) Derive the pipe line flow equation hence derive an equation for series pipelines.**[25]**

OR

The following data are provided for air-water flow. Estimate the slip and no - slip mixture properties. Estimate the gravitational and frictional pressure gradients using both slip and no-slip properties.

a) Q1 = 0.15 ft3/sec.
b) Qg = 0.2 ft3/sec.
c) Rho-1 = 62.4 lbs/ft3.
d) Rho-g = 1.5 lbs/ft3.
e) Mu-l = 1 cp.
f) Mu-g = 0.015 cp.
g) D = 4 inches.
h) Hl = 0.45
i) Theta = 90 degrees.
j) Roughness = 0.00006 ft.

P.T.O.

Q3) Explain the parts of a centrifugal and reciprocating compressor. **[25]**

OR

Natural gas with the following properties and conditions is to be compressed by a centrifugal compressor.

a) Gamma - g = 0.64

b) Ps = 256 psia

c) Pd = 665 psia.

d) k = 1.24.

e) ts = 99 deg F.

If the desired flow rate is 45 MMSCFD, what horsepower is required to compress the gas assuming 75% adiabatic efficiency and 95% mechanical efficiency?

SECTION - II

Q4) Derive and explain the p/z graph. **[25]**

OR

For water drive reservoirs (with no water production at the wells), derive the following equation.

P/Z = (Pi / Zi) [(1-(Gp/Gi)] / [(1-(WeBw/GiBgi))]

Q5) Draw a process flow diagram to show two methods how CO_2 is removed from a natural gas steam. **[25]**

OR

Draw and explain process flow sheet for H_2S removal.

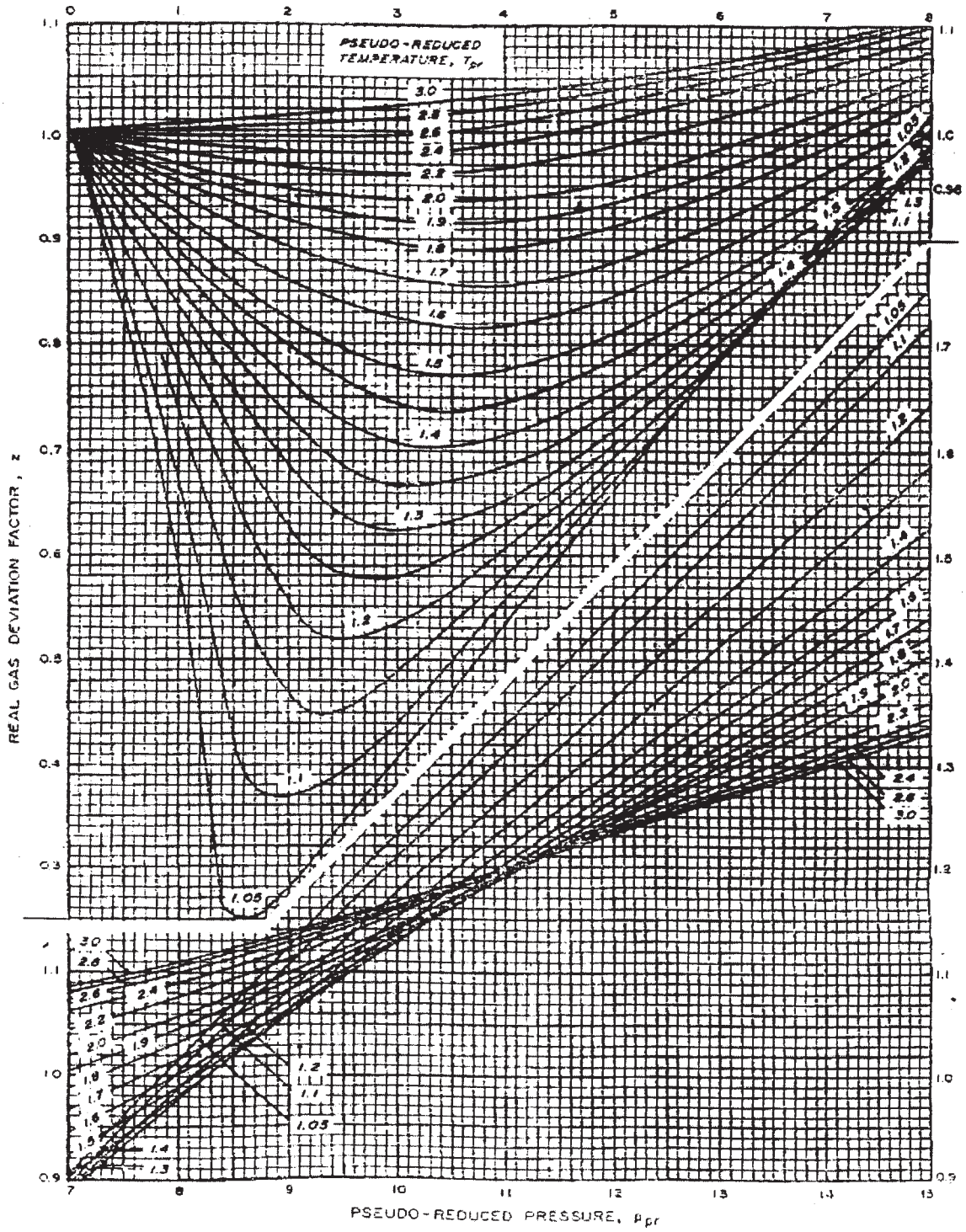
Q6) Explain gas well testing in detail, with reference to all the tests. **[25]**

OR

Following data were provided for a multi-rate isochronal test. Generate inflow performance relationship using the analytical m(p) method and the empirical m(p) method.

a) Pr = 352.4 psia.
b) M(p) = m(Pr) = 9.9714 x 10 ^ 6psia ^ 2/cp.

Time (hours)	Qg (MMSCF/D)	Pwf(psia)	M(pwf)
0.5	0.983	344.7	9.6386 × 10^6
0.5	2.631	329.5	9.0027 × 10^6
0.5	3.654	318.7	8.5674 × 10^6
0.5	4.782	305.5	8.0534 × 10^6
1	0.977	342.4	9.5406 × 10^6
1	2.588	322.9	8.7351 × 10^6
1	3.565	309.5	8.2071 × 10^6
1	4.625	293.6	7.6136 × 10^6
2	0.97	339.5	9.4179 × 10^6
2	2.533	315.4	8.4371 × 10^6
2	3.453	298.6	7.7922 × 10^6
2	4.438	279.6	7.0990 × 10^6
3	0.965	337.6	9.3381 × 10^6
3	2.5	310.5	8.2458 × 10^6
3	3.39	291.9	7.5435 × 10^6
3	4.318	270.5	6.7797 × 10^6


PSEUDO-REDUCED TEMPERATURE, T_{pr}
REAL GAS DEVIATION FACTOR, z
PSEUDO-REDUCED PRESSURE, p_{pr}

Total No. of Questions : 8] [Total No. of Pages : 2

P1810

[3965] - 52

M.E. (Mechanical) (Heat Power)

ADVANCED HEAT TRANSFER

(2002 Course) (502104)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Distinguish between fin - efficiency and fin effectiveness with suitable examples. **[8]**

b) A 2-kW heater has a wire of 4.1 mm diameter and length of 50 cm. Thermal conductivity of the wire is 15 W/mK and the surface of the wire has temperature of 110ºC. Find the centre - line temperature of the wire. **[8]**

Q2) a) Explain Reynold's & col-burn analogy. **[6]**

b) A turbine blade 6cm long & having a cross section area of 4.65 cm^2, is made of stainless steel; having thermal conductivity of 23.3 W/mK. The perimeter of the blade is 12 cm. The blade root is at 500ºC & the blade is exposed to a hot gas at 870ºC. The heat transfer coefficient between the blade surface & the gas is 442 W/m^2K. Determine the temperature distribution and the rate of heat flow at the root of the blade. Assume the tip to be insulated. **[10]**

Q3) a) Explain the followings: **[9]**

i) Time constant of a thermocouple.

ii) Heisler - Grober charts.

iii) Isotropic & anisotropic materials.

b) Discuss briefly all the possible types of boundary conditions encountered in heat conduction problems. **[7]**

P.T.O.

Q4) Write short notes on (Any three) **[18]**

a) Effect of prandtl number on thermal boundary layer.

b) Crank - Nicholson scheme.

c) Lumped system analysis.

d) Implicit and explicit methods.

SECTION - II

Q5) a) A black body emits radiation at 2000K. Calculate the monochromatic emissive power at $\lambda = 1 \mu m$. Also calculate λ_{max}. What is emissive power of the same.? **[8]**

b) Explain the working & applications of heat pipes. **[8]**

Q6) a) Differentiate between:- **[9]**

i) Nucleate and film boiling.

ii) Film condensation & dropwise condensation.

iii) Transpiration and Ablative cooling.

b) Explain: **[7]**

i) Hottel's cross string method.

ii) Flow patterns in natural convection.

Q7) a) A square plate 40 cm x 40 cm is maintained at 127ºC. It is suspended vertically in an atmosphere of 27ºC. Determine the heat transfer coefficient & rate of heat transfer from the plate, using the correlation, $Nu_L = 0.57 (R_a)^{1/4}$.

Given the properties of air as, $\vartheta = 20.75 \times 10^{-6}$ m^2/s, Pr = 0.697, K = 0.03 W/m-K. Also draw the velocity & temperature distribution at a section and the boundary layers formed. **[10]**

b) Discuss the radiation from gases and vapours. **[6]**

Q8) Write short notes on (any three): **[18]**

a) Fluidized bed combustion.

b) Stefan Boltzmann law and kirchoff's law.

c) Lambert's law and Wien's law.

d) View factors.

e) Radiation shields.

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1811

[3965] - 732

M.E. (Production) (CAD/CAM)

ADVANCED MATHEMATICS

(511210) (2010 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from section - I & 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form and specify the matrix of transformation. **[8]**

b) If $A=\begin{bmatrix} 2+i & 3 & -1+3i \\ -5 & i & 4-2i \end{bmatrix}$

Show that AA* is a hermition matrix where A* is the conjugate transpose of A. **[8]**

Q2) a) Solve the variational problem:

$$\delta\int_1^2 \left[x^2(y')^2+2y(x+y)\right]dx,$$

given $y(1) = y(2) = 0$. **[8]**

b) Apply Lagrange's equations, to show that the equation of motion of the double pendulum of Fig. are given by $(m_1+m_2)l_1\ddot{\theta}_1+m_2 l_2\ddot{\theta}_2+(m_1+m_2)g\,\theta_1=0$ and

$l_1\ddot{\theta}_1+l_2\ddot{\theta}_2+g\,\theta_2=0$, for small angles θ_1,θ_2 **[8]**

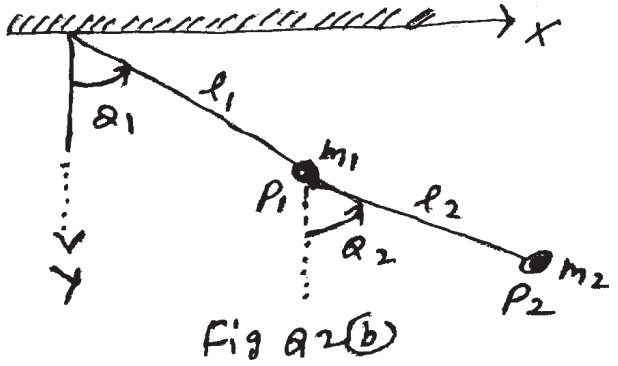


Fig Q2(b)

P.T.O.

Q3) a) Show that the Fourier transform of

$f(x)=e^{-x^2/2}$ is $e^{-s^2/2}$ **[8]**

b) Solve by method of transform the equation $y'' - 2y' - 8y = 0$ with $y(0) = 3, y'(0) = 6$. **[6]**

c) Apply convolution theorem to evaluate.

$$L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$$ **[4]**

Q4) a) Solve the integral equation

$$\int_0^\infty f(x)\cos px\,dx=\begin{cases}1-p, & 0\le p\le 1\\ 0, & p>1\end{cases}$$

Hence deduce that $\int_0^\infty \frac{\sin^2 t}{t^2}dt=\frac{\pi}{2}$. **[6]**

b) Show that the transformations.

$y_1 = 2x_1 + x_2 + x_3$

$y_2 = x_1 + x_2 + 2x_3$

$y_3 = x_1 - 2x_3$

is regular, write down the inverse transformation. **[6]**

c) Find the approximate deflection of a simply supported beam under a uniformly distributed load W in fig. Using Gaterkin's method. **[6]**

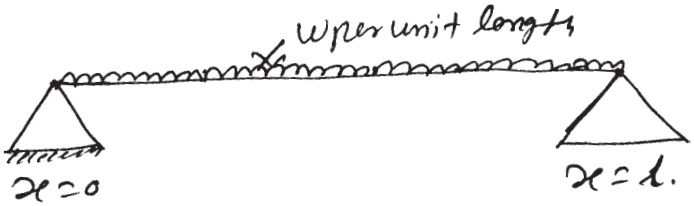


Fig. Q4(c)

SECTION - II

Q5) a) Solve the laplace equation. **[9]**

$\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$. Subject to the condition.

$u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin\left(\frac{n\pi x}{l}\right)$.

b) A tightly streched string with fixed end points $x = 0$ and $x = l$, is initially in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position, find the displacement $y(x, t)$. **[9]**

Q6) a) Explain discrete and continuous system simulation by taking example of each. **[8]**

b) Discuss the static variable model and its advantages over differential equation model. **[8]**

Q7) a) A random variable X has the following probability function values of X.

x :	0	1	2	3	4	5	6	7
$p(x)$:	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

i) Find k.

ii) Evaluate $P(X<6)$, $P(X\geq 6)$ and $P(0<x<5)$ **[8]**

b) For a chi-square distribution with n.d.f.establish the following recurrence relation between the moments

$\mu_{r+1} = 2r(\mu_r + n\mu_{r-1})$, $r \geq 1$, Hence find β_1 and β_2. **[8]**

Q8) a) The height of six randomly chosen sailors are (in inch) : 63, 65, 68, 69, 71, 72. Those of 10 randomly chosen soldiers are : 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Discuss the light that these data throw on the suggestion that sailors are on the average taller than soldiers. **[9]**

b) An insulated rod of length '*l*' has its end A and B maintained at 0°C and 100°C respectively until steady state condition prevail. If B is suddenly reduced to 0°C and maintained at 0°C. Find the temperature at a distance *x* from A at time t. **[9]**

Total No. of Questions : 10] **[Total No. of Pages :3**

P1820

[3965] - 67

M.E. (Mechanical) (Design Engg.)

MECHANICAL VIBRATIONS

(2002 Course) (502202)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) For the system shown in Fig. No.1 derive the equation of motion through the application Lagrange's equations. Hence find the motion of the center mass.**[16]**

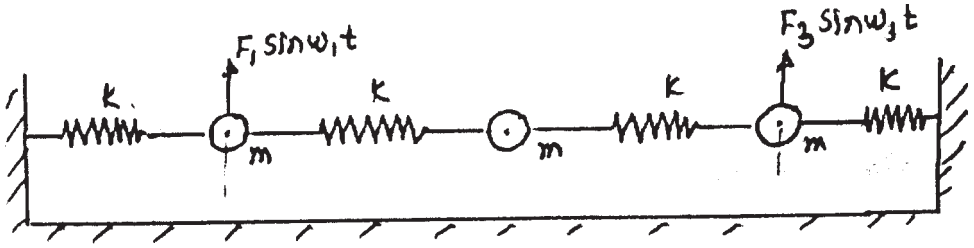


Fig. No.1

Q2) A string of length 90 cm and mass 50 gm per meter length fixed at both ends with a tension of 100 N. A force of 5 cos (10t) acts on the spring in transverse direction at a distance of 30 cm from one end. Find the resultant vibrations.**[16]**

Q3) A vehicle treated as a single degree of freedom undamped system has a mass of 5000 kg and a natural frequency of 1.5 Hz. It moves over a ramp at a speed of 30 kmph as shown in Fig. No.2. Find the resulting vibrations of the vehicle.**[16]**

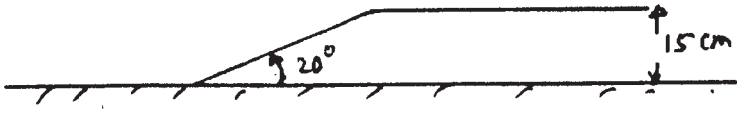


Fig. No.2

P.T.O.

Q4) Derive the condition for tuning of a damped dynamic vibration absorber. **[16]**

Q5) Write the short notes of the following (Any two) **[18]**

a) Frequency response function.
b) Inertial Influence coefficients.
c) Generalized force.
d) Rayleigh's damping.

SECTION - II

Q6) a) Differentiate between pulse and impulse force on vibratory system. **[6]**

b) Find the response equation of an undamped spring mass system subjected to an isosceles triangular pulse force of height 'F_0' and duration 'τ'. **[10]**

Q7) a) Explain wide band and narrow band random vibrations. **[6]**

b) Give three examples of random input. How will you proceed to find their Spectral Density?
Calculate the Autocorrelation function corresponding to the ideal white noise and to the unit step function. **[10]**

Q8) A mild steel shaft of length 1.2 m has a diameter of 2 cm for first and last 40 cm while central 40 cm is of diameter 3 cm. It carries two rotors of moment of inertia 0.6 kg-m^2 and 0.9 kg-m^2 at the junctions and 1 kg-m^2 at the center. Derive the mass and stiffness matrices and find the mode shapes through the matrix iterations. **[16]**

Q9) Find the fundamental natural frequency of torsional vibration of an end milling cutter. The mass moment of inertia of milling cutter is 10 kg-m^2. The diameter of the shank is 25mm and length is 150 mm. The modulus of rigidity of shaft material is $84*10^9 N/m^2$ and mass density 7800 kg/m^3. Derive the formula by considering it as a continuous system. **[16]**

Q10) Write the short notes of the following (any two) **[18]**

a) Phase plane technique.
b) Tool chatter.
c) Auto correlation function.
d) Axial vibrations of rod.

Laplace Transform Pairs

	$f(t)$	$L[f(t)]$
1.	$f(t)$	$\int_0^\infty f(t)e^{-st}dt = F(s)$
2.	$x(t)+y(t)$	$X(s)+Y(s)$
3.	$K f(t)$	$K F(s)$
4.	$u(t)$ *or* 1	$\frac{1}{s}$
5.	$\partial(i)$	1
6.	t	$\frac{1}{s^2}$
7.	t^n	$\frac{n!}{s^{n+1}}$
8.	Sin ωt	$\frac{\omega}{s^2+\omega^2}$
9.	Cos t	$\frac{s}{s^2+\omega^2}$
10.	e^{-at}	$\frac{1}{s+a}$
11.	e^{-at} Sin ωt	$\frac{\omega}{(s+a)^2+\omega^2}$
12.	e^{-at} Cos ωt	$\frac{s+a}{(s+a)^2+\omega^2}$
13.	$e^{-at} f(t)$	$F(s+a)$
14.	$u(t-a)$	$\frac{e^{-as}}{s}$
15.	$\partial(t-a)$	e^{-as}
16.	$\begin{bmatrix} 0 \text{ when } t<a \\ f(t-a) \text{ when } t>a \end{bmatrix} = f(t-a)u(t-a)$	$e^{-as}F(s)$
17.	$\frac{df(t)}{dt}$	$sF(s)-f(0)$
18	$\frac{d^2f(t)}{dt}$	$s^2F(s)-sf(0)-\frac{df(0)}{dt}$
19.	$\int_0^t f(t)dt$	$\frac{F(s)}{s}$

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1821

[3965] - 66
M.E. (Mech.) (D.E.)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a note on 'Accuracy Points and Structural Error' **[6]**

b) See Figure 1. Given data: O_1A = 4cm, O_2B = 6cm, ω_2 = 20 rad/s, cw; $\alpha_2 = 0$, ω_5 = 10 rad/s, ccw; $\alpha_5 = 0$. Other dimensions are shown in the figure. Use the method of auxiliary points to locate one auxiliary point on the floating link 3, and find out its velocity and acceleration. **[12]**

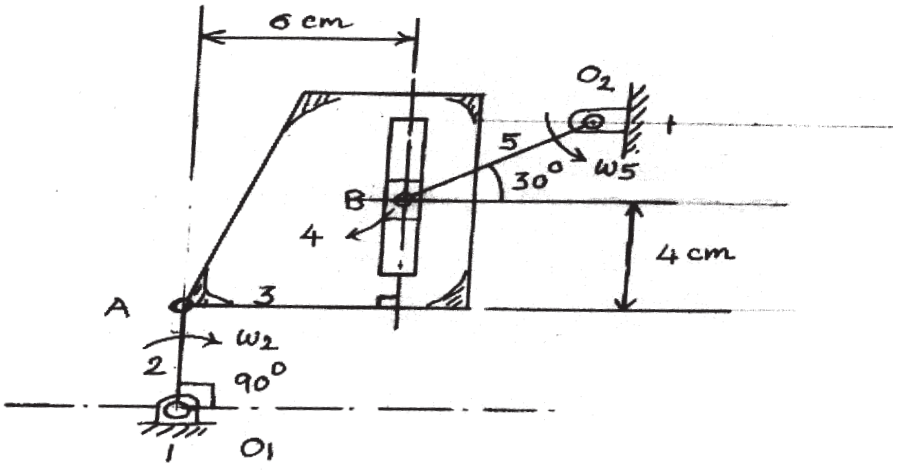


FIGURE 1

Q2) a) Synthesize a 4-bar mechanism function generator to generate the function $y = \log_{10} x$ over the interval $1 \leq x \leq 2$ using Frudenstein's equation. Use 3 accuracy points with EQUAL spacing. Total rotations of the input and output links can be taken as 60°each. **[10]**

b) State and prove the condition to be satisfied by a 4-bar, so that the coupler curve is symmetric. **[6]**

P.T.O.

Q3) Synthesize a slider - crank function generator for the following requirement.
total rotation of crank = 90°, cw.
total slider displacement = 15 cm towards right.
Slider displacement should be proportional to the crank rotation. 4 accuracy points with EQUAL spacing are to be used. You may select the relative pole R_{12} as the center point.
Draw the synthesized mechanism in all 4 positions. **[16]**

Q4) a) Explain the algebraic method of synthesis of slider - crank mechanism with 4 accuracy points. **[10]**

b) Write a note on 'Hartman Construction.'. **[6]**

SECTION - II

Q5) a) Figure 2 shows a slider - crank mechanism O_AAB. Given data: O_AA = 4cm, AB = 12 cm. Figure shows the other details. Use Bobillier construction to draw the inflection circle for the motion of connecting rod AB with respect to the frame. Then locate the center of curvature for the midpoint of AB. **[10]**

b) Write a note on 'Ball's point'. **[6]**

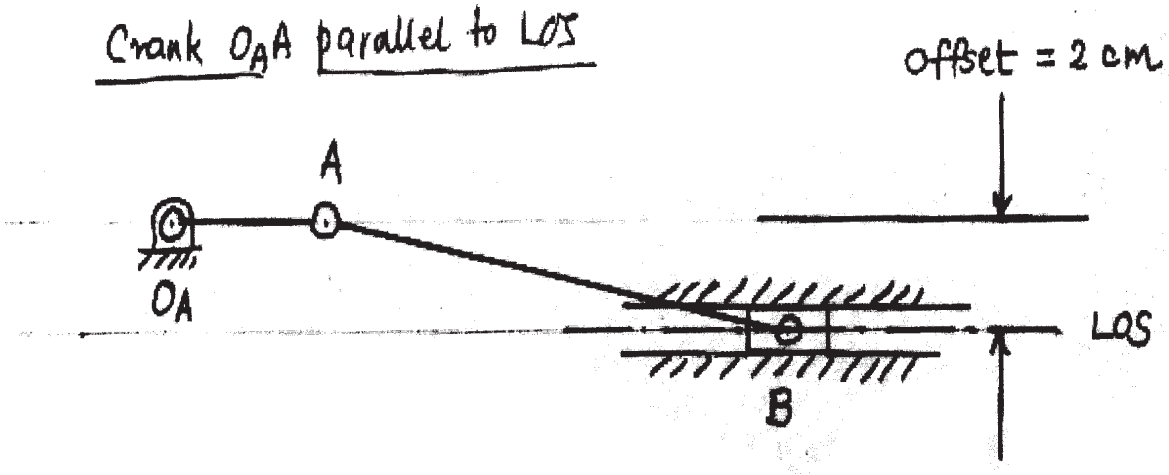


FIGURE 2

Q6) a) State and prove the 'Robert - Chebyshev' theorem. **[8]**

b) Explain the terms 'Function Generation', 'Path Generation' and 'Rigid Body Guidance'. **[9]**

Q7) Define the term 'Dyad'. Explain how a four - bar mechanism can be thought of as a combination of dyads for the purpose of synthesis for function generation, path generation and rigid body guidance. Derive the standard - form equation of dyad.

Explain the various steps involved in dyad - based synthesis of four - bar function generator, for three accuracy points.

Discuss the issue of number of prescribed accuracy positions versus number of solutions, as far as function generation using a four - bar is concerned.**[17]**

Q8) a) Explain the terms 'Order Defect' and 'Branch Defect'. **[6]**

b) Write notes on any two. **[10]**

i) Principles underlying the method of normal acceleration.

ii) Mechanical Error.

iii) Mechanical Advantage.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1846

[3965] - 126
M.E. (Electronic/E & TC)
(Common to DSD & Microwave)
MICROELECTRONICS
(2002 Course) (504205)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Design a Moore Machine synchronous to detect overlapped 1011 sequence. **[8]**

b) Explain about the stack - open & stack - short faults. **[8]**

Q2) a) Write VHDL code for divide by 8 synchronous counter. **[8]**

b) What are the different causes of power dissipation in CMOS, write in detail. **[8]**

Q3) a) What is Domino logic? Explain operation of Domino OR gate. **[8]**

b) List & explain about the advance tools used in VLSI. **[8]**

Q4) Write short notes on: **[18]**

a) Programmable devices.

b) Types & essence of Test Bench.

c) Different types of VHDL Modelling.

SECTION - II

Q5) a) Draw and explain about the CPLD. **[8]**

b) Compare the selection criteria of CPLD & FPGA write to applications. **[8]**

Q6) a) What is need of power optimization in VLSI circuit, Explain the techniques. **[8]**

b) What are the techniques of DRAM cell architecture. **[8]**

P.T.O.

Q7) a) Explain with suitable schematic of Antifase SRAM and flash technologies for PLD. **[8]**

b) Derive the state diagram for an FSM and VHDL code which has i/p 'w' and o/p 'Z'. The Machine has to generate Z = 1, when previous four values of 'w' are 1001, otherwise Z = 0. overlapping i/p patterns are allowed. **[10]**

Q8) Write short note on: **[16]**

a) Design for Testability, its need with example.

b) IEEE Standard for Boundary Scan.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1847

[3965] - 579

M.E. (Electrical) (Control System)

ADVANCED TOPICS IN CONTROL SYSTEMS

(2008 Course) (503105) (Elective - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain precisely the concepts of sliding mode control (SMC). Give advantages and disadvantages of SMC. **[8]**

b) Explain the terms :

i) Reaching mode,
ii) Sliding mode,
iii) Sliding surface and
iv) Chattering.

as used in sliding mode control technique. **[8]**

Q2) a) Explain precisely the term "Adaptive controller". Draw a block diagram of an adaptive system and explain the working of each block. **[8]**

b) With the help of neat diagrams explain the various "Adaptive Schemes". **[8]**

Q3) a) Discuss the various methods of obtaining the state feedback gain matrix $K = [k_1, k_2 \ldots\ldots k_n]$ **[8]**

b) Consider the state variable model **[10]**

$\dot{x} = Ax + Bu$

$y = Cx$

Where matrices A, B and C are given by

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -5 & -6 \end{bmatrix};\ B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix};\ C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}$$

Determine the state feedback gain matrix $K = [k_1\ k_2\ k_3]$ such that the closed loop poles are located at s = – 2+j4; s = –2–j4 and s = –10.

P.T.O.

Q4) Write detailed notes on any two of the followings:

a) The MIT Rule, **[8]**

b) Model Reference Adaptive System [MRAS], **[8]**

c) Pole - placement technique, **[8]**

d) Ackermann's formula. **[8]**

SECTION - II

Q5) a) Explain what is multirate output control. **[8]**

b) Compare Periodic output feedback and fast output sampling feedback. **[8]**

Q6) a) Explain Auto correctors for pattern Recognition. **[8]**

b) Classify and Explain in detail various learning methods in Neural Networks. **[8]**

Q7) a) Explain Hetro correlators using Kosko's discrete BAM. **[8]**

b) Explain structure and function of Biological neuron. **[8]**

Q8) a) Explain simple Neuron model. Discuss Input, hidden and output layer using neat sketch. **[8]**

b) Solve following for energy function if the pattern pairs are **[10]**

A_1 = (000 111 001) B_1 = (010 000 111)

A_2 = (111 001 110) B_2 = (100 000 001)

A_3 = (110 110 101) B_3 = (101 001 010)

Total No. of Questions :8] **[Total No. of Pages :2**

P1375 **[3965] - 130**

M.E. (E & T/C) (Microwave)

CONTINUOUS SPEECH PROCESSING

(2002 Course) (504208) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the speech production mechanism with the help of neat diagram. **[8]**

b) Define the following: **[8]**

i) Phonemes ii) Morphemes

iii) Bilabial iv) Nasals

v) Affricates

Q2) a) Explain the difference between Vowels and Consonants. **[6]**

b) What are formants? **[4]**

c) What is a Vocoder? **[3]**

d) What is speech spectrogram? **[3]**

Q3) a) What is speech digitization? **[2]**

b) Explain the various speech digitization techniques and compare their performance. **[14]**

P.T.O.

Q4) Write short notes on: (any three) **[18]**

a) Acoustic echo cancellation.

b) Short time speech analysis.

c) Quality assessment of coded speech.

d) Voice processing functions.

SECTION - II

Q5) a) Draw the block diagram of Text to speech converter and explain the various steps involved in conversion. **[10]**

b) Explain adaptive echo Cancellation. **[6]**

Q6) a) Explain Ensemble Interval Histogram (EIH). Computation model. Explain the properties of EIH with respect to speech coding. **[10]**

b) Explain the basics of neural network approaches used in speech recognition. **[6]**

Q7) a) Explain hardware components of a voice processing system with the help of block diagram. **[10]**

b) Explain standalone versus network controller voice processing architecture. **[6]**

Q8) Write short notes on: (any three) **[18]**

a) HMM for speech.

b) LPC spectral matching measures.

c) Speaker recognition.

d) Time delay neural network for speech recognition.

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Total No. of Questions :6] **[Total No. of Pages :2**

P1417 **[3965] - 459**

M.E. (Civil) (Structures)

ADVANCED DESIGN OF METAL STRUCTURES

(2008 Course) (Elective - II) (501405)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever* necessary.**
4) ***Figures to the right indicate full marks.***
5) ***Use of IS 800, 875, IS code for Aluminium sections tubular structure, light gauge section is allowed.***

SECTION - I

Q1) a) Enlist the various components of hoarding structures. **[6]**

b) Sketch various schematic arrangements used for hoarding structures. **[7]**

c) Explain the load considerations to be considered in design of hoarding structure. **[6]**

d) What are the I.S. code considerations listed for design of hoarding structure. **[6]**

Q2) a) Design a aluminium section for a beam of span 3.5 m supporting super imposed load of 5 kN/m. The ends of beam are partially restrained. **[9]**

b) Design a compression member 1.8 m long to carry 150kN force. Use aluminium section and suitable factor of safty. **[8]**

c) Clearly distinguish merits and demerits of Aluminium and steel section used as structural component. **[8]**

P.T.O.

Q3) a) Sketch typical welded connection using tubular section, indicate all necessary connection details. **[8]**

b) Design the welded tubular connection as shown in fig 3.b. **[9]**

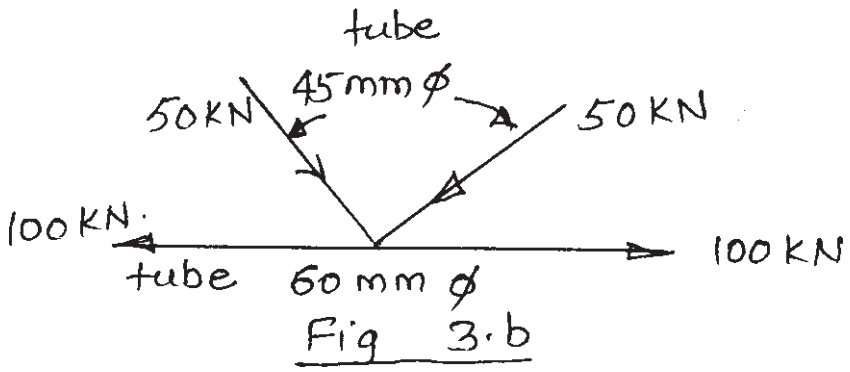


Fig 3.b

c) What are I.S. code provisions for design of scaffolding using tubular sections. **[8]**

SECTION - II

Q4) a) Explain structural advantage of castillated beam as compared to rolled steel beam section. **[5]**

b) Derive the expression for maximum bending stress and maximum shear stress in a castillated beam subjected to distributed loads. **[12]**

c) Calculate % increse in section modulus if ISMB 500 is castillated, assume suitable opening dimensions for web. **[8]**

Q5) a) Draw schematic arrangement for microwave tower 12m height. Show all necessary accesories. **[7]**

b) Calculate the nodal loads for the microwave tower structure you have suggested, assuming basic wind speed 39m/s, k_1, k_2, k_3 = 1.0. **[18]**

Q6) Design light gauge hat section with stiffened ends, for a simply supported beam of span 2.5 m. The super imposed load is 2kN/m. The yield strength of steel is fg = 300 MPG. Give check for combined bending, shear and deflection. **[25]**

❄❄❄

Total No. of Questions :8] [Total No. of Pages :2

P1423 **[3965] - 480**

M.E. (Civil) (Environmental Engineering)

PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEM

(2010 Course) (Elective - II) (501505)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain factors affecting bacterial growth. **[8]**

b) Explain the parameters affecting continuous and batch process selection. **[8]**

Q2) a) Explain the significance of BOD, COD, TKN and TVS with reference to wastewater treatment. **[8]**

b) Write process description of aerobic and anaerobic process. **[8]**

Q3) a) Design a grit chamber for a city of 3.0 lakhs population with a combined sewerage system. Water supply rate is 140 l/d on an average basis. Grit concentration is 50 mg/l. Grit of 0.2mm size and above with specific gravity of 2.65 is to be removed. Temperature = 20ºC. **[8]**

b) Explain different methods to control organic compounds in waste water. **[8]**

P.T.O.

Q4) a) Design a screen chamber for the data given below: **[10]**

Maximum flow = 0.42 m^3/s,

Average flow = 0.21 m^3/s,

Minimum flow = 0.084 m^3/s.

b) Write different methods of aeration. Explain any one aeration method in detail. **[8]**

SECTION - II

Q5) a) The data of an activated sludge process is as follows, MLSS = 4500 mg/l, Flow = 0.1 m^3/s, SS in flow = 300 mg/l solids settled after 30min = 25%. Volume of aeration tank = 2500 m^3, sludge wastage rate = 100m^3/d with VSS 15000 mg/l, calculate SVJ, SDJ and mean cell residence time? **[8]**

b) Write short note on sequential batch reactor. **[8]**

Q6) a) Design a septic tank in a building of having 20 users. Two toilets, two baths, kitchen sink one, wash basins two, shower bath one. Assume necessary data. **[8]**

b) Explain different methods of disposal of digested sludge. **[8]**

Q7) a) Explain any one sewage treatment plant with reference to all operational details. **[8]**

b) Explain Trouble shooting. **[8]**

Q8) a) Design and sketch high rate trickling filter from the following data: **[8]**

Quantity of sewage = 5 MLD, BOD of raw sewage = 250 ppm, BOD removed in primary classifier = 25%, Recirculation ratio = 1.5, desired BOD of effluent = 50 ppm.

b) Explain sludge digestion principles. **[6]**

c) List the operational problems in waste water treatment plant. **[4]**

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Total No. of Questions :10] **[Total No. of Pages :2**

P1432 **[3965] - 515**

M.E. (Mechanical) (Design Engg.)
MATERIAL HANDLING EQUIPMENT DESIGN
(2008 Course) (Elective - II) (502205A)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in brief the various elements of material handling systems, with its importance, objectives and benefits. **[8]**

b) Explain the principles and features of material handling system. **[8]**

Q2) a) Explain in brief the inter relationship between material handling and plant layout, physical facilities and other organizational functions. **[8]**

b) Explain the classifications, Applications, Advantages and disadvantages of material handling equipment. **[8]**

Q3) a) What are the various factors affecting for the selection and choice of material handling equipments. **[9]**

b) Explain in brief the activity cost data and economic analysis for design of components of material handling systems. **[9]**

Q4) a) Explain in brief the design of material (mechanical) handling equipments considering hoists. **[8]**

b) Explain in brief with suitable examples the design of cranes in design of material handling equipments. **[8]**

P.T.O.

Q5) Write short notes on the following (Any Four): **[16]**

a) Packing and storage of materials.
b) Drives for hoistings, components and hoisting mechanisms.
c) Rail Travelling components and mechanisms.
d) Hoisting gear operation.
e) Travelling mechanisms of cranes.
f) Hand propelled overheat Travelling cranes.

SECTION - II

Q6) a) What are the various types of load chains and ropes used in material handling systems. **[9]**

b) Explain in brief the design consideration for conveyor belts and give any five applications of load lifting attachments. **[9]**

Q7) a) Give in brief design of load lifting attachments with considering forged, standard and Ramshorn Hooks. **[8]**

b) Explain in brief the objectives of equipments used for material storage. **[8]**

Q8) a) What is Bulk material handling system and explain their types, applications in Industries, advantages and disadvantages. **[8]**

b) Explain in brief Gravity flow of solids through slides and chutes, with applications, advantages, disadvantages. **[8]**

Q9) a) Explain with examples the storages and warehouse planning and design in material handling and warehouse Automation. **[8]**

b) Explain in brief Safety considerations and design, safety regulations and disciplines in material handling systems and warehouse Automation. **[8]**

Q10) Write short notes on the following (Any Four): **[16]**

a) Cranes, Grabs and Clamps.
b) Storage in bins and hoppers.
c) Warehouse Automation.
d) Computerized warehouse planning.
e) Electromagnets.
f) Screw, vibratory and cabin conveyors.

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Total No. of Questions :8] **[Total No. of Pages :4**

P1437 **[3965] - 534**

M.E. (Mechanical – Mechatronics)

THEORY OF MACHINES AND MECHANISMS

(2008 Course) (Elective - II) (502805)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following terms: **[6]**

i) Kinematic Pair,

ii) Mechanism,

iii) Kinematic chain

iv) Degree of freedom in Mechanism,

v) Structure,

vi) Constrained Motion.

b) Define Inversion of a Mechanism? Explain with the help of neat sketches inversions of single slider crank chain? **[6]**

c) Write short note on Peaucellier's straight line mechanism. **[4]**

Q2) a) Explain the terms: - **[4]**

i) Space centrode.

ii) Body centrode.

P.T.O.

b) Fig. 01 shows the mechanism of a radial valve gear. The crank OA turns uniformly at 225 rpm and is pined at A to rod AB. The point C in the rod is guided in the circular path with D as a centre and DC as a radius. The dimensions of various links are: OA = 15 cm, AB = 55 cm, AC = 45 cm, DC = 50 cm, BE = 35 cm. Determine the velocity of E and angular velocity of link BE. **[12]**

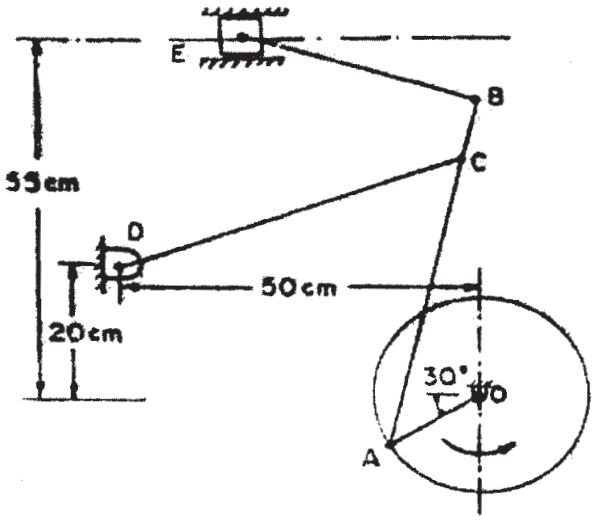


Fig. 01

Q3) a) In a slider crank mechanism, the stroke of slider is 220 mm and the obliquity ratio is 4.5, the crank rotates at 450 rpm clockwise. While the crank is approaching the inner dead centre and the connecting rod is normal to the crank find by using analytical method : **[6]**

i) Velocity of piston and angular velocity of the connecting rod.

ii) Acceleration of piston and angular acceleration of the connecting rod.

b) In the mechanism shown in the fig. 02, link AB rotates at 450 rpm uniformly in clockwise direction. The various dimensions are AB = 100 mm, CR = 150 mm, OC = 400 mm. Find velocity and acceleration of slider R. **[12]**

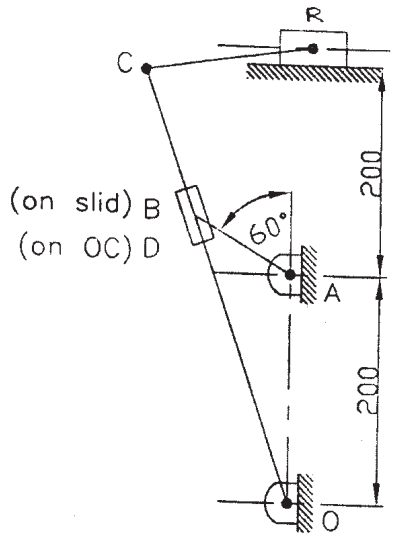


Fig. 02

Q4) a) In a crank rocker type four bar mechanism, the distance between the pivots of crank and rocker is 105 mm. the radius of crank is 45 mm and that of rocker is 115 mm. the coupler length is 185 mm. The crank is rotating at 25 r/s anticlockwise. Find the angular velocity of rocker when the crank is at 120° from the line through the pivots. Use the method of chase solution. **[8]**

b) The slider crank mechanism having stroke length 160 mm and obliquity ratio 4.5. The crank is rotating with anticlockwise direction with an angular velocity of 125 rad/sec. and retardation of 100 rad/sce^2. Find acceleration of slider when the crank is at 35° from I.D.C. using complex algebra method. **[8]**

SECTION - II

Q5) a) Explain three position synthesis for four bar mechanism using inversion method. **[6]**

b) Using freudenstein equation, design a four bar mechanism to generate the function $y = e^x$ for an interval in x from 0 to 5. The input link is to start from 30° and is to have a range of 80°, the output link is to start from 40° and is to have a range of 110°. Use three point chebychev spacing. Take the length of fixed link AD as 50 mm. **[10]**

Q6) a) Define the following terms: **[6]**

i) Longitudinal vibrations,

ii) Transverse vibrations,

iii) Torsional vibrations.

b) A shaft 1.5 m long is supported in flexible bearings at the ends and carries two wheels each of 50 Kg mass. One wheel is situated at the centre of shaft and other at a distance of 0.4 m from the centre towards right. The shaft is hollow of external diameter 75 mm and inner diameter 37.5 mm. the density of shaft material is 8000 Kg/m^3. The Young's modulus for the shaft material is 200 GN/m^2. Find the frequency of transverse vibration. **[10]**

Q7) a) Write short notes on kinematic equivalent of cam - follower system. **[4]**

b) A cam operates a roller type reciprocating follower moving with cycloidal motion during the lift and returning it with uniform acceleration and retardation. The specifications for cam follower arrangements are:- Basic circle radius of cam = 25 mm, roller radius = 10 mm, lift of follower = 30 mm, offset of reciprocating follower axis = 12 mm towards right, angle of lift = 60º, angle of outer dwell = 45º, angle of return = 90º, speed of cam = 200 rpm. Draw the cam profile and determine maximum velocity and maximum acceleration during lift and return. **[12]**

Q8) a) Write short note on coupler curve synthesis. **[6]**

b) Explain the terms 'Logarithmic decrement' as applied to damped vibrations. **[6]**

c) Derive equations for displacement velocity and acceleration for Circular arc cam operating a flat faced follower when the contact is on the circular flank. **[6]**

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Total No. of Questions :10] **[Total No. of Pages :3**

P1439 **[3965] - 563**

M.E. (Mechanical) (Automotive Engg.)
AUTOMOTIVE SAFETY & REGULATIONS
(2008 Course) (Elective - II) (502303)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain role of automotive safety to avoid accidents. What are various factors involved init. **[8]**

b) Give classification of active and passive safety systems used in light vehicle technologies. **[8]**

Q2) a) Explain with neat sketch impact absorbing crumple zones of an passanger car. **[6]**

b) What are various tests carried out in testing of a car collision, explain in brief. **[6]**

c) Describe types of impact undergoes when motor vehicle collision is studied. **[4]**

Q3) a) What is role of anthropometry in vehicle safety. Explain with neat sketch anthrometric data for Driver clearance in automobile. **[8]**

b) How Injury severity is analysed? Explain various methods of it. **[8]**

P.T.O.

Q4) a) What are various parts of seat belt, explain. **[6]**

b) Describe in brief what do you understand by "H point and Torso angle" for seating position in motor vehicle. **[6]**

c) Explain with neat sketch various types of Head restraint used in modern automobiles. **[4]**

Q5) Write short note on the following (Any Three): **[18]**

a) Pendesstrain safety.

b) Roll over test.

c) Whiplash Injuary.

d) Instrumentation for crash dummies.

e) Air bags.

SECTION - II

Q6) a) Explain the CCD base detector. **[6]**

b) Describe luminance meter and its principle. **[6]**

c) Describe various test (environmental), defined in indian standard for evaluation of lighting & signaling devices. **[4]**

Q7) a) What are various types of rear view mirrors. Explain in brief principle involved there in. **[8]**

b) What is automobile safety glass. what are various requirements of it. Explain. **[8]**

Q8) a) What are requirement of design of automotive seat. Explain. **[8]**

b) Briefly explain: **[8]**

i) Importance of Bumpers.

ii) Damagability criteria in bumper design.

Q9) a) AS per CMVR describe the following, procedure. **[8]**

i) Registration of motor vehicle.

ii) Insurance of motor vehicle against third party risk.

b) Draw a neat sketch specifying dimensions and color code as per CMVR 88 for following signs. **[8]**

i) Give way.

ii) Pedstrain crossing.

iii) School AHED

iv) Parking LOT-Cycles.

Q10) Write short note on the following (Any three): **[18]**

a) Necessity of Vehicle Registration.

b) Procedure for obtaining driving licence.

c) Warning devices.

d) Door locks and retension systems.

e) AIS 037.

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Total No. of Questions :6] **[Total No. of Pages :2**

P1443 **[3965] - 581**

M.E. (Electrical Engineering) (Control Systems)
SCADA SYSTEM & APPLICATION
(503105) (2008 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Supervisory Control and Data Acquisition (SCADA) system. Draw it's block diagram. Explain the components of SCADA and various functions performed by it. **[15]**

b) Write a note on interfacing of PLC with SCADA. **[10]**

Q2) a) With the help of block diagram explain Programmable Logic Controller (PLC). **[15]**

b) Explain with an example the concept of Ladder diagram programming. **[10]**

Q3) a) Explain in detail Remote Terminal Unit. **[15]**

b) Compare SCADA, DCS and PLC based systems. **[10]**

P.T.O.

SECTION - II

Q4) a) Discuss various SCADA architectures. **[15]**

b) Explain the 7 layers of OSI model and their functions. **[10]**

Q5) a) Explain in detail the use of SCADA in electrical transmission and distribution systems. **[15]**

b) Explain open standard communication protocols. **[10]**

Q6) a) Explain the use of SCADA in Energy management system for interconnected power system. **[15]**

b) Explain the use of SCADA in Water Purification systems. **[10]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1454 **[3965] - 613**

M.E. (E &T/C) (Microwave)

SPEECH PROCESSING AND APPLICATION

(2008 Course) (504225) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is speech digitization? **[2]**

b) Explain ADPCM and subband coding with the help of block diagram. **[10]**

c) Compare the performance of various digitization techniques. **[4]**

Q2) Explain different hardware and software modules of voice processing system. **[16]**

Q3) a) What is speaker recognition? Explain the various problems involved in the design of speaker recognition system. **[10]**

b) Explain Learning Vector Quantization (LVQ) network used in speech recognition task. **[6]**

P.T.O.

Q4) Write short notes on: (any three) **[18]**

a) Vowels and Consonants.

b) Source filter model of speech.

c) Linguistic units of speech.

d) Cepstrum.

SECTION - II

Q5) a) Explain any two noise suppression technique used in speech. **[8]**

b) How to assess quality of coded speech? **[8]**

Q6) a) What is HMM (Hidden Markov Model)? Explain how HMM can be used for speech recognition. **[8]**

b) Explain the issues related to HMM for speech recognition. **[8]**

Q7) a) What is acoustic echo? Draw the block diagram of acoustic echo canceller and explain. **[8]**

b) Explain the basic concept of neural network used for speech recognition. Draw and explain the architecture of Time Delay Neural Network (TDNN) used for speech. **[8]**

Q8) Write short notes on: (any three) **[18]**

a) Auditory nerve representation of speech.

b) LPC spectral distance matching measures.

c) Speech coding standards.

d) MFCC.

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Total No. of Questions :10] **[Total No. of Pages :2**

P1459

[3965] - 632

M.E. (E & TC) (VLSI & Embedded System)

MEMORY TECHNOLOGIES

(2008 Course) (Elective - II) (504185)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the parameters which should be taken into account while designing SRAMs? **[8]**

b) Draw the various SRAM cell structures? Explain then for various operations. **[8]**

Q2) a) What do mean by Dual-port SRAMs? What are its applications and features? Draw typical dual-port RAM cell. **[8]**

b) Write short note on Nonvolatile SRAMs. **[8]**

Q3) a) Draw the 1T cell structure of DRAM; explain its operation in short. Discuss its pro and cones. **[8]**

b) What are the developments took place in the sense amplifier for improvement of DRAM performance? **[8]**

Q4) a) What do mean by OTP EPROM? What are its advantages and disadvantages? **[8]**

b) What is antifuse? How this is been utilized in semiconductor memories? **[8]**

P.T.O.

Q5) What is the function of refreshing circuit? What are the parameters which should be taken into account while designing the refreshing circuit for semiconductor memories? Draw typical refreshing circuit. **[18]**

SECTION - II

Q6) a) List the faults that can occur in semiconductor chip. Out of these which affects semiconductor memory more. **[8]**

b) What is MSCAN? Describe the steps involved in it? **[8]**

Q7) a) How the Embedded DRAM fault modeling and testing is done? **[8]**

b) Describe Classical Test Algorithm GALPAT for semiconductor memory testing? **[8]**

Q8) a) What are the advantages and disadvantages of the FRAM? **[8]**

b) What are applications of Analog Memories? Draw the typical block diagram of Analog memory. **[8]**

Q9) a) Compare MRAM, SRAM, DRAM, EEPROM and FRAM. **[10]**

b) Enlist the memory cards available in the market. What are the different packaging materials used for memories? **[8]**

Q10)a) Why radiation hardening is required for semiconductor memories? Explain one best known producer for radiation hardening. **[8]**

b) Justify 'Semiconductor Rate failure analysis is very important' from reliability point of view. **[8]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1465

[3965] - 650

M.E. (E &TC) (Signal Processing)

WIRELESS AND MOBILE COMMUNICATION

(2008 Course) (Elective - II) (504504)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of path loss for indoor, propagation model. Comment on various factors, on which path loss depends. **[8]**

b) For a multipath channel delay spread is given by 1.37 ms. Find out 50% coherence BW. Is this BW sufficient for AMPS & GSM channel? If not, what will be the solution to achieve good transmission? **[8]**

Q2) a) Explain the concept of small scale & large scale fading. Explain the factors influencing small scale fading. **[6]**

b) Explain the various parameters of mobile multipath channel. **[6]**

c) Consider a channel with Rayleigh fading and averaged received power Pr = 20 dBm. Find the probability that the received power is below 10 dBm. **[6]**

Q3) a) Write a short note on Ricean fading. **[8]**

b) The subscriber is located at a distance of 1000 m from the base station and adjacent channel interference is at 100 m. from the base station. Find S/I ratio prior to filtering. Take n = 3. **[8]**

P.T.O.

Q4) a) Consider a system with 100 cells. Each cell has 20 channels. The average calling rate is 2 calls/hr. and average duration of each cell is 3 min. How many users can be supported if the allowed probability of blocking is 2%. **[8]**

b) Explain various approaches used to increase the capacity in cellular communication. **[8]**

SECTION - II

Q5) a) Draw and explain the architecture of a GSM system. **[8]**

b) Explain the need of GMSK type of modulation in a cellular system design. **[4]**

c) A channel has a doppler spread of 60 Hz. Find the time separation required in samples of the received signal in order that they are approximately independent. **[4]**

Q6) a) What type of antennas are used at the base stations? Explain sectorization. **[6]**

b) Write a short note on turbo coding. **[6]**

c) If desired S/I ratio of a cellular system is 18dB, by how much will the capacity increase if we use microcell zoning of 3 zones/cell. Take path loss exponent as n = 4. **[6]**

Q7) a) Prove that the system capacity in CDMA is given as M = GP/Eb/No. **[8]**

b) Write a short note on Walsh codes. **[8]**

Q8) a) Why does minimizing the reuse distance, maximize the spectral efficiency of a cellular system. **[4]**

b) If the cell radius of new cells are reduced by half, what will be the required trasmit power for these cells. **[6]**

c) Compare GSM and CDMA system. **[6]**

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Total No. of Questions :10] **[Total No. of Pages :2**

P1471

[3965] - 669

M.E. (Electronics) (Digital Systems)

MEMORY TECHNOLOGIES

(2008 Course) (Elective - II) (504198)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the parameters which should be taken into account while designing DRAMs? **[8]**

b) Draw the various DRAM cell structures? Explain then for various operations. **[8]**

Q2) a) What do mean by Dual-port SRAMs? What are its applications and features? Draw typical dual-port RAM cell. **[8]**

b) Write short note on Nonvolatile SRAMs. **[8]**

Q3) a) Draw the cell structure of SRAM; explain its operation in short. Discuss its pro and cones. **[8]**

b) What are the developments took place in the sense amplifier for improvement of DRAM performance? **[8]**

Q4) a) What do mean by EEPROM? What are its advantages and disadvantages? **[8]**

b) What is antifuse? How this is been utilized in semiconductor memories? **[8]**

P.T.O.

Q5) What is the function of refreshing circuit? What are the parameters which should be taken into account while designing the refreshing circuit for semiconductor memories? Draw typical refreshing circuit. **[18]**

SECTION - II

Q6) a) What is stuck at fault? Explain with it suitable example. **[8]**

b) What is ATS? Write ATS Procedure? **[8]**

Q7) a) How the GaAs SRAM fault Modeling & Testing is done? **[8]**

b) Describe Classical Test Algorithm MSCAN for semiconductor memory testing? **[8]**

Q8) a) What are the advantages and disadvantages of the MRAM? **[8]**

b) What are applications of Analog Memories? Draw the typical block diagram of Analog memory. **[8]**

Q9) a) Compare MRAM, SRAM, DRAM, EEPROM and FRAM. **[10]**

b) What are different types of packaging techniques are used for memories? Draw schematics for few of them. **[8]**

Q10)a) Justify 'Semiconductor Rate failure analysis is very important' from reliability point of view. **[8]**

b) Why radiation hardening is required for semiconductor memories? Explain one best known producer for radiation hardening. **[8]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1475 **[3965] - 686**

M.E. (E & TC) (Communication Networks)
NETWORK ARCHITECTURE & DESIGN
(2010 Course) (Elective - II) (504604)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Answers any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail generations of networking. **[8]**

b) What are key characteristics of a network architecture and design that affect the post implementation costs? Also give suitable examples. **[8]**

Q2) a) Justify how system components play vital part in Network analysis, architecture, and design. **[8]**

b) Explain the concept of architecture and design defensibility with suitable example. **[8]**

Q3) a) Why is requirements analysis important to network architecture and design? Give three reasons. **[8]**

b) Categorize and justify each of the following requirements as user, application, device, or network. **[8]**

i) Database servers must run brand XYZ software.

ii) Teleconferencing requires at least 350 Kb/s capacity.

iii) Users must be able to submit print jobs of up to 25 MB in size.

iv) Each access network should be able to service 200 corporate users.

P.T.O.

Q4) a) Explain with example requirements for predictable performance. **[6]**

b) Explain with example requirements for guaranteed performance. **[6]**

c) Given an MTBCF requirement of 10000 hours and an MTTR requirement of 7 hours, calculate an availability requirement. **[6]**

SECTION - II

Q5) a) Initial conditions for your network project consist of the following categories: type of network project, scope of network project, and architecture/design goals. Develop three sets of initial conditions (each containing one element from each category) and give an example regarding network project for each set. **[8]**

b) For many hybrid mechanisms, traffic flows can have routed paths or switched paths, depending on the characteristics of each flow. Describe switching and routing. When would you recommend that a flow be switched, and when would it be routed? Present recommendations based on the following: **[8]**

i) Duration of each flow in terms of the numbers of cell, frames, and/or packets.

ii) Type of each flow, by protocol or application.

Q6) a) Explain with example performance envelope from requirements analysis. **[8]**

b) How to choose and apply routing protocols? Give different recommendations. **[8]**

Q7) a) Define critical flow? Where this flow analysis is used? **[8]**

b) Explain the concept of degrees of hierarchy and interconnectivity in context to routing. **[8]**

Q8) a) Which network monitoring mechanisms are deployed in network management? **[8]**

b) Explain the terms: **[10]**

i) State

ii) Hard state

iii) Soft state

iv) Stateless

v) Stateful

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Total No. of Questions :8] **[Total No. of Pages :2**

P1480 **[3965] - 704**

M.E. (Production)

ADVANCE ROBOTICS

(2008 Course) (Elective - II) (511105)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following: (Any Two): **[8]**

i) Drives used in Robot.

ii) Path control systems in robot.

iii) Forward and inverse kinematics

b) A planer RR manipulator has first link of 100 mm length and second link of length 70 mm. State whether the manipulator can reach points P, Q, R separately where P is at (15,15), Q is at (15,70) and R is at (15,170). **[8]**

Q2) a) Explain Denavit Hartenberg parameters for link transformation: **[8]**

b) Explain briefly Lagrangian formulation for manipulator dynamics. **[8]**

P.T.O.

Q3) a) A robot has the link parameters are as shown in table. Determine the origin of the gripper w.r.t. base frame indicating all the intermediate steps. **[8]**

Joint	α_{i-1}	A_{i-1}	d_i	θ
1	0º	0	0	30º
2	90º	5	0	90º
3	90º	10	0	0º

b) A robot joint required to reach 60° from 30° taking a total time of 6 seconds. Obtain the cubic polynomial fit and get the trajectory. **[8]**

Q4) Write short notes on any three: **[18]**

a) Applications of robots

b) Matrix representation of coordinate transformation

c) Trapezoidal velocity strategy for robots in trajectory planning

d) Force analysis & gripper design

SECTION - II

Q5) a) Classify sensors and give the characteristics for selecting the sensors for using them in a robot. **[8]**

b) Explain with suitable figure Touch and slip sensors. **[8]**

Q6) a) Explain low level and high level machine vision system used in robotic system. **[8]**

b) Explain the levels of robot programming and their requirements. **[8]**

Q7) a) Explain encoders used in robotic system. **[8]**

b) Define the term "Artificial Intelligence". Speculate role of AI techniques in robotic applications. **[8]**

Q8) Write short notes on any three: **[18]**

a) Robot controller

b) Stability issues in legged robots

c) Micro-robotics

d) MEMS

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Total No. of Questions :8] **[Total No. of Pages :3**

P1481

[3965] - 706

M.E. (Production)

TOOL AND DIE DESIGN

(Revised 2008 Course) (Elective - II) (511105)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the principle elements to be considered while designing a plain milling cutter. **[8]**

b) Explain various principles to be followed for locating the surfaces of the workpiece. **[8]**

Q2) Design a progressive die for the component shown in Figure 1.

Given: Stock thickness = 2 mm, Shear strength of material = 195 MPa.

Draw assembly drawing. **[18]**

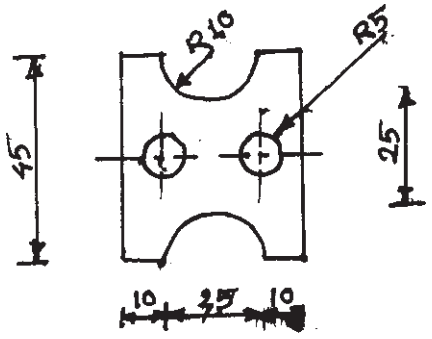


Fig1 Material Al, 2mm thick

P.T.O.

Q3) Design a Drawing die for the component shown in Fig.2.
Given: Sheet thickness = 1 mm, Yield strength of material = 427 N/mm^2
Calculate

a) Blank size by area method **[4]**
b) Blank size graphical method **[6]**
c) No. of draws required **[2]**

Calculate the dimensions of the die and punch for each draw and also calculate press capacity. **[4]**

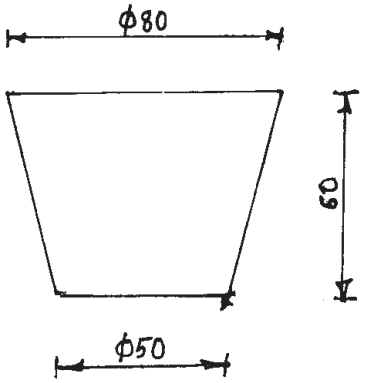


Fig 2.

Q4) Write short note on:

a) Methods of mounting of the punch and design. **[5]**
b) Spring back and is prevention. **[6]**
c) Quick acting clamps. **[5]**

SECTION - II

Q5) Design forging die for the component shown in Fig.3. **[16]**

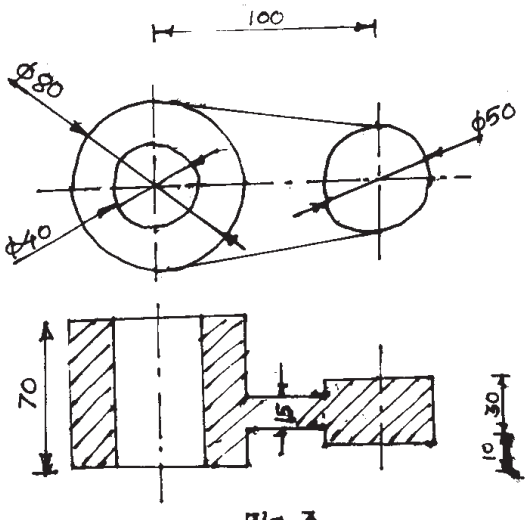


Fig.3

Q6) a) Explain the basic rules for die design in upsetting. **[8]**

b) What is gate in injection mould? What factor should be considered in designing gate? What are the different types of gate explain it shortly. **[8]**

Q7) a) Explain types of core in die casting. **[8]**

b) Explain different die locking methods. **[8]**

Q8) Write short note on:

a) Blow molding. **[6]**

b) Defects in die casting and their remedies. **[6]**

c) Directional solidification in die casting. **[6]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1492 **[3965] - 727**

M.E. (Production) (CAD/CAM)

RAPID PROTOTYPING

(Revised 2010 Course) (511205) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the overview of Rapid Prototyping (RP) technology. **[8]**

b) What are the three phases of prototyping? Contrasting these with those of geometric modeling, what similarities can be drawn? **[8]**

Q2) a) Classify the RP systems and explain Fused Deposition Modeling (FDM) system in detail. **[8]**

b) Describe the advantages of Rapid Prototyping in-terms of its beneficiaries to the product designer, tool designer, manufacturing engineer, marketers and consumers? **[8]**

Q3) a) Explain with suitable example the following properties of prototype: **[8]**

i) Material ii) Dimensional accuracy

iii) Surface finish iv) Machinability

b) Despite the increase in relative complexity of the shape and form of products, project times have been kept relatively shorter. Why? **[8]**

P.T.O.

Q4) Write short notes on (any three): **[18]**

a) Comparison of STL and SLC file formats.

b) Laminated Object Manufacturing (LOM).

c) Environmental resistance in RP.

d) Reverse engineering in RP.

SECTION - II

Q5) a) With the help of block diagram explain the design concept of generation of models, form and fit checking, and functional testing is done in RP. **[8]**

b) Explain with a suitable example how *Rapid Tooling* helps to enhance production. **[8]**

Q6) a) Explain briefly the curved line width function and state its application. **[8]**

b) Explain in detail the photomodulus model? **[8]**

Q7) a) Describe with the flow chart the economic analysis in using the Rapid Prototyping technology in the present context. **[8]**

b) Describe with a neat sketch the Laser Subtractive Laser Fabrication process. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Miniaturization using RP.

b) Application of RP in forensic science.

c) Laser Additive Non Laser Fabrication.

d) Material characteristics in RP.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1496

[3965] - 747

M.E. (Computer Engg.)

EMBEDDED SYSTEM DESIGN

(2008 Course) (510105) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Questions one and five are compulsory. Attempt any two questions from question 2 to 4 in section I and Attempt any two questions from question 6 to 8 in section II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different classifications of embedded systems? Explain. **[8]**

b) With the help of neat diagram, describe different characteristics of embedded systems. **[8]**

Q2) a) Give brief overview of ARM7 architecture. **[8]**

b) Name and explain power management modes of Bluetooth. **[8]**

Q3) a) What are the different packets used for bus transaction in USB. Also explain types of data transfers supported by USB protocol. **[10]**

b) Explain how bit transfer takes place in I2C. Also mention the applications of I2C. **[8]**

Q4) a) What is PCI-X? Compare it with PCI. **[8]**

b) Given: It is required to read the sensor inputs using a microcontroller with on-chip 8-channel 10-bit ADC. Two input channels of ADC, namely AIN2 and AIN4 are used for this application. Write pseudo code to configure and read the digital outputs from these analog inputs. The digital output is available in ADDR register and configuration can be done using ADCR register. **[8]**

P.T.O.

SECTION - II

Q5) a) Compare Bluetooth protocol, 802.11 and IrDA w.r.t. following features. **[10]**

i) Technology

ii) Distance

iii) Security

iv) Cost

v) Data Rate

b) Differentiate between 802.11 and 802.15. **[6]**

Q6) a) With the help of neat diagram, explain the structure of FPGA. **[8]**

b) Describe the following IPC mechanisms in detail: **[8]**

i) Binary semaphore

ii) Message Queue

Q7) a) What 'are cross compilers? When do you use them? How they are different than compilers? **[6]**

b) Object oriented programming is widely used in embedded system programming. Why? **[4]**

c) What are the different criteria, based on which RTOS is selected for an embedded system application? **[8]**

Q8) a) Explain development process of an embedded system along with different phases. **[10]**

b) VxWorks, QNX, WINCE and RTLINUX. Categorize these under soft RTOS or hard RTOS. **[6]**

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Total No. of Questions :10] **[Total No. of Pages :3**

P1502 **[3965] - 764**

M.E. (Computer) (Computer Networks)
WIRELESS TECHNOLOGY
(510305)(2008 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the main benefits of spread spectrum system? How can spreading be achieved? How can DSSS systems benefits from multi-path propagation? **[8]**

b) What is multipath propagation and what are its effects? List the factors that influence small scale fading. **[8]**

Q2) a) Explain the following as related to antenna system. **[8]**

i) Directivity

ii) Effective Weight

iii) Radiation Pattern

iv) Effective Area

b) Derive an expression for antenna efficiency in terms of radiation resistance. **[8]**

P.T.O.

Q3) How does frequency reuse enhance cellular network capacity? Besides the number of users, what other major factor influences the decision on cluster size? A cellular system uses frequency spectrum 1800 MHz to 1840 MHz for uplink channels and 1860 MHz to 1900 MHz for downlink channels respectively. Each channel takes 200 KHz and can be shared by 8 users. Each user needs one uplink and one downlink channel. How many users can be supported without frequency reuse in this cellular system? **[16]**

Q4) a) State the Shannon's Channel Capacity Theorem. A communications channel with a bandwidth of 4 kHz has a signal power to noise ratio of 7. The bandwidth is reduced by 25 %. How much should the signal power be increased to maintain the same channel capacity? **[8]**

b) What are the differences between Wi-Fi and Wi-Max. **[8]**

Q5) Discuss in detail about GSM system architecture, channel types and frame structure. **[18]**

SECTION - II

Q6) a) What are the requirements for converting a computer wired LAN based laboratory into a typical mobile wireless laboratory. Analyze the requirements, regarding s/w & h/w. **[8]**

b) Explain 'Bluetooth Protocol stack' with neat diagram. **[8]**

Q7) a) Explain different basic access mechanism defined in IEEE 802.11 in detail. **[8]**

b) Explain "power management" and "roaming" as handled by DLL in 802.11 infrastructures N/W. **[8]**

Q8) a) Why the MAC protocol of for the wired network cannot be used for wireless. **[8]**

b) A bank wishes to offer to its customers the benefit of 'mobile banking' facility. The account holder is provided facilities to query his account details and perform related functions. Identify a suitable environment to support such a requirement of the bank. Clearly identify the underlying protocols, suitable infrastructure and the application support requirement. **[8]**

Q9) a) Explain how tunneling works for mobile IP using IP-in-IP, Minimal, and generic routing encapsulation respectively. Discuss advantages and disadvantages of these three methods. **[8]**

b) Explain the errors in a wireless network with degrade TCP performance. Briefly explain how TCP snooping can improve the situation **[8]**

Q10)a) Discuss the PHY frame format of an IEEE 802.11 using the spread spectrum technique which separates by code. **[9]**

b) In the Distributed Coordination Function(DCF) protocol of IEEE 802.11, why does a Node wait only SIFS time units (after the last data packet reception) before sending an ACK, while waiting DIFS time units before attempting a data transmission ? **[9]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1503 **[3965] - 765**

M.E. (Computer Networking)

INFORMATION SECURITY AND AUDIT MANAGEMENT

(2008 Course) (Elective - II) (510305)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from section -I and three questions from section -II.***
2) ***Answer of section-I and section-II should be written on separate answer sheets.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagram wherever necessary.***
5) ***Make suitable assumptions wherever necessary.***

SECTION - I

Q1) a) Explain Principles of Information Security Management. **[8]**

b) What is Management? Describe Management characteristics. **[8]**

Q2) a) Security Systems Development Life Cycle. **[8]**

b) Explain various types of Information Security Governance. **[8]**

Q3) Explain the components of contingency planning with reference to: **[16]**

a) Business Impact Analysis.

b) Incident Response Plan.

c) Disaster Recovery Plan.

d) Business Continuity Plan.

e) Timing and Sequence of CP Elements.

f) Crisis Management.

P.T.O.

Q4) Write short notes on any three: **[18]**

a) Information Security Policy, Standards and Practices.

b) Project Management Tools.

c) Fundamentals of Contingency Planning.

d) Components of the Security Program.

SECTION - II

Q5) a) Explain the following Security Architecture Models. **[8]**

i) Bell-LaPadula Confidentiality Model.

ii) Clark-Wilson Integrity Model.

b) Explain the Performance Measures in Information Security Management. **[8]**

Q6) a) What is Risk Identification? Explain Creation, Classification and Categorization of Assets. **[8]**

b) Explain Risk Assessment Strategies. **[8]**

Q7) a) Explain the Protection mechanisms using Access Controls, Firewalls, Intrusion Detection and Prevention Systems. **[8]**

b) Describe the Information Security Positions and Responsibilities. **[8]**

Q8) Write short notes on any three: **[18]**

a) Security Management Models.

b) Risk Control Strategies.

c) Security Scanning and Analysis Tools.

d) Information Security Professional Credentials.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1506

[3965] - 769

M.E. (Computer Networking)

NETWORK PROGRAMMING

(2008 Course) (510311) (Elective - III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Write TCP connection establishment and termination process steps and explain with the help of state transition diagram. **[8]**

b) Why do both sockets and XTI provides the interface from the upper three layers of the OSI model into the transport layer? What is wrapper function? Explain the wrapper function for the socket function. **[8]**

Q2) a) Describe IPV4/IPV6 socket address structure. Write Byte ordering function with the help of suitable program. **[8]**

b) What is the difference between echo client/server and using the Telnet client to communicate with our echo server. Explain with suitable programs. **[8]**

Q3) a) Write detailed steps that allow an IPV4 TCP client to communicate with an IPV6 server with suitable diagram. **[8]**

b) Explain the use of get host by name and get servby name with detailed program. **[8]**

Q4) a) Explain the fetching and printing a routing table entry process. Write first half of program to issue RTM-GET command on routing sockets. **[8]**

b) Explain the Interface name and Index function with its structure. **[8]**

c) What are Routing sockets? What types of operations are supported on a routing socket. **[2]**

P.T.O.

SECTION - II

Q5) a) What is Resource Discovery? Explain the internet applications that use broad casting with examples. **[8]**

b) Explain various multicast group membership socket options. **[8]**

Q6) a) What is SNTP? Explain various primitives with suitable example. **[6]**

b) What is concurrent servers? How UDP server deals with different types of server? **[6]**

c) Explain IPV6 packet information. **[4]**

Q7) a) Compare the descriptor usage in a server using fork versus a server using a thread, using 100 clients. **[8]**

b) Write a program for TCP based echo server using Threads. **[8]**

Q8) a) Why does the parent keep the listening socket open instead of closing it after all the children are created? Explain with suitable code. **[10]**

b) Explain TCP prethreaded server with **[8]**

i) Per thread accept.

ii) Main thread accept.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1512 **[3965] - 788**

M.E. (Chemical)

CATALYSIS AND SURFACE PHENOMENON

(2008 Course) (Elective - III) (509111)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a note on selectivity of a catalyst with suitable examples. **[4]**

b) Explain the gas adsorption method of estimating pore volume with relevant equations. **[8]**

c) Explain how rate controlling step can be determined from a graph of rate constant and diffusivity against temperature. **[4]**

Q2) Explain the following catalyst characterisation techniques.

a) XRF, XRE and PIXE **[9]**

b) ESR **[7]**

Q3) a) Give classification, description and applicability of adsorption isotherms. **[10]**

b) Compare the rates of homogeneous reactions and heterogeneous reactions on the basis of transition state theory. **[8]**

P.T.O.

Q4) When nitrogen was employed to determine the surface area of a 0.5 g sample of silica gel. the following results were obtained. **[16]**

Equilibrium Pressure, p, kpa	0.8	3.3	5.0	6.3	7.5	9.0	11.2	18.7	30.7
Volume adsorbed (STP) V × 10^6 m^3	3.4	6.4	6.7	7.0	7.2	7.4	7.7	8.5	9.9

The sample of silica gel was maintained at normal boiling point of liquid nitrogen (77k). The area of plane surface which a single molecule of nitrogen would occupy is 16.2×10^{-20} m^2. Calculate the specific surface area of silica gel.

SECTION - II

Q5) a) Derive an expression for the effectiveness factor of a cylindrical catalyst pellet. Sealed at both ends, in which first order chemical reaction occurs. **[12]**

b) Give different reactions involved in Fischer-Tropsch Process. **[4]**

Q6) a) Explain different types of hysteresis loops and their relation with pore geometry. **[10]**

b) Explain the dusty gas model of porous structure. **[6]**

Q7) a) Describe different industrial catalyst preparation methods. **[8]**

b) What is meant by catalyst deactivation? State the methods by which deactivation may occur. **[8]**

Q8) a) What is the dynamic model for deactivation? Find the equation for the rate at which the core radius decreases. **[12]**

b) Write a note on perovskites. **[6]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1517 **[3965] - 802**

M.E. (Chemical) (Environmental Engg.)

MEMBRANE TECHNOLOGY IN ENVIRONMENTAL ENGINEERING

(2008 Course) (509135) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question nos. 1 & 5 are compulsory. Out of the remaining attempt any two questions from section - I & any two questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain conventional filtration and membrane filtration process. How Membrane separation processes are classified? **[6]**

b) Explain Industrial applications of membrane processes. **[6]**

c) Discuss essential features of membrane process. **[6]**

Q2) a) Explain controlling factors for the selection of polymers for the membrane preparation. **[8]**

b) Explain phase inversion process on a ternary diagram. **[8]**

Q3) a) Explain how performance of a membrane is determined? **[8]**

b) Explain classification of separation processes with suitable examples. **[4]**

c) Explain the use of non porous membranes. **[4]**

P.T.O.

Q4) Write short notes on the following: **[16]**

a) Surface properties of membranes.

b) Necessity of modules.

c) Charged membranes.

d) Polymer coating process.

SECTION - II

Q5) a) Explain Symmetric and Asymmetric membranes. How interfacial polymerization is used for the preparation of composite membrane? **[6]**

b) Explain Sol-Gel Process for inorganic composite membrane. **[6]**

c) Explain dead-end operation and cross flow operation. What is a 'tapered design' of modules in system? **[6]**

Q6) a) Explain how demixing time controls the membrane morphology. **[6]**

b) Define a phase and explain the preparation of glass membrane by phase separation. **[5]**

c) Various methods used for membrane preparation. **[5]**

Q7) a) Explain the crystallization, gelation and vitrification process for the polymer membranes. **[8]**

b) Which are the driving forces are used in membrane processes? Explain with suitable Examples. **[8]**

Q8) Write short notes on the following: **[16]**

a) Osmosis and reverse osmosis.

b) Membrane reactors.

c) Liquid membranes.

d) Purification of Sea water.

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Total No. of Questions :10] **[Total No. of Pages :2**

P1523

[3965] - 841

M.E. (Information Technology)

INFORMATION ASSURANCE AND SECURITY

(2008 Course) (Elective - II) (514405-A)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What are the different types of attacks on Digital Signature? **[8]**

b) Kerberos uses three different kinds of secret keys: the login key, the ticket-granting key and session key. Explain the need for each of these keys. In particular, how the security offered by Kerberos is weakened if we made use of just the login key or just the session key and login key, instead of the three keys. **[10]**

Q2) a) Describe the DES encryption algorithm. What is avalanche effect in DES decryption? **[8]**

b) Discuss two security mechanisms applied at the application layer. Are they safer than those applied at the lower network layer? Justify your answer. **[8]**

Q3) a) Explain the X.800 security mechanisms. **[8]**

b) In a Public Key System using RSA, you intercept the cipher-text C = 10 sent to a user whose public key is e = 5, n = 35. What is the plain text M? **[8]**

Q4) a) What are the important features of advanced encryption standard (AES)? How does AES differ from DES? **[8]**

b) Compare the distinct features of SHA-l and MD-5 algorithms. **[8]**

P.T.O.

Q5) a) Why security policies are important? How Security can be achieved with the help of setting of the data integrity policy? **[8]**

b) Compare symmetric and asymmetric key cryptography on the basis of their performance. **[8]**

SECTION - II

Q6) a) What is need of calculating multiplicative inverse in RSA algorithm? If gcd (550,1759) = 1, find multiplicative inverse of 550. **[8]**

b) Why do MD4, MD5 and SHA-1 require padding of messages that are already in multiples of 512 bits? What are minimal and maximal amount of padding in each of these cases? **[8]**

Q7) a) What is VPN? Why should user VPNs require strong authentication? Which authentication mechanisms are best for a user VPN? **[10]**

b) How do you establish an e-mail and Web Surfing Policy? **[8]**

Q8) a) Define Cyber-law terms. Integrate concepts of Cyber-law into everyday business practices by reviewing Cyber-law Internet security issues. **[8]**

b) Explain in brief following hacker's tools: **[8]**

i) Port Scanners. ii) Vulnerability Scanners.

iii) Rootkits. iv) Sniffers.

Q9) a) Which are the system security levels defined in Orange Book? Which are the primary requirements of C2 standard? **[8]**

b) Distinguish between two modes of IPSec. Explain AH (Authentication Header) and ESP (Encapsulating Security Payload). **[8]**

Q10)a) What is the difficulty posed to an opponent when Diffie-Hellman Key exchange algorithm is used in public key cryptography? Show necessary steps to support your answer. **[8]**

b) How is a virus different from a worm? What are the various types of viruses? **[8]**

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Total No. of Questions :10] **[Total No. of Pages :2**

P1526 **[3965] - 847**

M.E. (Information Technology)
INTERNET AND WEB TECHNOLOGIES
(514411) (2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Illustrate Watermarks services. **[8]**

b) Explain MVC Design Pattern. **[8]**

Q2) a) What are the EJB's used for? **[8]**

b) Explain SOAP protocol? **[8]**

Q3) a) Explain JSR 168 portlet. **[8]**

b) Explain Web Browser Security features. **[8]**

Q4) a) Explain any three Java Patterns. **[8]**

b) Compare Perl and PHP. **[8]**

Q5) Answer any three Short notes (with illustration): **[18]**

a) CORBA.

b) STRUTS.

c) AJAX.

d) Browsers Performance.

e) VRML.

P.T.O.

SECTION - II

Q6) a) Explain N-Tier Web System. **[8]**

b) Explain plugin used by browser. **[8]**

Q7) a) What are different Skills set available to develop the Web systems. **[8]**

b) Explain Search Engine working. **[8]**

Q8) a) Explain Localization and Internationalization. **[8]**

b) Explain platforms for Web development. **[8]**

Q9) a) Illustrate Java Beans. **[8]**

b) Illustrate use of WSDL. **[8]**

Q10) Short notes (any 3): **[18]**

a) JSR 168.

b) RSS feeds.

c) JNDI.

d) JMS.

e) Servlets.

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Total No. of Questions :10] **[Total No. of Pages :2**

P1527

[3965] - 850

M.E. (Information Technology)

MOBILE COMPUTING AND M-COMMERCE

(2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are various strengths of SMS? Explain all of them? Also state what are the applications areas where these strengths can be used? **[8]**

b) Why VLR regarded as distributed HLR? What particulars about mobile will you like to keep in the VLR database? **[8]**

Q2) a) Define the term: IMEI, IMSI, TMSI and SIM. **[8]**

b) Mobile IP provides the ability of a host to stay connected to the internet regardless of their location and without needing to change the mobile host's long-term IP address. Explain Mobile IP operation with suitable diagrams. **[10]**

Q3) a) Describe the GPRS architecture and protocols. How many of them already exist in GSM? **[8]**

b) Summarize the main features of 3rd generation mobile phone system. How do they achieve higher capacities? How does UMTS implement asymmetrical communication and different data rates? **[8]**

Q4) a) What is the major difference between the main functionality of mobile-originated messaging and GSM call-origination procedures? **[8]**

b) Explain frequency reuse in Cellular Communications. What are the advantages of this approach? List different frequency reuses schemes and explains any one of them. **[8]**

P.T.O.

Q5) Write a short note on: **[16]**

a) Co-channel Interference

b) EDGE

SECTION - II

Q6) a) Draw the GPRS architecture showing the main components. Which is the component responsible for assignment of an IP address to the mobile? Why does there is a need of mapping between the mobile's IMSI and its IP address? **[10]**

b) Describe in brief difference between Electronic Commerce (E-Commerce) and Mobile Commerce (M-Commerce). **[8]**

Q7) a) Write a short note on m-commerce life cycle. **[8]**

b) What is Wi-Max? How it is different than Wi-Fi? **[8]**

Q8) a) Explain the relation between GSM, CDMA and WAP. **[8]**

b) What are the reasons for WAP defining its own security layers? Discuss the important function of WSP and WAE. **[8]**

Q9) a) Explain framework for m-commerce and levels of framework. **[8]**

b) List and explain at least 4 emerging applications of m-commerce. **[8]**

Q10)a) What do you mean by DECT? Explain its system architecture. **[8]**

b) What are the various emerging issues in mobile commerce? Explain. **[8]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1533 **[3965] - 881**

M.E. (Instrumentation & Control) (Process and Biomedical Instrumentation)

INDUSTRIAL AUTOMATION

(2008 Course) (Elective - I) (5061105)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in brief Data Base Organization of typical DCS system. **[8]**

b) Write note on Development of User Requirement Specification (URS) for automation. **[8]**

Q2) a) A water pump is driven by a motor. The pump is used for two water lines, where two solenoid valves are used, one in each line; feeding to two separate tanks.SV-l operates immediately on starting the pump while SV-2 remains closed. After desired level in 'Tank l' is reached (detected by level switch LS-l) SV-1 is closed & SV-2 is opened & water is delivered to the 'Tank-2'.After filling tank-2 to desired level (detected by level switch LS-2) SV-2 & also pump are automatically turned Off. Start & Stop push buttons are provided for the pump as usual. Draw sketch of the process. Prepare a relay ladder diagram for the same. **[10]**

b) Explain in brief different types of Sequencer. **[6]**

Q3) What are the basic tools of SPC and their main application areas? Explain Multivariate charts in brief. **[16]**

P.T.O.

Q4) Design Fuzzy Logic Controller for water heating system. Assume suitable data if necessary. **[18]**

SECTION - II

Q5) Elaborate with suitable example implementation of the MPC strategy. Explain in brief different forms of model used for Linear MPC applications. **[16]**

Q6) Explain in brief related to DCS system: **[16]**

a) Medium access control procedures

b) Automation functions of system levels

Q7) Describe in brief main sub processes involved in the Iron Plant. Develop DCS based configuration of blast furnace control. **[18]**

Q8) Write notes on: **[16]**

a) OPC.

b) Interfacing PLC with SCADA Software.

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Total No. of Questions :6] **[Total No. of Pages :1**

P1565

[3965] - 925

M.E. (Printing)

ENTREPRENEURSHIP IN PRINTING AND ALLIED FIELDS

(2008 Course) (508105 - B) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each sections.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicates full marks.***

SECTION - I

Q1) a) What is Entrepreneurship in printing and allied Industry. **[15]**

b) What is work flow in Printing Industry. **[10]**

Q2) Explain in details laws affecting printing concern, publisher and an author. **[25]**

Q3) a) Explain cost Estimates in Printing Industry. **[13]**

b) What is standard production Time. **[12]**

SECTION - II

Q4) a) What is prizing & profit estimation in Printing Industry. **[15]**

b) How standard production data is used in Printing Industry. **[10]**

Q5) Explain in details procedure for Market Research. **[25]**

Q6) a) Explain Laws related to employment. **[15]**

b) Explain Tax structure while selling product in the market. **[10]**

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Total No. of Questions :6] **[Total No. of Pages :2**

P1594

[3965] - 444
M.E. (Civil/ Hydraulics)
HYDROPOWER
(2008 Course) (501305) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State objectives of hydropower policy 1998 and briefly explain policy initiatives. **[12]**

b) Define: **[5]**

i) Plant factor ii) Load factor

iii) Capacity factor iv) Utilization factor

v) Power factor

c) An upper middle class family has five rooms and the electricity consumption is as follows. Calculate monthly electricity bill in terms of units. **[8]**

i) In each room, there are two lights (totaling 160 W and usage 4 hrs per day) and one fan of 50 W (usage 10 hrs per day).

ii) One refrigerator of 220 W and usage is 20 hrs per day.

iii) One AC of 1400 W and usage is 6 hrs per day

iv) One geyser of 2000 W and usage is 1 hr per day

v) One TV of 160 W and usage is 6 hrs per day

vi) One mixer of 50 W and usage is 1 hr per day

vii) One electric iron of 550 W and usage is 1 hr per day.

P.T.O.

Q2) a) State and explain various components of ROR power plant. **[10]**

b) With the help of a load curve discuss the combined efficiency of a power generation scheme shared by thermal and pumped storage plant. **[10]**

c) Explain disadvantages of hydroelectric power plants. **[5]**

Q3) a) Explain principal component systems in a layout of powerhouse. **[12]**

b) Write a short note on:

(i) Merits of underground powerhouse. **[5]**

(ii) Briefly explain any powerhouse you have visited. **[8]**

SECTION - II

Q4) a) Write a note on advantages and disadvantages of buried penstocks. **[10]**

b) Briefly explain hydraulic design of penstocks. **[5]**

c) What is a surge tank? How it helps absorbing water hammer pressure? **[10]**

Q5) a) Determine minimum number of Francis turbines required for a power plant having 250 cumec flow and 25 m head. The generator is directly coupled to the turbine which has specific speed of 250 rpm, efficiency 85 %. The frequency of generation is 50 cycles/s and number of poles used is 20. **[8]**

b) Explain theory of draft tube. **[10]**

c) Describe governing of reaction turbine with neat sketch. **[7]**

Q6) a) Write a short note on objectives of micro hydro development. **[15]**

b) Briefly explain the cost of micro hydro and its financial profitability. **[10]**

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Total No. of Questions :6] **[Total No. of Pages :2**

P1595

[3965] - 455

M.E. (Civil) (Structures)

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2008 Course) (501404) (Elective - I)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data, if necessary.***

SECTION - I

Q1) a) Write short note with sketches on Hillerborgs strip method. **[7]**

b) Draw yield lines for the following: **[8]**

i) Equilateral triangular slab fixed at two sides and unsupported third side.

ii) Rectangular slab with fixed at supports on long sides with shorter side simply supported and other shorter side unsupported.

c) Design a RCC slab for a circular hall of diameter 5 m using Yield Line Theory. Assume the peripheral support thickness 300 mm ,The slab is simply supported Use M20 Fe415 take Live load = 5 kN/m^2 & floor finish load = 1.5 kN/m^2. Draw reinforcement details. **[10]**

Q2) a) Design a flat slab for a hall with column spacing 6.2 m × 6.2 m c/c. the size of the column is 550 mm × 550 mm each Use M20 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 0.9 kN/m^2. Draw reinforcement details. **[10]**

b) Design a grid slab for a floor of hall 12 × 15 m c/c having square grid of 1.5m. Use M25 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 1.5 kN/m^2. Apply the required check & draw reinforcement details. **[15]**

P.T.O.

Q3) Design a staging for circular type ESR for 3.5 lakh liters with staging height 12 m using M25, Fe500 in earthquake zone III. Safe bearing capacity is 180 kN/m^2. Design of container is not required. Assume approx dimension of container, wall, top, bottom slab thickness, beams sizes & number of columns. Design must include Calculations of vertical loads and horizontal force calculations Design the bracings, columns and foundations. Draw the reinforcement details. **[25]**

SECTION - II

Q4) Design deep beam of a hall for flexure and shear for the following:

Clear span = 4.8 m, width of support = 500 mm, working UDL on the beam 1400 kN/m. Take the total depth of beam = 3.6 m Use M35 & Fe500. Show all Analysis and Design calculations & draw the reinforcement details. **[25]**

Q5) a) Write detailed note on flanged shear wall.

b) A two span prestressed concrete continuous beam ABC having cross section 200 × 750 mm simply supported at A & C and continuous over B. The eccentricities of the parabolic cables at A & C = 0, at B = 200 mm above neutral axis and at midspan of AB & BC = 280 mm below it. Material used is M45 and multistrand cables 2 Nos 7T13 (having 7 strands of 100 mm^2 with fy = 1950 N/mm^2), stressed to 75% of fy. each span is of 15 m, superimposed load on both the spans 16 kN/m.

i) Determine primary, secondary moment at support at prestress and dead load.

ii) Draw the resultant line of thrust at working load.

iii) Calculate shift and stress in extreme fibers at working load. **[25]**

Q6) Design post tensioned prestressed concrete slab for a floor for the following:

Flat interior panel of 6.2 m × 6.2 m, live load on slab 5 kN/m^2, floor finish load on slab = 1.5 kN/m^2,concrete grade M50 HT steel is cables (having strand area of 100 mm^2 with fy = 1950 N/mm^2). Assume 3 panels in each direction (floor size 18 m x 18 m) width of the beam on periphery of floor 600 mm and column size 600 mm × 600 mm. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

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Total No. of Questions :6] **[Total No. of Pages :3**

P1596 **[3965] - 456**

M.E. (Civil/Structures)

STRUCTURAL DESIGN OF CONCRETE BRIDGES

(2008 Course) (501404) (Elective - I)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC - 5, 6, 18, 27, 45, 78 & 83 codes, IS 1343, IS 456-2000 is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) List the steps in design for single span rigid frame bridge assuming the fixed at the base. **[8]**

b) Write detail note on design of bridge substructure stating factors affecting the design. **[8]**

c) Write short note on IRC standards for loads on different bridges. **[9]**

Q2) Design intermediate post tensioned prestressed concrete Tee Beam Bridge for the following: **[25]**

Effective span = 15m, width of carriageway = 7.5m, No. of beams 4 equally spaced along the carriageway width, Spacing of cross girders = 3m c/c, width of footpath on either side of carriageway =1.0m loading class = IRC class AA, kerb size = 200mm × 600mm , concrete grade M45. Design should include detail load ,bending moment calculation, Check fiber stresses in concrete Draw sketches showing cable profiles.

P.T.O.

Q3) a) Write detail note on Courbon's Theory used for determining the fraction load carried by the longitudinal girders. **[10]**

b) Design box culvert bridge for following data: **[15]**

i) Loading class A

ii) Clear span of the culvert = 5.5m

iii) Clear carriage way width = 7.5m

iv) Size of kerb = 300mm × 600 mm

v) Average thickness of wearing coat 80mm

vi) Use material M25,Fe 500

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

SECTION - II

Q4) a) Draw schematic sketch of cable stayed bridge covering all components, also state function pylon in detail. **[8]**

b) Under which situation; the load testing of the bridge superstructure is necessary? State concerned IRC recommendations. **[8]**

c) Describe different types expansion joints used for bridge with the help of sketches stating merits and demerits of each type. **[9]**

Q5) a) write note on data required for design of bridge foundation. **[10]**

b) Check the stability of the pier for the following: **[15]**

i) Top width of abutment = 1.2m

ii) Height of pier up to springing level = 9m.

iii) Side face is battered at 1: 12

iv) HFL = 1m below bearing level

v) Span of bridge = 15m

vi) Loading = IRC Class AA.

vii) Road = Two lane with 1 m wide footpath on either side

viii) Superstructure: Three longitudinal girders of depth 1.2 m with slab thickness 230mm web width 300mm.

ix) Material of pier = M25 concrete.

Q6) a) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data. **[15]**

i) Maximum vertical load = 1200 kN

ii) Dynamic vertical load = 80 kN

iii) Transverse lateral load = 30 kN

iv) Longitudinal load = 60 kN

v) Longitudinal total translation 9 mm

vi) Rotation at support 0.003°

vii) Shear modulus of elastomeric bearing = 1.2 N/mm^2

viii) Allowable comp. stress for concrete = 8 N/mm^2

ix) Allowable comp. stress for elastomer = 10 N/mm^2

b) Draw detailed cross section of typical box caisson Name all components, also write functions of each. **[10]**

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Total No. of Questions :10] **[Total No. of Pages :3**

P1597

[3965] - 524

M.E. (Mechanical Engg.) (Design Engg.)

VEHICLE DYNAMICS

(2008 Course) (Elective - IV) (502212)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) "Vibration isolation for the sprung mass (i.e., vehicle body) is achieved, if natural frequencies of the sprung and un-sprung mass are widely separated" - Justify. **[8]**

b) The sprung parts of a passenger car weigh 9000 N and the un-sprung parts weigh 900 N. The combined stiffness of the suspension springs is 55 kN/m and that of the tires is 555 kN/m. Determine the two natural frequencies of the bounce motions of the sprung and un-sprung mass. **[8]**

OR

Q2) The sprung parts of a vehicle weigh 10 kN, its center of gravity is 1 m behind the front axle, and the wheelbase is 2.3 m. The combined stiffness of the springs of the front suspension is 25 kN/m and that of the rear suspension is 26.5 kN/m. The radius of gyration of the sprung parts about a horizontal transverse axis through the center of gravity is 102.6 cm. Calculate the natural frequencies of the pitch and bounce motions of the vehicle body. Also determine the locations of the oscillation centers. If the radius of gyration of the sprung parts of the vehicle can be varied, determine the conditions under which the oscillation centers of the vehicle body will be located at the points of attachment of the front and rear springs. Also calculate the natural frequencies of the sprung parts. **[16]**

P.T.O.

Q3) A sports car weighs 10 kN and has a wheelbase of 2.3 m. The center of gravity is 1.25 m behind the front axle. The cornering stiffness of each front tire is 60 kN/rad and that of each rear tire is 71 kN/rad. The steering gear ratio is 20:1 and has a mass moment of inertia about a vertical axis passing through its center of gravity of 570 kg-m^2. If the car is given a step input of steering wheel angle of 30° at a speed of 80 km/h, determine the rise time for the yaw velocity response. **[16]**

OR

Q4) A passenger car weighs 20 kN and has a wheelbase of 2.8 m. The center of gravity is 1.3 m behind the front axle. If a pair of radial-ply tires, each of which has a cornering stiffness of 46 kN/rad, are installed in the front, and a pair of bias-ply tires, each of which has a cornering stiffness of 33 kN/rad, are installed in the rear, determine whether the vehicle is understeer or oversteer. Also calculate the characteristic or critical speed of the vehicle as appropriate. What would happen to the steady-state handling characteristics of the vehicle, if the front and rear tires are interchanged. **[16]**

Q5) Write short notes: **[18]**

a) Constant speed test

b) Constant radius test

c) Constant steer angle test

SECTION - II

Q6) A tracked vehicle is equipped with a controlled differential steering system having a gear ratio of 3:1. The vehicle weighs 155 kN, and has a tread of 2 m and a contact length of 3 m. The contact pressure of the track is assumed to be uniform. On a particular terrain, the value of the coefficient of motion resistance is 0.15, and that of the coefficient of lateral resistance is 0.5. Determine the minimum turning radius of the vehicle. Also calculate the power required to maintain a steady-state turn at the minimum turning radius when the speed of the center of gravity of the vehicle is 10 km/h. **[16]**

OR

Q7) Derive conditions for sequence of tire locking during braking. **[16]**

Q8) Derive the condition for maximum braking forces of front and rear tires be developed at the same time. **[16]**

OR

Q9) A vehicle weighs 20 kN and has a wheelbase of 2.8 m. The center of gravity is 1.3 m behind the front axle and 50 cm above ground level. The frontal area of the vehicle is 2.32 m^2 and the aerodynamic drag coefficient is 0.45. The coefficient of rolling resistance is given by $f_r = 0.0136 + 0.4 \times 10^{-7} V^2$, where V is the speed of the vehicle in kilometers per hour. The rolling radius of the tires is 33 cm. The coefficient of road adhesion is 0.8. Estimate the possible maximum speed of the vehicle on level ground as determined by the maximum tractive effort that the tire-road contact can support if the vehicle is (a) rear-wheel drive, and (b) front-wheel-drive. Plot the resultant resistance versus vehicle speed, and show the maximum thrust of the vehicle with the two types of drive. **[16]**

Q10) Write short notes: **[18]**

a) Skid Steering.

b) Spectral density.

c) Frequency Response Function.

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Total No. of Questions :8] **[Total No. of Pages :3**

P1598

[3965] - 533

M.E. (Mechatronics)

CONTROL SYSTEMS

(2008 Course) (502805) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever necessary.***

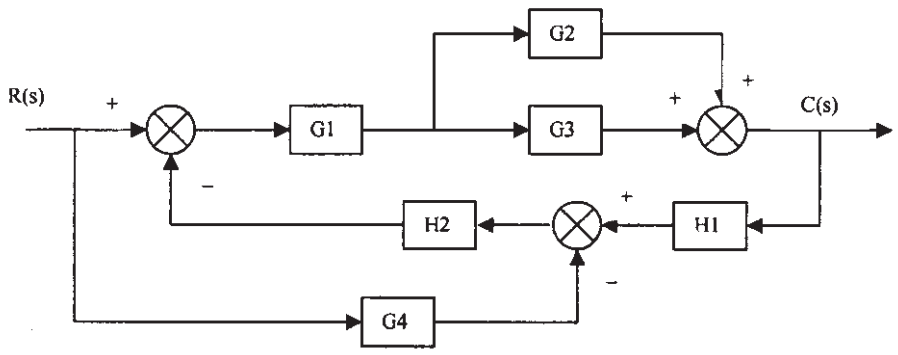
SECTION - I

Q1) a) Distinguish between the following. **[8]**

i) Time variant and Time invariant control systems.

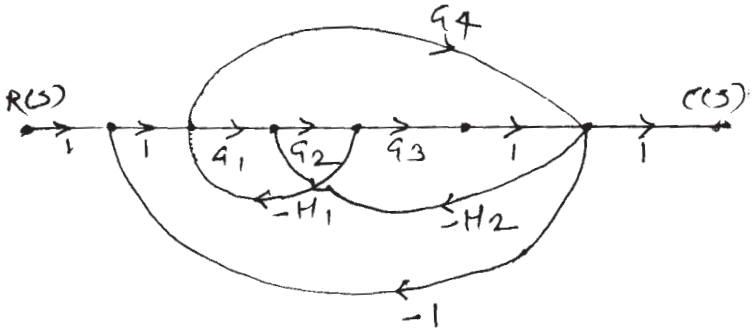
ii) Open loop and closed loop control systems.

b) Reduce the following block diagram of the system shown in following figure into a single equivalent block by block diagram reduction technique. **[8]**



P.T.O.

Q2) a) Obtain the closed loop transfer function C(S)/ R(S) using Mason's gain formula. **[8]**



b) Explain standard test signals and state clearly the difference between steady state and transient response of a system. **[8]**

Q3) a) A system has open loop transfer function as **[10]**

$$G(S)\ H(S) = \frac{10}{S(S+5)}$$

Find the underdamped natural frequency, the damping ratio, the damped natural frequency, rise time, peak time, peak overshoot, and settling time with 2% criterion.

b) Examine the stability by Routh's criterion for the characteristics equation. **[8]**

$$S^6 + S^5 + 3S^4 + 3S^3 + 2S^2 + S + 1 = 0.$$

How many roots of the system lie in the RHS of S plane?

Q4) a) Write short notes on: **[8]**

i) Adaptive control ii) Optimal control.

b) What are MIMO control systems? Briefly explain. **[8]**

SECTION - II

Q5) a) Write short note on comparison on time domain and frequency domain analysis. **[6]**

b) The loop transfer function of a unity feedback control system is **[10]**

$$G(S)\ H(S) = \frac{k}{S(S+2)(S+5)}$$

Sketch the root locus of the system, Determine the value K for marginal stability from the root locus.

Q6) a) A unity feedback control system has **[12]**

$$G(S)\,H(S)=\frac{100}{S(1+0.1s)\,(1+0.2s)}$$

Sketch bode plot. Determine from it

i) Gain crossover frequency. ii) Phase crossover frequency.

iii) Gain margin. iv) Phase margin

v) Stability of system.

b) State advantages and disadvantages of state variable analysis over conventional control system. **[4]**

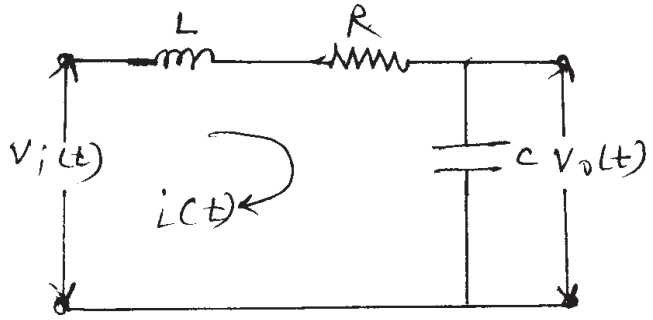
Q7) a) Explain the following terms. **[8]**

i) State (ii) State variable.

iii) State space (iv) State vector.

b) Obtain the state model of the given electrical network in standard form. Given at **[8]**

$t = t_0$, $i(t) = i(t_0)$ and ,$V_0(t) = V_0(t_0)$



Q8) a) Give the classification of controllers and explain the characteristics of on-off, P, I, D, PID controllers. **[10]**

b) Sketch and comment on the outputs of P, PI, PD and PID controllers for a ramp input. **[8]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1617

[3965] - 50

M.E. (Mechanical) (Heat Power Engg.)

ADVANCED THERMODYNAMICS

(2002 Course) (502103)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain availability; Irreversibility & Entropy production. **[6]**

b) A compressed air receiver of $0.5m^3$ capacity contains air at 16 bar, 85ºC. The air gets cooled to 10ºC by transfer of heat to the surroundings. Which are at 08ºC. **[10]**

Calculate:-

i) Initial & final availability. ii) Irreversibility, and

iii) Work done.

Q2) a) Describe the generalized compressibility chart. **[6]**

b) Define critical point & triple point with suitable diagram. **[4]**

c) Write down the Vaander Waal's equation and state how it differs from the equation of state for an ideal gas. What is volume and force of cohesion. **[6]**

Q3) a) State and explain Helmholtz and Gibb's function. **[6]**

b) With usual notations derive the following thermodynamic relations: **[10]**

i) $\left(\frac{\partial Cp}{\partial p}\right)_T = -\vartheta T \beta^2$ ii) $\left(\frac{\partial s}{\partial p}\right) = -\left(\frac{\partial \vartheta}{\partial T}\right)_P$

P.T.O.

Q4) Write short notes (any three):- **[18]**

a) Joule Thompson coefficient and Inversion curve.

b) Maxwell Relations.

c) Clausius clay peyron equation.

d) T - ds equations.

SECTION - II

Q5) a) A rigid chamber of $0.35m^3$ capacity contains 2.2 kg of a certain gas 10ºC. Heat is supplied to the gas until its temperature becomes 105ºC. Calculate: **[9]**

i) Change in internal energy.

ii) Change in enthalpy & entropy.

Show the process on p-v and T-s diagram.

b) What is fugacity and activity? Explain. **[7]**

Q6) a) Write a note on adiabatic flame temperature. **[6]**

b) Explain :- **[10]**

i) Amagat's law.

ii) Kay's rule.

iii) Dalton's law of partial pressure.

Q7) a) Discuss briefly: **[10]**

i) Equilibrium constant ii) Gibb's phase rule

b) Octane (C_8H_{18}) is burnt with 40% excess air. Estimate the actual & theoretical air-fuel ratio. **[6]**

Q8) Write notes on (Any Three): **[18]**

a) Nerst theorem & thermal heat death of universe.

b) Bose-Einstein statistics.

c) Fermi - Dirac statistics.

d) Entropy and probability.

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Total No. of Questions :8] **[Total No. of Pages :3**

P1800 **[3965] - 449**

M.E. (Civil) (Hydraulic Engineering)

COASTAL ENGINEERING

(2008 Course) (Elective - III) (501311)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question No. one (section I) and five (section II) are compulsory.***
2) ***Answer any two questions each from section I and section II.***
3) ***Answers to the both sections should be written in separate books.***
4) ***Neat diagrams must be drawn whenever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of the electronic pocket calculator and standard tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State True or False with reasons (any four): **[8]**

i) Breaker zone is a deep water phenomenon.

ii) Diffraction of the wave takes place in the presence of coastal structure.

iii) There is loss of wave energy in the wave refraction process.

iv) The form of the sea waves is sinusoidal in the coastal region.

v) The long shore sediment transport is parallel to the shore.

b) Explain the difference between (any four): **[10]**

i) Off shore & near shore region.

ii) Deep water & shallow water.

iii) Regular & random wave.

iv) Sea & swell waves.

v) Storm & Tsunami.

P.T.O.

Q2) a) Explain with neat sketches the phenomena of refraction & diffraction of sea wave. What is the significance of the coefficient of Refraction & shoaling on the wave height in the shallow region? **[8]**

b) Write short notes (any two): **[8]**

i) Wave generation in deep water.

ii) Monsoons on east & west coast of India.

iii) Normalized Wave Spectrum.

iv) Assumptions in the linear wave theory.

Q3) a) Draw neat sketch of the cross section of the sea portion up to the shore & show the following: **[6]**

i) Changes in the wave form.

ii) Region of deep, intermediate & shallow water,

iii) Breaker zone,

iv) Shape of wave induced currents.

v) Equation for wave length in each region.

b) Explain terms in the short term & long analysis of recorded wave data & significance of the results in the estimation of the wave climate. **[10]**

Q4) a) Define the following terms. **[6]**

i) Significant wave height.

ii) Normalized wave spectrum.

iii) Swell waves

iv) Fully developed sea.

v) Average wave period

vi) Semi Diurnal Tide.

b) Describe the various methods used for field data collection & recording of coastal parameters. **[10]**

OR

Explain in brief with sketch the Tucker's method for computation of Significant Wave Height (Hs).

SECTION - II

Q5) a) State true or false with reasons (any four): **[8]**

i) Littoral sand transport is related to suspended load in deep water.

ii) Hudson formula provide the optimum slope for the breakwater.

iii) Tidal range increases in the long estuary.

iv) Sand trap is located on the up-drift side of the breakwater.

v) Offshore breakwater is located parallel to the shore.

vi) Sediment budgets is tool for estimation of net sediment at the Specific site.

b) What are the different methods for coastal protection? Explain with neat sketches. **[10]**

Q6) a) Explain the significance of longshore energy flux factor in the development of longshore transport rate formulae. **[6]**

b) Write short notes on (any four): **[10]**

i) Relation between changes in beach volume & shoreline.

ii) Sand -trap design criteria.

iii) Beach nourishment methods.

iv) Winter & summer beach profiles.

v) Offshore breakwater.

Q7) a) What is the significance of extreme waves in the Computation of "life time" wave for the design of coastal structure. Briefly describe any one method. **[10]**

b) Explain the use Hudson formula for design of breakwater, & state the reasons for it's applicability over last 50 years. **[6]**

Q8) a) What are functional aspects of sea wall? Explain the various methods of construction with sketches. **[8]**

OR

What are various coastal processes responsible for shoreline changes or configuration?

b) Sketch & explain in brief the variety of landforms due to erosion & accretion. **[8]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1801

[3965] - 148

M.E. (Electronics) (Digital System/Computer)

COMPUTER NETWORKS

(2002 Course) (504304)

Time : 3 Hours] ***[Max. Marks :100***

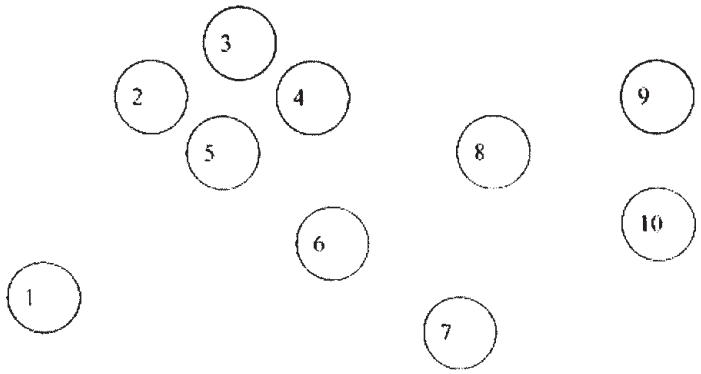
Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule and electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the Network design issues in brief. **[9]**

b) For the terminals shown in figure apply the Dysart-Georganas algorithm for k =4, to determine concentrator location list. **[9]**



Q2) a) Messages (independently) arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600 bps channel. A character is 8 bit long. **[8]**

i) What is the average service time?
ii) What is the arrival rate?
iii) What is the service rate?
iv) What is the utilization of the server?

b) Explain M/M/m/q systems and derive necessary equations. **[8]**

P.T.O.

Q3) a) Explain Address Resolution Protocol (ARP) and Reverse Address Resolution Protocol (RARP). **[8]**

b) What are the advantages and disadvantages of Adaptive Routing and Explicit Routing? **[8]**

Q4) a) Describe the network performance parameters and explain how they can be estimated? **[8]**

b) Explain BG algorithm for flow measurement. **[8]**

SECTION - II

Q5) a) Suppose traffic with intensity 2 Erlangs is offered to 3 lines. What is the probability of loss predicted by Erlang-B, Erlang-C and Poisson formulas? **[8]**

b) Explain infrastructure based wireless LAN. Explain protocol architecture and bridging in 802.11 **[8]**

Q6) a) Describe IPv6 and highlight important features of it. **[8]**

b) What are the services offered by TCP to an Application Layer? Explain TCP/IP socket programming in brief. **[8]**

Q7) a) Explain the types of firewalls. **[8]**

b) In a public key system using RSA, you intercept the ciphertext C = 10 sent to a user whose public key is e = 5, n = 35. What is the plaintext M? **[8]**

Q8) Write short notes (Any Three): **[18]**

a) VoIP

b) Video conferencing.

c) SNMP.

d) Bluetooth.

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Total No. of Questions :8] **[Total No. of Pages :3**

P1823 **[3965] - 624**

M.E. (E & TC) (MICROWAVE)

SOFTWARE PROJECT MANAGEMENT

(2008 Course) (Elective - IV) (504232)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any three questions from section I and any three questions from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Project Management? Explain five goals of project? Explain the role of Project Manager in Project Management. **[12]**

b) What are the main challenges while implementing the Software Project? How to overcome these challenges? **[6]**

Q2) a) Identify the actions that could prevent each of the following risks from materializing or could reduce the impact if it did occur: **[10]**

i) A key member of the programming team leaving;

ii) A new version of the operating system being introduced which has errors in it;

iii) A disk containing copies of the most up-to-date version of the software under development being corrupted;

iv) System testing unearths more errors than were expected and takes longer than planned;

v) The government changes the taxation rules which alter the way that VAT is to be calculated in an order processing system under development.

P.T.O.

b) What is Risk? Explain different categories of Risk with Risk management Model. Tools and techniques for Risk identification, Risk analysis & Risk response planning. **[6]**

Q3) a) Describe an overall framework for Project Integration Management to integrate different pieces developed by the teams of the Project. **[4]**

b) Explain the following: **[12]**

i) Cost estimation.

ii) Quality planning

iii) PERT Chart

Q4) a) Explain brainstorming technique for problem-solving, team-building and creative process. **[8]**

b) Draw an Activity Network using either Activity-on-Node or Activity-on-Arrow network conventions for each of the following projects: **[8]**

- Choosing and purchasing a desktop computer.
- Getting married.
- Travel from Pune to Mumbai.

SECTION - II

Q5) a) How would you evaluate the following aspects of a proposal? **[8]**

i) The usability of an existing software application.

ii) The usability of a software application that is yet to be designed and constructed.

iii) The maintenance costs of hardware to be supplied.

iv) The time taken to respond to requests for software support.

v) Training.

b) Explain the categories of data function types. Also explain the rules for identification. **[8]**

Q6) a) What is the difference between Customers & Stakeholders? How to Manage Stakeholders in Software Development Projects. **[8]**

b) Explain the project phase review & briefly explain five ways of review? **[8]**

Q7) a) What are the benefits of function points? Explain the function point analysis methods. **[8]**

b) Define the transaction function. Explain the two components of transaction function that decides its complexity. **[8]**

Q8) Explain the following: **[18]**

a) General System Characteristics.

b) Project Procurement Management.

c) Project Control in Project Management.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1826 **[3965] - 736**

M.E. (Production) (CAD/CAM)

TECHNOLOGY MANAGEMENT

(2010 Course) (Elective - IV) (511212)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define Technology Management. State various functions of technology management. Explain the relation of it with business management. **[8]**

b) Explain management of technology strategy. How mergers and takovers considered as potential strategy in a competitive market? **[8]**

Q2) a) Explain in brief various types of organisational structure for promotion of creativity & innovation. **[8]**

b) Explain the following concepts: **[8]**

i) Ishikawa and Reverse Ishikawa diagrams.

ii) Mind mapping.

Q3) a) State and explain the concept of acquiring technology through technology transfer for leveraging business profit. **[8]**

b) Differentiate between invention and innovation. Explain the role of research & development activity for any product development. **[8]**

P.T.O.

Q4) Write short notes on Any Three. **[18]**

a) Models of management of Technology.

b) Strategy for environment & sustainable development.

c) Challenges in commercialization of research.

d) Imperative of knowledge management.

SECTION - II

Q5) a) State and explain the role of WTO in international business. **[8]**

b) What is patent? How it differs from copy right? Explain Patenting procedure in India. **[8]**

Q6) a) State and explain various steps in project report preparation. **[8]**

b) Differentiate between innovation and research. What are the objectives of newly setup innovation foundation? **[8]**

Q7) a) Explain the procedure steps followed in Analytical Hierarchical Process (AHP) with a suitable example of industrial products. **[8]**

b) What do you understand by the term "Convergence technology"? What are its implications for the technology industry? **[8]**

Q8) Write short notes on Any Three. **[18]**

a) Procedure for world patenting.

b) Various Government schemes of innovation.

c) Items which can be patented.

d) Limitations of Analytical Hierarchical Process.

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Total No. of Questions :8] **[Total No. of Pages :3**

P1827 **[3965] - 736 - B**

M.E. (Production) (CAD/CAM)

COMPUTATIONAL FLUID DYNAMICS

(2010 Course) (511212) (Elective - IV)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Derive an expression for energy equation for infinitesimally small, moving fluid element. **[16]**

Q2) a) Clearly distinguished between the Finite difference, FEM and FVM methods used for solving CFD problems. Why FVM as preferred method in CFD? **[10]**

b) Explain the following terms used in CFD: **[8]**

i) Conservation form of governing equations.

ii) Non-conservation form of governing equations.

iii) Substantial derivative.

P.T.O.

Q3) a) Consider the one-dimensional convective type equation $\frac{\partial T}{\partial t} + u\frac{\partial T}{\partial x} = 0$.

Determine the use of the von Neumann stability method to analyse the stability properties of the linear partial differential equation. Comment on courant number. **[10]**

b) Distinguish between discretization and round-off error. Compare them with suitable example. **[6]**

Q4) The one-dimensional transient diffusion equation is given as,

$$\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}$$

By applying the finite-difference discretization to the equation, discuss the stability of the numerical solution using the explicit finite difference method at two different time-step sizes of $\Delta t = \frac{1}{1000}$ and $\Delta t = \frac{1}{10}$ with a fixed grid step size of $\Delta x = \frac{1}{10}$. Approximate the time and spatial derivatives according to first order forward and second order central differences. The initial condition is set according to $T(t = 0, x) = 1 - x + \sin(2\pi x)$, where $0 \leq x \leq 1$ & $T(t, x = 0) = 1$ and $T(t, x = 1) = 0$ respectively. The thermal diffusivity α is also assumed constant with a value of 0.5. Compare the results after 5th iterations & comment on the stability of the solution. **[16]**

SECTION - II

Q5) For a quasi one dimensional compressible flow in a converging - diverging nozzle.

a) Derive following continuity equation. **[6]**

$$\frac{\partial(\rho A)}{\partial t} + \frac{\partial(\rho A V)}{\partial x} = 0.$$

b) Write momentum and energy equation for this nozzle, in partial differential form. **[2]**

c) Show how density is updated using Mac-Cormack method. **[10]**

Q6) a) Why staggered grid is adopted in incompressible flow? **[2]**

b) Show how the staggered grid is implemented for the pressure equation (simple). **[6]**

c) Present the SIMPLE algorithm and show how the pressure is determined. **[8]**

Q7) Outline the MAC-Algorithm and show how the incompressible flow field is obtained. **[16]**

Q8) a) Derive the forward and central difference approximations to the first derivatives, along with the leading error term. **[8]**

b) Explain following with merits and demerits: **[8]**

i) Explicit Method

ii) Implicit Method

iii) Semi-Implicit Method.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1829

[3965] - 842

M.E. (IT)

NETWORK PROGRAMMING

(2008 Course) (Elective - II) (514422)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain the allocation of port number scheme.

b) Explain the overview of TCP/IP protocols.

[16]

Q2) a) Explain simple echo client server along with the functions used for input and output.

b) Compare the various socket address structure of IPV4, IPV6, Unix domain and Data link.

[16]

Q3) a) Explain the structure of Data link address.

b) Explain the three types of operations which are supported on routing socket.

[16]

Q4) a) Explain TCP connect function in detail.

b) Draw and explain the typical arrangement of client, resolver and name server.

[18]

P.T.O.

SECTION - II

Q5) a) Signify the source and code portability of IPV4 and IPV6.

b) Explain the steps that allow an IPV4 TCP Client to communicate with an IPV6 server.

[16]

Q6) a) Explain the differences between Unicast, Broadcast and Multicast with proper examples.

b) Explain different forms of addressing supported by IPV4 and IPV6 along with TCP and UDP.

[16]

Q7) a) How simultaneous connections will be served by Web server.

b) What is Fork? What are problems faced by fork for implementation?

[16]

Q8) a) What do you mean by PreForking process?

b) Write a short note on TCP concurrent server.

[18]

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Total No. of Questions :8] **[Total No. of Pages :2**

P1830 **[3965] - 852**

M.E. (IT)

ADVANCE NETWORK PROGRAMMING

(2008 Course) (Elective - IV) (514412)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat diagram how concurrent server has child handle client? **[8]**

b) Explain how buffer sizes limits the size of input datagram? **[8]**

Q2) a) Explain Socket Function in detail. **[8]**

b) Write a short note on Byte Order function. **[8]**

Q3) a) Explain Interface name and Index functions in detail. **[8]**

b) Explain how reading from and writing to kernel takes place through socket. **[8]**

Q4) a) Explain TCP Connect function in detail. **[9]**

b) Give a short note on Domain Name System. **[9]**

P.T.O.

SECTION - II

Q5) a) Explain IPV6 address Testing Macros. **[8]**

b) How IPV6 server on dual stack host serving IPV4 and IPV6 clients. **[8]**

Q6) a) Explain Race Condition for shared data accession in detail. **[8]**

b) List and Explain different types of broadcast address. **[8]**

Q7) a) Explain the Write a short note on TCP echo server using threads. **[8]**

b) Explain Thread functions for creating and Termination. **[8]**

Q8) a) Give a short note on TCP Iterative Server. **[9]**

b) What are the strength and weaknesses of client design? **[9]**

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1362

[3965] - 30
M.E. (Civil) (Hydraulics)
OPEN CHANNEL HYDRAULICS
(2002 Course) (501302)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive chezy's equation for uniform flow through an open channel. **[6]**

b) Determine the dimensions of the most economical trapezoidal earth lined channel (Manning's n = 0.02) to carry a discharge of $15 m^3/s$ at a slope of 1 in 2500. **[6]**

c) Explain velocity distribution in open channels. **[4]**

Q2) a) In a flume 1 m wide water flows at a depth of 0.98 m with a velocity of 1 m/s.

Find **[8]**

i) Discharge in m^3/s

ii) Froude number

iii) Is the flow subcritical or supercritical

iv) Critical depth

v) How for the bottom level has to be raised so that flow becomes critical.

vi) How for the width of the flume has to be reduced (keeping the bottom line unchanged) so that the flow becomes critical.

b) With usual notations, prove that,

$$Fr_2 = \frac{2\sqrt{2}\ Fr_1}{\left(\sqrt{1 + 8Fr_1^{2-1}}\right)^{3/2}}\ .$$ **[8]**

P.T.O.

Q3) a) A rectangular flume 2 m wide carries discharge at the rate of 2 m^3/s. The bed slope of the flume is 0.00041. At a certain section, the depth of flow is 1m. Calculate the distance downstream where the depth of flow is 0.9 m. Take n = 0.015 solve by step by step method. Take two steps. **[10]**

b) Discuss the characteristics of M_2 profile and state it's occurence. Sketch the possible water surface profile when the flow takes from a mild slope to steep slope followed by a horizontal slope. **[6]**

Q4) a) Derive Dynamic equation for spatially varied flow with increasing discharge. **[10]**

b) Write short notes on : **[8]**

i) Chow's method GVF profile computation.

ii) Channel transition with a hump for supercritical flow.

SECTION - II

Q5) a) Water is released from a sluice gate into a rectangular channel at a velocity of 0.6 m/s and a depth of 1 m. The discharge is suddenly increased to 2.5 times its original value by opening the gate. Find the change in the depth of flow. **[8]**

b) Derive St. Venant's equation of motion for unsteady flow. **[8]**

Q6) a) Define flood routing. What are the uses of flood routing? **[6]**

b) Derive the Muskingum routing equation and the expressions for the routing coefficients C_0, C_1 and C_2. **[10]**

Q7) a) Derive equation of motion of stratified flow. **[8]**

b) Explain finite difference method for solving St. Venant Equation. **[8]**

Q8) Write short notes on : **[18]**

a) Dam break problem.

b) Positive surges.

c) Celerity and stability of surge.



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1363

[3965] - 36
M.E. (Civil Structures)
ADVANCED DESIGN OF STEEL STRUCTURES
(2002 Course) (501508)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of electronic pocket calculator is allowed. I.S. 800, 801, 875, 1915, 1161.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show with neat lebelled sketches the structural arrangement of deck type and through type railway plate girder bridge. Draw types of bracing systems used. **[8]**

b) Sketch various lateral load resisting systems used in frames. **[8]**

c) Explain the types of bridge bearings adopted by IRC for railway bridges show with neat sketch. **[9]**

Q2) a) A deck type 'N' truss bridge has 10 equal panels of 5m each with depth of truss as 5m. For this bridge D.L, L.L are 30 kN/m & 40 kN/m respectively. Draw influence line diagrams for the bottom chord, top chord, inclined member, to carry maximum axial force. Design the built up section for top chord member. Use impact factor 0.37. **[20]**

b) What is racker, What is design force for racker, Draw racker member connection to truss. **[5]**

Q3) A rectangular box section of light gauge steel has sides 125 × 200 mm. The wall thickness is 2mm, fillet radius at all corners is 4 mm. The length of member is 3.5m. **[25]**

a) Calculate axial compressive load carrying capacity when both ends pinned.

b) Calculate max. transverse distributed load supported by beam.

P.T.O.

SECTION - II

Q4) A tubular form work is used to support R.C.C. bridge deck 600 mm thick, 100 mm thick finishing coats. Width of deck slab is 15m. Height of sofit above G.L is 12m. **[25]**

a) Design & sketch arrangement for tubular support used as form work.

b) Use I.S. recommendation to suggest detailing of form work.

Q5) a) Find shape factor for channel section with vertical web. 100 × 10 mm, horizontal flanges 65 × 10 mm. **[9]**

b) Define & explain upper bound & lower bound theorems in plastic analysis, Thus explain complete, over complete & partial collapse condition. **[9]**

c) Differentiate light gauge steel structural members with reference to manufacturing process, types of sections & advantages. **[7]**

Q6) Determine the collapse load for the beam as shown in figure 6. **[25]**

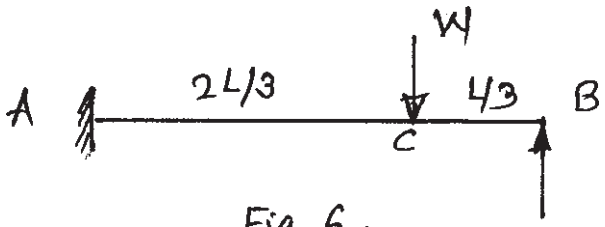


Fig 6.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1365

[3965]-48

M.E. (Mechanical) (Design & Heat Power Engineering)

INSTRUMENTATION & AUTOMATIC CONTROL

(2002 Course) (502102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section I and three questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Distinguish between following with one example each. **[8]**

i) Feedback and Feedforward Control System.

ii) Analog and Digital Control System.

b) Explain the properties of Transfer function. **[8]**

Q2) a) Obtain overall transfer function of the system shown in fig. 1. **[10]**

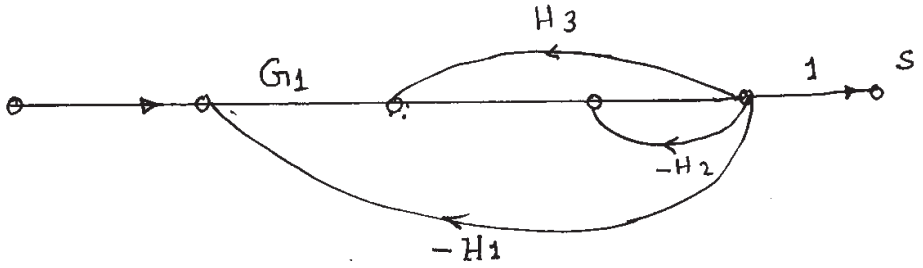


Fig. No. 1.

b) Explain the terms : **[8]**

i) Resolution.

ii) Linearity.

iii) Drift.

iv) Sensitivity.

P.T.O.

Q3) a) Explain the importance of signal flow graph. **[8]**

b) Explain the method of measurement of flow using turbine flow meter. State its merits & demerits. **[8]**

Q4) a) What is meant by stability of control system? Explain the criteria for determining stability. **[8]**

b) Explain advantages & disadvantages over other controllers. **[8]**

SECTION - II

Q5) a) Discuss the step response of First order and Second order system. **[8]**

b) Explain in detail any three data display devices. **[8]**

Q6) a) Explain the principle and working of McLeod gauge for measuring pressure. **[8]**

b) What are the factors influencing selection of Strain gauges. **[8]**

Q7) a) Explain P+I+D Pneumatic Controller. **[8]**

b) Draw a ladder diagram for water level control system. **[8]**

Q8) Write short notes on any THREE : **[18]**

a) Hot wire anemometer.

b) Measurement of very high temperature.

c) Piezoelectric accelerometer.

d) Stages of measurement system.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1366

[3965] - 51

M.E. (Mechanical) (Heat Power)

ENERGY CONSERVATION AND MANAGEMENT

(2002 Course) (502108)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different types of energy audits? List them in the sequence of investment required. **[8]**

b) What are the functions of Energy Manager? What are the functions of Energy Auditor? **[8]**

Q2) a) Why is measurement of energy essential? What instruments do you recommend in a power plant working on natural gas as fuel. **[8]**

b) Why energy audit is necessary in an organization? Draw a process energy flow chart for an Internal Combustion engine manufacturing plant. **[8]**

Q3) a) Mention the methods of finding efficiency of a boiler? Comment on their merits and limitations. **[8]**

b) What are the losses considered in the direct method? **[8]**

P.T.O.

Q4) Write short notes on (any two) : **[18]**

a) Energy conservation plan for a dairy.

b) Measures to prevent losses in air conditioning systems in industry.

c) Energy analysis of an induction furnace in a foundry.

SECTION - II

Q5) a) Find the simple payback period when Rs. 8000/- is required as investment for replacing 40 incandescent lamps (40 W) by 9 W CFLs (40 numbers) producing the same lumen output. Assuming 10 hours of operation period daily and electricity charges @ Rs. 4/- per kWh. **[8]**

b) Write notes on (any two) : **[10]**

i) Salient features of Electricity act 2003.

ii) Energy efficient windows.

iii) Automatic power factor controllers.

Q6) Explain with neat sketch the working of a/an (any three) : **[16]**

a) Heat wheel. b) Heat Pipe.

c) Heat pump. d) Recuperator.

Q7) Write notes on (any two) : **[16]**

a) Maximum demand controllers.

b) Check list for lighting.

c) Energy Efficient motors.

Q8) a) What are the topping and bottoming cycles of Co-generation? Explain with neat sketches. **[6]**

b) Give a check list of energy conservation in refrigeration. **[4]**

c) Discuss the scope of Co-generation in the present energy scenario of our country. **[6]**

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1369

[3965] - 65
M.E. (Mechanical.) (Design Engg.)
MACHINE STRESS ANALYSIS
(2002 Course) (502201)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A simply supported beam of length 2m carries a central load of 4 kN inclined at 30° to the vertical and passing through the centroid of the section. Determine

a) Maximum tensile stress. **[16]**

b) Maximum compressive stress.

c) Deflection due to load.

d) Direction of neutral axis. (Refer Fig No. 01, $E = 200 \times 10^5$ N/cm^2).

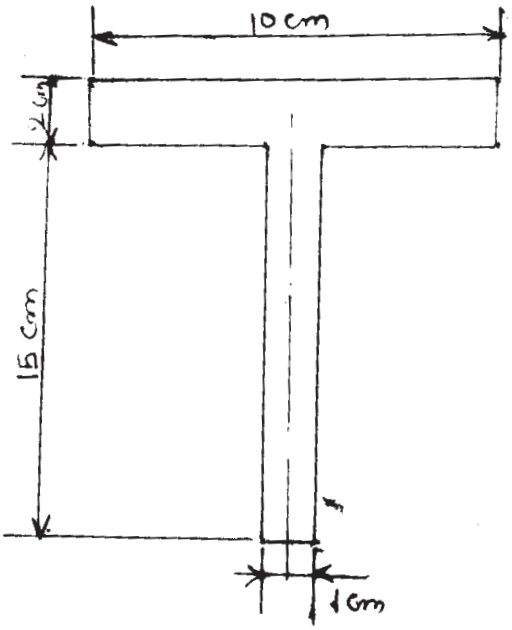


Fig. no - 01

P.T.O.

Q2) a) List the various methods of torsional stress analysis. Explain any one in detail. **[8]**

b) A compound shaft is mode up by securely fixing a 500 mm long brass bar to a 500 mm long aluminium bar. The diameter of each bar is 40 mm. Determine the maximum torque which can be applied at the lower end of the shaft. The maximum angle of twist is not to exceed 3° and the maximum shear stress in aluminium and in the brass are 78 MPa and 55 MPa respectively. (Gbr = 34 Gpa and Gal = 28 Gpa.)**[8]**

Q3) State and explain the theorem of virtual work and least work. Apply these theorems to find out deflections at the free end of a comfilence beam of length 'L' subjected to vertical torque 'T' at the free end. **[16]**

Q4) a) Show that the function 'ϕ' is given by $\phi = {}^{a}/_{2}\ x^2 + bxy + {}^{c^2}/_{2}\ y^2$ is a stress function. Determine the stress components. **[6]**

b) What is the significance of compatibility conditions. Derive compatability equation by using polar-co-ordinate system. **[10]**

Q5) Explain the following : **[18]**

a) Plain stress and plain strain problems.

b) Kelvin's fluid flow analogy.

c) Saint Venant's principle.

SECTION - II

Q6) a) Explain following terms used in photoelastic analysis : **[8]**

i) Isoclinics. ii) Stress and strain fringe valve.

iii) Dark field polariscope. iv) Birefringement material.

b) How strain gauges are arranged to obtain various strain rossettes. **[8]**

Q7) Derive the governing equations for stresses in thick walled cylinder under internal and external pressure. **[16]**

Q8) a) Explain 'shape factor' for a beam section, subjected to plastic bending.**[6]**

b) Obtain a shape factor of a circular section. **[5]**

c) Explain plastic flow process. **[5]**

Q9) Two curved surfaces each having different radii at a point of contact are pressed together. From fundamentals derive an equation for contact stresses between two elastic bodies stating clearly the assumptions mode. Explain with sketch how you would find contact stress in a tangent cam with roller follower. **[16]**

Q10) Write short note on : **[18]**

a) Spring back in bending of plates.

b) Effect of sliding friction on contact stresses.

c) Brittle coating method.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1371

[3965] - 101
M.E. (E&TC) (Instrumentation & Microwave)
ADVANCED DIGITAL SIGNAL PROCESSING
(2002 Course) (504102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the use of DFT in linear filtering. **[6]**

b) Find the output y(n) of the given two sequences using circular convolution **[6]**

$x_1(n) = \{\underset{\uparrow}{2}, 1, 2, 1\}$

$x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$

c) Explain the characteristics of deterministic and random signal. **[4]**

Q2) a) Explain the following : **[8]**

i) Decimation by a factor D.

ii) Interpolation by a factor U.

iii) Sampling rate conversion by a factor U/D.

b) Design a two stage decimator for the following specifications : **[8]**

D = 100; Passband $0 \leq F \leq 50$

Transition band $50 \leq F \leq 55$

Input sampling rate : 10,000 Hz

Ripple $\delta_1 = 10^{-1}$; $\delta_2 = 10^{-3}$

P.T.O.

Q3) a) Explain Levinson-Durbin algorithm for solving normal equations. **[10]**

b) Explain forward linear predictor with the help of block diagram. **[6]**

Q4) Write short notes on (any three) : **[18]**

a) Subband coding of speech signals.

b) Polyphase filter structures.

c) AR lattice structures.

d) Wiener filter.

SECTION - II

Q5) Explain what do you mean by system modelling and identification? Explain how system identification can be done by using MA, AR & ARMA model. **[16]**

Q6) a) What is power spectrum estimation? **[2]**

b) Compare the performance characteristics of non parametric power spectrum estimator. **[8]**

c) Explain the Welch method of power spectrum estimation. **[6]**

Q7) a) Explain the parametric methods of power spectrum estimation. **[8]**

b) Explain the relationship between filter parameter and auto correlation sequence. **[8]**

Q8) Write short notes on (Any three) : **[18]**

a) Radar signal processing.

b) DSP processor architecture.

c) DTMF.

d) Eigenanalysis algorithm for spectrum estimation.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1373

[3965] - 124
M.E. (E&TC) (Microwave)
RF AND MICROWAVE CIRCUIT DESIGN
(2002 Course) (504204)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) Derive an expression for standing wave ratio for transmission line. **[13]**

b) Write detail notes on high frequency resistors, inductors and capacitors. **[12]**

Q2) a) A load impedance $Z_1 = (40 + J60)\Omega$ is connected to a 50Ω transmission line of 4cm length and operated at 3GHz. By using impedance transformation process find the input impedance Z_{in} under the assumption that the phase velocity is 70% of the speed of light. **[13]**

b) Explain in detail Y parameters and signal flow graph for the analysis of RF circuit. **[12]**

Q3) a) An N = 3 Chebyshev band pass filter is to be designed with a 3 dB passband ripple for a communication link. The center frequency is 3 GHz and the filter has to meet a bandwidth requirement of 25%. The filter has to be inserted into a 50 Ω characteristic line impedance. Find the inductive and capacitive elements and plot the attenuation response in the frequency range of 1 to 4 GHz. **[17]**

b) Draw a table for Kuroda's identity and prove the four identities from table. **[8]**

P.T.O.

SECTION - II

Q4) a) Describe in detail operating principal of IMPATT diode. **[13]**

b) A BJT is encapsulated in a plastic housing and mounted on a heat sink with R_θ = 3.75°C/W. Under this condition the total power dissipation is suppose to be 20 W at an ambient temperature of 20°C. What rating has the engineer to choose for the BJT casing if the maximum junction temperature should not exceed 175°C? **[12]**

Q5) a) Draw linear diode model. A conventional Si-based pn diode is operated at 300°k and has the electrical parameters as : τ_T = 500 ps, Is = 5×10^{-15} A, Rs = 1.5Ω, n = 1.16. The dc operating conditions are chosen such that I_Q = 50mA. Find **[17]**

i) The impedance response of the diode in the frequency range 10 MHz to 1 GHz.

ii) Impedance behavior in the same frequency range.

b) Focus on bilateral design approach for microwave amplifier. **[8]**

Q6) a) A MESFET operates at 6 GHz has the S parameters as : S11 = 0.5∠– 60°, S12 = 0.02∠0°, S21 = 6.5∠115° and S22 = 0.6∠– 35° **[13]**

Determine :

i) If the circuit is unconditionally stable.

ii) Find the maximum power gain under optimal choice of the reflection coefficients, assuming unilateral design (S12 = 0).

b) Write detail notes on microwave mixers and oscillators. **[12]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1376

[3965] - 147

M.E. (Electronics) (Digital Systems)

IMAGE PROCESSING AND PATTERN RECOGNITION

(2002 Course) (Elective - I) (504309)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Answer any three questions from each section.***
3) ***Answers to the two sections must be written in separate answer books.***
4) ***Use of scientific calculator is allowed.***
5) ***Use suitable data wherever required.***

SECTION - I

Q1) a) Explain the following terms : **[8]**

i) A stationary process.

ii) Autocorrelation.

iii) Power spectral density.

b) Why the image is required to be preprocessed? Name different preprocessing techniques. **[8]**

Q2) a) Explain topological, relational and pyramidal data structures. What is chamfering? **[8]**

b) Explain different pixel brightness transformations. How will you form a negative of any image? **[8]**

Q3) a) Explain local and global histogram equalization technique. **[8]**

b) Explain practical method of implementing Cany Edge detector. **[9]**

Q4) a) Explain use of sobel edge operator. What is the use of second derivative for edge enhancement. **[9]**

b) Explain the use of thresholding for segmentation. Explain use of bi-modal histogram for deciding a threshold. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain any one method for inner and outer boundary tracing. **[8]**

b) Explain A algorithm graph search for boarder detection with the help of simple example. **[9]**

Q6) a) Explain the use of hough transform for a line detection. **[8]**

b) Explain chain coding for boundary representation. **[8]**

Q7) a) Explain the meaning of convex hull for shape representation. **[8]**

b) Explain any cluster analysis technique for pattern recognition. **[9]**

Q8) a) Explain model based control strategies for image understanding. **[8]**

b) Explain the use of probabilistic relaxation for scene labeling. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1378

[3965]-162

M.E. (Electronics) (Computer)

COMPILER CONSTRUCTION

(Elective - II) (2002 Course) (504408)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is difference between a phase and a pass of a compiler? Explain machine dependent and machine independent phases of compiler. **[8]**

b) Whether lexical analysis detects any errors? Explain with example. Is lexical phase separate from syntax analysis? Briefly explain "LEX" tool. **[8]**

Q2) a) Explain recursive descent parser with on example. **[8]**

b) Show that following grammar is LL (1) but not SLR (1).

$S \rightarrow Aa\ Ab / Bb\ Ba$

$A \rightarrow E$

$B \rightarrow E.$ **[10]**

Q3) a) What are synthesized and inherited attributes? What are Marker Non - terminal symbols? Give example. **[8]**

b) Explain the concept of back-patching with example. **[8]**

Q4) a) Write short note on various Compiler Construction tools. **[8]**

b) What is activation second? Explain each of its fields. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain runtime support and storage organization in detail. **[8]**

b) With a suitable example explain different parameter passing methods. **[8]**

Q6) a) Consider following code fragment. Generate 3-address code for the same:

```
if (a < b)
        while (c > d)
        x = x + y ;
else
    do
      p = p + q ;
      while (e < = f) ;
```

[10]

b) What is a need of code optimization? Discuss principal sources of code optimization. **[8]**

Q7) a) Explain different parameter passing methods with the help of suitable example. **[8]**

b) What do you mean by next use information? How it is computed? **[8]**

Q8) a) Explain dynamic programming code generation algorithm. **[8]**

b) Write short note on runtime support and storage organization. **[8]**



Total No. of Questions : 06] **[Total No. of Pages : 2**

P1380

[3965]-181
M.E. (Electrical) (Power Systems)
HIGH VOLTAGE POWER TRANSMISSION
(2002 Course) (503204)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any <u>TWO</u> questions from each section.***
2) ***Answer to the two sections must be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

<u>SECTION - I</u>

Q1) a) Derive the expressions for the average d.c. output voltage and d.c. output current of a 6 pulse, hvdc, 3 - phase converter in terms of a.c. line voltage, overlap angle, delay angle and power frequency. State assumptions made, if any. **[15]**

b) A hvdc link having resistance of 2.5 ohm is connected to hvdc, full bridge, 3 - phase converters at either end which are in turn connected through the transforms to a.c. system. The bridge converters operate as follows:- **[10]**

<u>Rectifier</u>

a.c. terminal voltage : 325 kV (line) (secondary)

P_{dc} = 400 MW

V_{dc} = 350 KV.

X_{kr} = 45 ohm.

<u>Inverter</u>

X_{ki} = 44 ohm

extinction angle = 20°

Determine the a.c. line current, voltage and p.f. at the inverter terminals.

Q2) a) With a neat circuit diagram, discuss the twelve pulse operation of hvdc converter. State the advantages of a 12 pulse converter. **[10]**

b) State and explain the advantages of hvdc transmission over ehvac transmission. **[8]**

c) It is required to obtain a dc. voltage of 100 kv from a 3 - phase, full bridge, hvdc converter operating with $\alpha = 30°$ and $\mu = 15°$. Calculate the necessary secondary voltage of the rectifier transformer which is nominally rated at 345 kv/150kv, calculate the tap - ratio required. **[7]**

P.T.O.

Q3) Write short notes on the following :-

a) hvdc converter control characteristics; **[9]**

b) Layout of a hvdc station; **[8]**

c) hvdc links. **[8]**

SECTION - II

Q4) a) Derive the expressions for the voltage and current at any point on a long, loss - less transmission line. Assume that Z_o(surge impedance of line), V_R(receiving end voltage), I_R (receiving end current) *l* (length of line) and parameters of the line are known. **[15]**

b) A 720 kv transmission line has a surge impedance of 250 ohm and the transformer connected to it has a surge impedance of 1000 ohm. For its h.v. winding. The length of the winding is 5km and its far end is solidly connected to ground. A surge of 2300 kv coming in the line is to be limited to 1600 kv at the transformer bushing by using a short cable. Determine the surge impedance and the voltage rating of the cable that is interposed between the line and transformer. **[10]**

Q5) a) Determine the relative attenuation occurring in 5 cycles in the overvoltage surge set up on a 66 kv cable fed through an air blast circuit breaker when the breaker opens on a system short circuit. The breaker incorporates resistance switching. The network parameters are :- L =0.5 mH; c = 0.05 μF; and R = 8.2 ohm. **[10]**

b) State and explain the reasons for overvoltages in ehvac transmission lines. **[8]**

c) Explain the characteristics of a gapless lightning arrester and state its advantages over other types of arresters. **[7]**

Q6) Write short notes on the following:-

a) Corona and its effects on transmission lines; **[9]**

b) Biological effects of high voltage electric fields on animals and humans; **[9]**

c) Bewley's lattice diagram. **[7]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1381

[3965]-182
M.E. (Electrical) (Power Systems)
POWER SYSTEM DYNAMICS
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written on separate answer-books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Discuss the Clarke's diagram as a tool to determine the steady state stability margin of a two machine system with consideration of shunt admittance. **[10]**

b) A single synchronous machine is connected to an infinite bus through a symmetrical network whose ABCD constants are known. Derive the expressions for the maximum power delivered by the machine and the load angle at which it occurs. Derive also the expressions for the maximum power received by the bus and the angle at which it occurs. Draw sketches and waveforms where necessary. **[15]**

Q2) a) Describe the different measures to improve steady state power limit of a power system. Justify each suggested measure. **[10]**

b) A synchronous generator is delivering 50% of its P_{max} to an infinite bus through a transmission line. A fault occurs on the line such that the new maximum power is 35% of the original value of P_{max}. When the fault is subsequently cleared, the maximum that can be delivered is 80% of the original maximum value.

i) Determine the critical clearing angle. **[8]**

ii) Determine the maximum value of δ for which the machine swings around its new equilibrium position, if the fault is cleared at $\delta = 75^{\circ}$. **[7]**

P.T.O.

Q3) Write short notes on the following :

a) Equal Area criterion; **[9]**

b) Power system stabilisers, and **[8]**

c) Effect of excitation controls on steady state stability. **[8]**

SECTION - II

Q4) a) Discuss the transient stability of a SMIB system using a circuit breaker with "automatic reclosing facility. **[10]**

b) Using the modified Euler's method, solve the differential equation $\frac{d\delta}{dt} = t^2 - \delta$ given that $\delta_0 = 1$ radian at $t = 0$; and determine δ (0.15). Take h = 0.05 sec. **[15]**

Q5) a) A 50Hz synchronous alternator having H = 9.8 MJ/MVA and $x'_d = 0.3$ p.u. is connected to an infinite bus through a transformer which has a leakage reactance of 0.18 p.u. and a double circuit transmission line of reactance 0.25 p.u. each. The alternator is delivering 0.65 p.u. of real power at 0.85 p.f. lagging to the infinite bus. The p.u. damping coefficient of the alternator is 0.125. For a small disturbance of 5° in the load angle of the alternator, obtain the equation of motion of rotor angle and generator frequency. **[15]**

b) Describe how the loads are represented in power system stability studies. Discuss the effects of loads on steady state stability limit. **[10]**

Q6) a) A load is supplied from a 132kV infinite bus bars through a line of reactance 50Ω phase to neutral. The load consists of a constant power demand of 100MW and a reactive power demand Q which is related to the load voltage by the equation $(V - 0.75)^2 = 0.18\ (Q - 0.75)$ where the base quantities for V and Q are 132kV and 100MVAr respectively. Examine the voltage stability of the system. **[12]**

b) Write short notes on the following :

i) Classical multimachine model and; **[6]**

ii) Islanding in power systems. **[7]**



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1383

[3965]-192
M.E. (Production)
ROBOTICS AND ITS INDUSTRIAL APPLICATIONS
(2002 Course) (511107)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Differentiate between Lagrangian and Euleriar approach to dynamics. What do you understand by TRL robot configuration? **[6]**

b) A two degree of freedom robot manipulator is as shown in Fig. 1. Given that the length of each link is 1 unit, establish link Co-ordinate frame and the kinematic parameters. Find ${}^{0}A_{1}$ and ${}^{1}A_{2}$ Arrive at $_{\text{the}}$ inverse kinematic solution to this problem. **[10]**

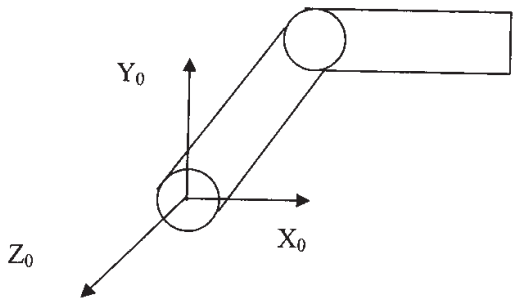


Fig.1

Q2) a) A robot has the link parameter table as shown :

i	θ_i	d_i	a_i	α_i
1	30°	0	0	0
2	0°	2	0	90°
3	60°	4	θ	0

Determine the origin of the gripper w.r.t. the base frame indicating all the intermediate steps. **[8]**

P.T.O.

b) Obtain the Kinematic parameters of the robot arm shown in Fig.1. **[8]**

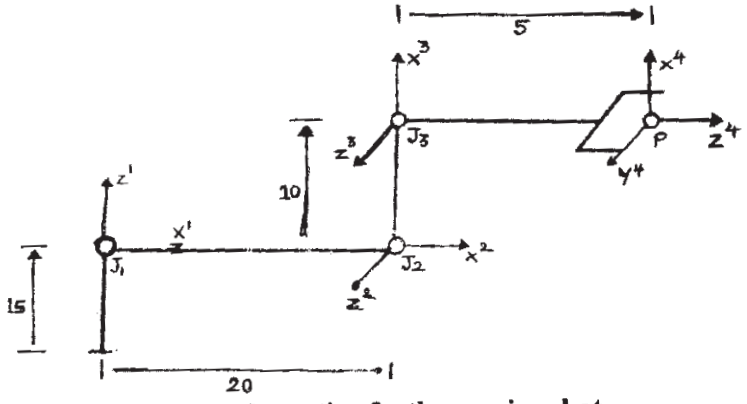


Fig. 1 Schematic of a three axis robot

Q3) a) Describe a robot gripper to take measurements of outer and linear dimensions of objects with the aid of pneumatic gauging. **[8]**

b) A vacuum pump is used to maintain a pressure differential of 3 N/cm^2 compared to atmospheric pressure. The gripper is used to lift 400 mm × 900 mm plate having a net weight of 300 N. Assuming two section cups engaged for lifting the weight, determine the diameter of the suction cups if frictional coefficient is 0.4. Assume factor of safety as 1.4. **[8]**

Q4) a) Discuss the uses of Electro-Optical Imaging Sensor in the Robotic vision system, explaining with neat sketches the functions it performs. **[6]**

b) Explain the principles operation of : **[10]**

i) High resolution pneumatic and

ii) Roller type slip detecting tactile sensing systems.

Q5) Write in brief about **any <u>three</u>** of the following : **[18]**

a) Joint space scheme.

b) Use of polynomials to define path segments.

c) Brushless motors used as actuators.

d) Sensors for measuring wrist forces.

e) Desirability of compliances in assembly manipulators.

<u>SECTION - II</u>

Q6) a) What are different elements of robot vision system? Explain their interrelationship. Differentiate between low vision and high vision. **[6]**

b) Following table gives gray scale entries. Sketch binary image array choosing suitable threshold level. The gray level image depicts a light object on a dark background.

1	4	4	3	3	4	4	3	8	3	12	12
1	4	2	9	2	2	2	11	4	8	4	12
1	3	4	3	11	11	2	2	2	2	12	7
5	4	3	3	3	10	10	11	11	12	12	13
3	3	9	3	2	10	10	11	6	12	12	13
5	9	10	10	10	10	11	11	11	11	13	13

Find the memory in bits as also in bytes needed to store the array. **[10]**

Q7) a) What is meant by blending time? If α is the angular acceleration during the blending time show that

$$\alpha \geq 4\left(\frac{\theta_f - \theta_0}{T^2}\right)$$

where θ_f and θ_0 are the final and initial joint angle respectively and T is the cycle time. **[8]**

b) Show how the obstacles in the path of the robot movement can be avoided using Lee's algorithm. **[8]**

Q8) a) Explain the procedure of interfacing robots with P.C. **[8]**

b) What are the safety rules and measures to protect operator from accidents in a robot work-cell? **[8]**

Q9) a) Explain lead through method of programming. **[4]**

b) What is teach pendent and how programming is done by suing it. **[8]**

c) Write a program to pick and move the part from one place and put in a box using VAL language. **[4]**

Q10) Write short notes on **any three** : **[18]**

a) Adaptive gripper with pneumatic control.

b) PID controller.

c) Economics of robot.

d) Use of robot in Arc-welding.

e) Building block concept for assembling robots.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1384

[3965] - 193
M.E. (Production)
ADVANCED MACHINE TOOL DESIGN
(2002 Course) (511103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss in brief how design considerations of *feed gear box* differ from *speed gear box.* **[6]**

b) What is meant by a compound or compromise gear box? It has been decided to design a fourteen speed gearbox having speeds from 90 rpm to 3200 rpm, in two distinct ranges having 8 speeds at lower regime of working. Draw the compromise ray diagram and discuss any specific provision to be made on the intermediate shafts for obtaining a compact gear box. Give short sketches for additional provisions, if required to be made. **[10]**

Q2) a) Explain the method of increasing the range of regulation in modern machine tools. **[8]**

b) Deduce the mathematical equation for a cone-type friction variator in-order to obtain self-locking. **[8]**

Q3) a) Show any typical method of preloading a lead screw and the major considerations thereof. **[6]**

b) Find out the specific pressure on a lead screw assuming a mild steel material being cut by HSS tool on a lathe machine using a depth of cut

P.T.O.

equal to 2 mm and a feed 0.2 mm / rev. Permissible intensity of pressure on the lead screw is 30 kg/cm^2. Weight of the carriage is 50 kg. And the coefficient of friction between the carriage and the guide is 0.20. Find out, further, the errors in pitch of the lead screw arising out of the loading condition, if the thread profile is trapezoidal type. Also determine the efficiency under **[10]**

(i) no lubrication and

(ii) lubrication having coefficient of kinetic viscosity = 0.0067 kg. sec/m^2 at a speed of 300 rpm.

The screw dimensions are :

Outside diameter = 70 mm

$D_{average}$ = 65 mm

Pitch p = 10;

Depth of thread t_2 = 5 mm

δ = average gap (average clearance) between the non-working surfaces of the thread profile of the screw and the nut = 0.182 mm.

$P_x : P_y : P_z :: 0.25 : 0.40 : 1$

Length of nut = 1.5 D_{av} = 97.5 mm.

Q4) a) Give the comparative evaluation of machine tool structures on the basis of : **[8]**

i) Materials for machine tool structures.

ii) Static and Dynamic Stiffness.

iii) Profiles of machine tool structures.

b) Show that the rigidity of hydro-dynamically lubricated slides is always less than that of hydro-static slideways. **[8]**

Q5) Write short notes (any three) : **[18]**

a) Composite guideways.

b) Dependence of process capability of machine tool on its rigidity.

c) Dynamic analysis of stick-slip vibration in machine tools.

d) PIV drive.

SECTION - II

Q6) a) What are the basic consideration in designing the spindle unit supports and spindle ends in a high speed machine tools? Sketch unit supports and spindle ends in a high speed machine tools? **[8]**

b) Explain the concept of static and dynamic rigidity of machine tool and state the procedure for estimating them. **[8]**

Q7) a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. **[8]**

b) Analyze the forces acting on a vertical knee-type milling machine during end milling operation and explain the design procedure of the table. **[8]**

Q8) a) What do you understand by stick-slip motion in machine tool? What are the various methods of minimizing the stick-slip vibration in machine tool? **[8]**

b) What do you understand by open and close type hydraulic circuits? Explain the factors used for selecting fluids for hydraulic system. **[8]**

Q9) a) Compare the following systems : **[8]**

i) Stepper motor and DC servomotors.

ii) DNC and Stand-alone NC machine.

b) Explain with neat sketches the working principles of a shaft encoder using gray code and single disc radial transducer. **[8]**

Q10) Write short notes (any three) : **[18]**

a) Dynamic characteristic of the cutting process.

b) Electrical automatic control systems.

c) Design considerations for CNC machine tools.

d) Retrofitting.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1385

[3965] - 194

M.E. (Production)

CIM AND ADVANCED MANUFACTURING PROCESSES

(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***

SECTION - I

Q1) a) Explain system design procedure in CIM. **[8]**

b) Explain any two module related to engineering application for MRP-II. **[8]**

Q2) a) Explain the component and different data of FMS. **[8]**

b) Explain Opitz system for classification and codification of parts while grouping them into families with suitable example. **[8]**

Q3) a) Describe factory network hierarchical structure with block diagram in CIM. **[8]**

b) Explain computerized elements of a CIM system. **[8]**

Q4) Write short notes on any three : **[18]**

a) MRP.

b) Selection of AGV system.

c) Computer aided quality control.

d) Local area network.

P.T.O.

SECTION - II

Q5) a) What mean by modular concept? Explain how it is used in setting up aggregate machine. **[8]**

b) With the help of neat sketch explain the principle of working of an electron beam machining system. How is the beam controlled. **[8]**

Q6) a) Explain different process parameters that affect on material removal rate in USM process? **[8]**

b) What is micromachining? Explain any one method to achieve it. **[8]**

Q7) a) Explain solid base curing process of rapid prototyping along with advantages, limitation. **[8]**

b) Discuss different steps in chemical milling process? **[8]**

Q8) Write short notes on any three : **[18]**

a) Wire cut EDM.

b) Fused deposition method of Rapid prototyping.

c) Rapid prototyping.

d) Agile manufacturing.

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Total No. of Questions : 08] **[Total No. of Pages : 2**

P1386

[3965]-195
M.E. (Production)
CAD/CAM/FMS
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt not more than FIVE questions of which at least two questions must be from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Perform the following transformation if the co - ordinates of the vertices of the pentagon are A(4,1), B(8,1), C(10,4), D(6,7), and E(2,4). Determine the new position of pentagon after the rotation by 30° in anticlockwise about X-axis. Write the Auto LISP program to perform this complete CAD task. **[20]**

Q2) a) Given S(1, 1), T(2, 3), U(4, 3) and V(3, 1) are the vertices of a Bezier polygon. Determine the equation of Bezier curve controlled by these vertices. **[10]**

b) Explain different solid entities with parameters and its importance in solid modeling. **[10]**

Q3) a) Write various G and M codes usually used in CNC programming on machining centre. **[10]**

b) Explain the concept of high speed manufacturing. What are the necessary requirements of machine tool for the same? **[10]**

Q4) a) Explain the sequence of steps to start meshing in finite element analysis. **[10]**

b) Derive an expression for the element stiffness matrix of the two node truss element. Also show the element stress calculations. **[10]**

P.T.O.

SECTION - II

Q5) a) Classify the different methods of manufacturing cell formation. **[10]**

b) Differentiate variant type CAPP and Generative CAPP. **[10]**

Q6) a) Explain with neat diagram computer aided material requirement planning. **[10]**

b) Explain with neat diagram computer aided process planning and control. **[10]**

Q7) a) With a neat sketch, explain FMS layout and its components. **[10]**

b) Enlist the steps for computer aided quality control. **[10]**

Q8) Write short notes on any two **[20]**

a) Adaptive control system in FMS.

b) Various types of neural networks.

c) Tool magazines in Flexible Manufacturing.

d) Knowledge based expert system.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1387

[3965]-197

M.E. (Production)

HUMAN FACTORS IN DESIGN AND MANUFACTURING

(2002 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain various phases and related strategies of product life cycle. **[16]**

Q2) Explain MRP with proper flow chart and suitable illustration. **[16]**

Q3) Explain A.H.P. in decision support system. Also explain the procedure (steps) to calculate relative importance of the Miterias. **[16]**

Q4) a) Explain 'Logistic Management'. **[9]**

b) Explain 'Manpower Planning'. **[9]**

P.T.O.

SECTION - II

Q5) Explain various factors that affect visual discriminations. **[16]**

Q6) a) Explain various measures of energy expenditure. **[10]**

b) Explain MMH. **[8]**

Q7) Explain principles of motion economy related to: **[16]**

a) Use of human body.

b) Design of work place.

c) Use of tool.

Q8) a) Explain 'Lean Manufacturing'. **[8]**

b) Explain 'World Class Manufacturing'. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1390

[3965]-204
M.E. (Computer)
DISTRIBUTED OPERATING SYSTEMS
(2002 Course) (510102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from Section I and three questions from Section II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is the primary motivation behind the development of a lightweight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. **[8]**

b) Explain the concept of logical clocks and their importance in distributed systems. A clock of a computer system must never run backward. Explain how this issue can be handled in an implementation. **[8]**

Q2) a) Describe the basic NFS architecture for UNIX systems with the help of a neat diagram. **[8]**

b) Discuss the relative advantages and disadvantages of implementing a thread package in user space and in the kernel. **[8]**

Q3) a) Describe the architectures of workstation-server model and processor pool models of distributed operating systems. **[8]**

b) What types of objects are more suitable in a distributed system? How they are different from traditional objects? **[8]**

Q4) a) What is the motivation behind the implementation of group communication in distributed systems? **[8]**

b) Explain the distributed approach for mutual exclusion along with suitable cases. **[10]**

P.T.O.

SECTION - II

Q5) a) Describe the Kerberos system architecture with a help of a neat diagram. State the details of the Kerberos authentication protocol. **[8]**

b) What are the properties on which deadlock detection algorithm correctness depends? Explain hierarchical approach for deadlock detection. **[8]**

Q6) a) What are the main causes of thrashing in a DSM system. What are the commonly used methods to solve the thrashing problem in a DSM system? **[8]**

b) Describe the Chandy-Misra-Haas algorithm for deadlock detection. State the advantages of this algorithm. **[8]**

Q7) a) Describe the significance of consistency models. Which consistency model is more suitable for distributed systems? **[8]**

b) Describe Ricart-Agrawala's algorithm for implementing mutual exclusion in a distributed environment. Discuss the advantages and drawbacks of this algorithm. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Replication and caching.

b) Ring algorithm.

c) Mach OS.

d) Fault tolerance.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1391

[3965] - 207
M.E. (Computer)
GEOMETRIC & SOLID MODELING
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and briefly explain topological space. **[4]**

b) With the help of an example show that ordinary Boolean intersection of two cubes may produce **[8]**

i) Solid ii) Plane

iii) Pint iv) Line

c) Enlist the levels of abstractions applicable to modeling system. Explain in brief. **[6]**

Q2) a) Comment on the statement "Generic design cannot be displayed or converted to boundary representation". **[4]**

b) Why the mathematics of sweeping is said to be more delicate and demanding? **[4]**

c) Explain the winged edge representation technique for representing the boundary of polyhedron. **[8]**

Q3) a) What is range tree? What is its use in modeling? Explain in brief. **[6]**

b) Consider the following intervals : **[8]**

L1 = [–1, 6], L2 = [–2, 3] L3 = [0, 4], L4 = [2, 7], L5 = [3, 4], L6 = [–2, –1].

Construct the range tree for the above set of intervals showing all the intermediate steps and calculation.

c) Define the term : static interval tree. **[2]**

P.T.O.

Q4) a) How do you perform the topological validation of manifold B-rep solid? **[8]**

b) Briefly explain the sweep technique. **[8]**

SECTION - II

Q5) a) Find the explicit representation for linear (degree 1) B-splines in case of uniformly spaced knots (i.e. $t_{i+1} - t_i = L$). **[8]**

b) For the knot set $t_1 = 1$, $t_2 = 2$.....ti = 1 calculate $B_{i,3}$ (5.5). **[8]**

Q6) a) What property of raster displays makes the technique of the ray tracing possible? **[4]**

b) What are the advantages of ray tracing method? **[4]**

c) How can the computational efforts involved in using ray tracing method be reduced? **[6]**

d) Explain the terms affine and projective spaces. **[4]**

Q7) a) Compare and contrast between graph based model, Boolean model, boundary model and space partitioning model. **[8]**

b) As Geometric modeling is based on floating point arithmetic, explain the numerical errors in floating point arithmetic and geometric failure due to floating point arithmetic with example. **[8]**

Q8) a) A ray is represented by $r(t) = s + td$ where $s = 2i + j$ and $d = i + 2k$, find the coordinate on the ray that correspond to t = 0, 1, 2, 5 and 3 respectively. **[8]**

b) Explain the various representation conventions for face representation, edge representation and vertex representation. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1392

[3965]-210

M.E. (Computer Engineering)

INTELLIGENT SYSTEMS

(Elective - I) (Revised Course 2002)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define in your own words: **[8]**

i) Intelligence.

ii) Artificial Intelligence.

iii) Intelligent Agent.

b) Solve Blocks world problem using hill climbing search method. Also explain the problems associated with the hill climbing method. (Assume any Start and Goal state). **[10]**

Q2) a) Explain Best first search algorithm with the help of suitable example. **[8]**

b) Explain with the algorithm any two uninformed search strategies. **[8]**

Q3) a) Explain with suitable example why problem formulation must follow goal formulation. **[8]**

b) Explain the properties of task environments. **[8]**

Q4) Write short notes on any two: **[2 x 8 = 16]**

a) Applications in CSP.

b) A* Algorithm.

c) Informed Search Strategies.

P.T.O.

SECTION - II

Q5) a) Explain planning with State Space Search using suitable example. Also explain How STRIPS notations are used to represent planning problem. **[8]**

b) Describe the differences and similarities between problem solving and planning. **[8]**

Q6) a) Explain conditional planning in Fully observable environment. **[8]**

b) What do you mean by Partial Order Planning? Explain with suitable example partial order plan vs. total order plan. **[8]**

Q7) a) What is Hierarchical Task Network (HTN) Planning? Explain with algorithm, the basic HTN procedure. **[8]**

b) Compare and contrast between simple replanning agent vs. unbounded indeterminacy. **[8]**

Q8) Write short notes on any three: **[3 x 6 = 18]**

a) Uncertainty.

b) Bounded vs. unbounded indeterminacy.

c) Inferences in First Order Logic.

d) Memory Bounded Search.



Total No. of Questions : 8] **[Total No. of Pages :2**

P1395

[3965] - 215
M.E. (Computer)
APPLIED ALGORITHMS
(2002 Course)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is time complexity of an algorithm? How do we represent it using Big-Oh(O) notation? Write any algorithm to solve same problem in different ways so that they have different time complexities. **[12]**

b) Suppose you have algorithms with the running time listed below (Assume these are exact running time) How much slower do each of these algorithms get when you (i) Double the input size (ii) increase the input size by one? **[6]**

1) $100n^2$
2) n log n
3) 2^n

Q2) a) Consider another variation of the binary search algorithm so that it splits the input not only into two sets of almost equal sizes, but into two sets of sizes approximately one-third and two third. Write down the recurrence for this search algorithm and find the asymptotic complexity for this search algorithm. **[8]**

b) What is divide and conquer strategy for algorithmic design? Give an example which can be solved with and without divide and conquer strategy? And give the advantages and disadvantages of divide and conquer strategy. **[8]**

P.T.O.

Q3) a) Explain how Greedy strategy is applied in minimum spanning tree problem? Analyze the prim's algorithm using greedy algorithm. **[8]**

b) Give an algorithm to detect whether a given undirected graph a cycle. If the graph contains a cycle, then your algorithm should output one. (it should not output all cycles in graph, just one of them) the running time of your algorithm should be O(m+n) for agraph with n node and m edged. **[8]**

Q4) a) Show that if all internal nodes in a tree have degree K then the number of external nodes n is such that n mod (k-1) = 1. **[8]**

b) Analyze the recursive and iterative version of quick sort algorithm and compare the complexity of both the algorithms. **[8]**

SECTION - II

Q5) a) N = 3 and {a1, a2, a3}= {do, if, while} Let p (1 :3) = (0.5, 0.1, 0.05) q(0:3) = (0.15,0.1,0.05,0.05) Compute and construct OBST for above values using Dynamic approach. **[12]**

b) What is dynamic programming approach to solve the problem? Explain with suitable example. **[6]**

Q6) a) Discuss and analyze the problem of finding Hamiltonian cycle using backtracking. **[8]**

b) Analyze the 8-queen problem using backtracking strategy of problem solving. **[8]**

Q7) a) Show that both P and NP are closed under the operation union, intersection, concatenation and kleen closure (*). **[10]**

b) Show that an infinite recursively enumerable set has an infinite recursive subset. **[6]**

Q8) a) What do you mean by NP hard and NP complete? Show that Knapsack's problem is NP-Complete. **[8]**

b) Write an algorithm for Depth First Search algorithm in Graph using suitable data structure. What is the complexity of the algorithm? If we have not use this data structure can still we implement the same algorithm, if yes what is its complexity? **[8]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1397

[3965]-236
M.E. (Instrumentation) (Bio & Process)
ADVANCED ELECTRONIC INSTRUMENTATION
(2002 Course) (506103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain Successive approximation register type ADC with internal blocks. What are the advantages of it over dual slope ADC. **[25]**

Q2) What are the internal blocks of universal counter? Explain working of each block. What are the factors which affect accuracy of the counter? **[25]**

Q3) Write short notes on the following : **[25]**

a) Gauss meter.

b) Lux meter.

SECTION - II

Q4) What are the different components of a Data Acquisition System? Explain working of each with a case study. **[25]**

Q5) Explain the following controls of a dual trace oscilloscope with an application. **[25]**

a) X-Y mode.

b) Ext. trigger.

P.T.O.

c) Variable sweep.

d) ADD mode.

e) CHOP mode.

Q6) Write short notes on : **[25]**

a) Arbitrary Wave form generator.

b) Oscillo-graphic recorder.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1398

[3965] - 238
M.E. (Instrumentation) (Process & Biomedical)
TRANSDUCER DESIGN
(2002 Course) (506102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Using a typical formula for deflection of a proving ring design an LVDT based force transducer to measure force acting on a clay sample in a soil engineering laboratory. **[18]**

δ = Deflection / change in radius =

d = Diameter of proving ring = 5 cm.

E = Young's modulus = 201 GPa.

I = Moment of Inertia = 200 kN/m.

b $t^{3/12}$ =

Where = t = 1.5 mm. & W = 10 mm.

Find deflection when force of 1000 N is applied to the maximum limit & resolution in deflection is desired be better than 0.5%. Suggest LVDT specifications and use a suitable circuit to produce digital display for deflection & force indicator. Suggest two applications for this transducer.

Q2) a) Suggest an experimental set up to measure vibrations of a structure due to operation of a large pounding machines installed in a building. Note this structure has a resonant frequency of 10 Hz. Which type of accelerometers are preferred, here and types of measuring instruments needed to be associated to measure vibration amplitude & frequency. **[8]**

b) Describe (i) Straingauge based accelerometer & (ii) Potentiometric accelerometer. **[8]**

P.T.O.

Q3) a) Discuss a Laser optic based torque transducer to measure a torque on a rotating shaft. What other type of torque sensor one could think of for this measurement. Discuss. **[8]**

b) Discuss use of coriolis flow meter and turbine flow meter for the process industry. Discuss one such set up. **[8]**

Q4) a) Design a simple' digital liquid level sensor employing float level switches to monitor water level / liquid level in a large reservoir. Suggest one more set up other than this arrangement. **[8]**

b) What factors are necessary to select sensors for flow measurements in sewage industry. Discuss one such design set up. **[8]**

SECTION - II

Q5) Design a pressure transducer to measure static & dynamic (fluctuating) pressure in a hydro turbine outlet. The expected maximum pressure is 300 mt. of water column with fluctuating head of 50% of static column. Size of transducer is limited due to space availability in the outlet & hence it is to be 6 mm in diameter & 10 mm. length (max). A straingauge based transducer is desired. The material to be used is aluminium with Young's modulus of 205 GN/m^2. Specific gravity = 7.83×10^{-3} kg/cm^3. Poisson's ration = 0.300. Suggest signal condition is appropriate to help measure static and fluctuating pressure simultaneously, suggest filters also. **[16]**

Q6) a) Discuss non invasive displacement measurement employing optical fiber and laser. Discuss any one set up. **[8]**

b) A vibrating wire transducers system is proposed for monitoring earth pressure and strain in large bridge on the river Godawari near Nanded. Discuss the principle and monitoring instruments. **[8]**

Q7) Design a temperature measuring system for a boiler in a sugar factory. The temperature is to be monitered from boiler inlet to steam outlet. Maximum dry steam temp. is expected to be 200°C. Suggest temperature sensors, their signal conditioning & micro controller based monitoring system.**[16]**

Q8) Design an instrumentation with relevant transducers to monitor operation of a vehicle on the rough road in test laboratory. Suggest transducers to monitor 6 components of motion, pressure & torque on wheels. Recording facility for data acquisition & storage is also necessary in this system. **[18]**

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Total No. of Questions : 06] **[Total No. of Pages : 2**

P1399

[3965]-240

M.E. (Instru.) Bio & Process

MICRO CONTROLLER APPLICATIONS IN INSTRUMENTATION

(2002 Course) (506108)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design a Tachometer using 8051 microcontroller with Following specifications. Support your design with electronic hardware and software flow chart.
Display : 4 digit LED.
Range : 5000rpm
Least count : 1 rpm
transducer : Encoder TTL o/p (60 pulses per revolution)
power : 230 Vac +/- 10%. **[25]**

Q2) Discuss different techniques adapted to reduce power Consumption of battery powered instruments.
Explain with an example. **[25]**

Q3) An 8051 based system has only P0.0, P0.1 and P0.2 port pins available. Suggest a scheme for driving 8 relays with a shift register. Explain circuit/block schematic and software flow chart. **[25]**

SECTION - II

Q4) A computer transmits ASCII characters "A" and "B" over an RS - 232 serial port. Design an 8051 based system to receive the same data and has to be outputted on a port. The computer transmission format is as follows. **[25]**

- Baud rate : 9600
- Start bit : one
- Stop bit : one
- Parity : no

P.T.O.

Q5) Explain a scheme for generating sinusoidal and triangular waveforms with a microcontroller and peripheral interface devices. Support your scheme with a block diagram and flow chart. **[25]**

Q6) Comment on advantages and limitations of IIc and RS485 serial interface with a case study. **[25]**



Total No. of Questions : 10] **[Total No. of Pages : 2**

P1402

[3965]-266
M.E. (Information Technology)
SOFTWARE ENGINEERING
(2003 Course) (510121)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail function point metric. List all the values adjustment factor. What are the metrics for specification quality? **[8]**

b) What is prototyping in software development? Provide example of software development project that would be amenable to prototyping. And provide example of software development project that would be more difficult to prototype. **[8]**

Q2) a) What is feasibility study? Develop a checklist for attributes to be considered when the "feasibility" of a system or product is to be evaluated. Discuss the interplay among attributes and attempt to provide a method for grading each so that a quantitative "feasibility number" may be developed. **[8]**

b) What is software architecture? Enlist important characteristics of the model of your choice with a suitable diagram. **[8]**

Q3) a) Explain why the process of project planning is iterative and why a plan must be continually reviewed during a software project. **[8]**

b) What do you mean by process maturity? With the help of neat labeled diagram explain Capability Maturity Model? **[8]**

Q4) a) What is PERT/CPM technique? How is this technique useful in software project planning? Explain it with suitable example. **[8]**

b) If you were developing a security-critical system, how would you integrate the security requirements engineering and assurance processes into the model? **[8]**

P.T.O.

Q5) a) State and explain different organizational paradigms for software engineering teams. **[10]**

b) What is change control? Explain the procedure of change control process? **[8]**

SECTION - II

Q6) a) Briefly explain the purpose of each of the stages in a software project plan. What is the critical distinction between a milestone and a deliverable? **[8]**

b) Suggest why it is important to make a distinction between developing the user requirements and developing system requirements in the requirements engineering process. **[8]**

Q7) a) What are the advantages and disadvantages of developing software in which quality is "good enough"? That is, what happens when we emphasize development speed over product quality? **[8]**

b) With suitable example, explain fault free analysis in critical system. **[8]**

Q8) a) Explain why an object oriented approach to software development may not be suitable for real time systems. **[8]**

b) Explain how CMM encourages continuous improvement of software process. **[8]**

Q9) a) What are design patterns? What are different elements of design pattern? **[8]**

b) Explain the following design patterns : **[8]**

i) Observer.

ii) Proxy.

Q10) Write a short note on : **[18]**

a) Object Oriented Software life cycle model.

b) Stages in a software project plan.

c) W5HH.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1403

[3965]-267
M.E. CSE (IT)
MOBILE COMPUTING
(2002 Course) (510125)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from section-I and three questions from section-II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of non-programmable pocket calculator is allowed.***

SECTION - I

Q1) a) What do you mean by the radio spectrum? Which radio spectrum is more appropriate for present mobile technologies? Why the spectrum more than 3GHz is not useful for the mobile communication? **[8]**

b) How DSSS Spread spectrum technology helps to spread the bandwidth? If user signal is 1 MHz and spreading (chip) code is 11-bit, what would be the resulting bandwidth? **[8]**

Q2) a) A 200 MHz to 2000 MHz UHF signal is to be transmitted wirelessly. Calculate the size of the dipole antenna required for transmission. What will be the size of antenna for GSM 900 MHz? If FM radio transmit over 90 MHz what will be the wavelength. **[8]**

b) How FHSS (Frequency Hopping Spread Spectrum) technology works? How many hop carriers are used in Bluetooth? How many hops are used in Bluetooth per second? **[8]**

Q3) a) In CDMA network assume chip code k = 6 bits and there are three users (A,B,C) communicating with base receiver R. Following are the chip sequences.

Code for A = <1, –1, –1, 1, –1, 1>
Code for B = <1, 1, –1, –1, 1, 1>
Code for C = <1, 1, –1, 1, 1, –1>

Consider the transmission from B and C. The B and C both transmitted bit 1. Show that how receiver will attempt to recover B's transmission. **[8]**

P.T.O.

b) If a total of 32 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 25KHz simplex channels to provide full duplex voice and control channels. Compute the number of channels available per cell if a system uses.

i) 7-cell reuse.
ii) 12-cell reuse.
iii) 19-cell reuse.

If 1 MHz of allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of above three systems. **[8]**

Q4) a) Draw the block diagram of GSM system architecture with radio subsystem. What are the standard frequencies of interfaces Um, A_{bis}, radio subsystem and switching subsystem? Mention the one function of each component in the block diagram. **[8]**

b) If the one time slot of TDMA is 0.577 microseconds, calculate the following : **[10]**

i) One Multiframe Time and One Multiframe TDMA Time slots.
ii) One Superframe Time and One Superframe TDMA Time slots.
iii) One Hyperframe Time and One Hyperframe TDMA Time slots.

SECTION - II

Q5) a) Give the GPRS protocol architecture and explain the functions of SNDCP, LLC, RLC and GTP protocols. **[8]**

b) How is the mobile number (MSISDN) formed? Explain the different components of the mobile number 919845062050 for our country. **[8]**

Q6) a) Explain the procedure for call establishment from mobile. What are the functions of RACH, AGCH, SDCCH and FACCH channels? **[8]**

b) What are the means to mitigate narrowband interference? How it has been implemented in FHSS and DSSS? **[8]**

Q7) a) Which handoff algorithm is used in GSM network? How handover is managed in GSM network? **[8]**

b) Give the SMS architecture and explain the role of SM-SC Short Message Service Center, SMS GMSC SMS Gateway MSC and IWMSC Interworking MSC. **[8]**

Q8) a) Give and explain the WAP Programming Model. **[10]**

b) Give and explain the DECT system architecture reference model. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1404

[3965] - 268
M.E. CSE (IT)
NET CENTRIC COMPUTING
(2002 Course) (510122)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) List and explain the properties of twisted pair cable, coaxial cable and OFC with respect to data rate, frequency range, bandwidth repeater spacing and attenuation and noise interference. **[8]**

b) A TCP machine is sending full windows of 65,535 bytes over a 1 Gbps channel that has a 10 msec one way delay. **[8]**
What is the maximum throughput achievable?
What is the line efficiency?
What RTT will result in minimum two digit efficiency?

Q2) a) List the data design parameters and explain the importance of each from network design point of view. **[8]**

b) List the function and responsibilities of network administrator from network performance point of view. **[8]**

Q3) a) Explain the Sharma's algorithm with suitable example optimal network design. **[8]**

b) What is the role of bridge? How it is different from switch? How a network installed using bridges transfer the information over the Network installed using the switches? **[8]**

P.T.O.

Q4) Write short notes on (Any Three) : **[18]**

a) ESAU William's algorithm.

b) Need of Queuing Theory.

c) Performance Evaluation of Networks.

d) Fault Diagnosis and Recovery.

SECTION - II

Q5) a) Why Manchester encoding is not used in Fast Ethernet and Gigabit Ethernet? Which other techniques are available for Fast Ethernet and Gigabit Ethernet? Explain any one multilevel signaling techniques used in Fast Ethernet. **[8]**

b) Why analog switching results in more noise than digital switching? Give the network configuration and protocols for ISDN packet switching using B channel with circuit switched access. Can we use D channel for packet switching? **[8]**

Q6) a) What are the advantages of having fixed cell size in ATM? How small and fixed cell size affects the performance of the network? **[8]**

b) Explain man-in-middle attack in Kerberos 4. What different parameters to be considered while setting validity period for ticket granting ticket and service granting ticket. **[8]**

Q7) a) Give the system architecture of VoIP. How quality of service is maintained in VoIP. **[8]**

b) How multipoint line layout heuristics is used to design the network? **[8]**

Q8) Write short notes on (Any Three) : **[18]**

a) JPEG Compression

b) CMST Algorithm .

c) Storage Network.

d) PSTN Gateways.

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Total No. of Questions : 08] **[Total No. of Pages : 2**

P1405

[3965]-270
M.E. CSE (Information Technology)
ADVANCED INTERNET TECHNOLOGY
(Revised Course 2002) (510127)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Compare between active attacks and passive attacks. Give at least two examples of each and suggest the mechanisms to control them. **[8]**

b) What is the difference between virus and intrusion attack on computer node? What is the basic difference in the working principle of antivirus and intrusion detection? **[8]**

Q2) a) How distributed denials of service attacks are more difficult to defend than traditional denial of service attacks? Support your answer with proper examples. **[8]**

b) How route aggregation is different from route segregation? What kind of security role is played by these techniques? **[8]**

Q3) a) Explain SNMP Proxy with diagram. What is necessity of Proxy in SNMP? **[8]**

b) Prove the efficiency of RSA algorithm through mathematical support embedded in it. **[8]**

Q4) Write short notes on (Any 3): **[18]**

a) ICMP Echo Overrun.
b) SYN Flood Attack.
c) ARP Cache Poisoning.
d) DMZ Networks.

P.T.O.

SECTION - II

Q5) a) Explain in detail different attacks on DES? Is this algorithm more secured than RSA? **[8]**

b) What do you mean by network partitioning? Explain how security can be well implemented with network partitioning. **[8]**

Q6) a) Explain how SNMP protocol takes care of configuration, fault and performance management. **[8]**

b) How PKI takes the care of Secure Communication, Data Integrity, Authentication, Authorization and Non - Repudiation? **[8]**

Q7) a) What do you mean by e - mail frauds? Does PEM protocol helps to prevent it? Justify your answer. **[8]**

b) Describe the role of Extended Euclid's algorithm and Euler's Theorem in security algorithms by giving examples. **[8]**

Q8) Write short notes on (Any 3): **[18]**

a) Secure RSVP.

b) Virtual Networks.

c) Secure Routing Interoperability.

d) Logical Access Control.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1406

[3965]-272

M.E. CSE (IT)

INTELLIGENT SYSTEMS

(2002 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Why would evolution tend to result in systems that act rationally? What goals are such systems designed to achieve? **[8]**

b) Define in your own words the following terms: **[10]**

i) Reflex Agent.

ii) Model Based Agent.

iii) Goal based Agent.

iv) Utility based Agent.

v) Learning Agent.

Q2) a) Consider a state space where the start state is number 1 and the successor function for state n returns two states, numbers 2n and 2n + 1.

i) Draw the portion of the state space for states 1 to 15.

ii) Suppose the goal state is 11. List the order in which nodes will be visited for breadth first search, depth limited search with limit 3, and iterative deepening search.

iii) Would bidirectional search be appropriate for this problem? If so, describe in detail how it would work.

[8]

b) Explain Best first search algorithm with the help of suitable example.

[8]

P.T.O.

Q3) a) Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent. **[8]**

b) Define in your own words the following terms: **[8]**

i) Constraint Satisfaction Problem.

ii) Backtracking Search.

iii) Arc consistency.

iv) Backjumping.

Q4) Write short notes on any two: **[2 x 8 = 16]**

a) Contingency Problems.

b) A* Algorithm.

c) Properties of task environments.

d) Iterative Deepening and IDA*.

SECTION - II

Q5) a) Explain how planning problem is expressed in STRIPS with the help of suitable example. **[8]**

b) Explain four planning methods for handling indeterminacy. **[8]**

Q6) a) Explain continuous planning with suitable example. **[8]**

b) Explain partial order planning with suitable example. **[8]**

Q7) a) Explain why the axioms of probability are reasonable. **[8]**

b) Explain the constraints or axioms of utility theory. **[8]**

Q8) Write short notes on any three: **[3 x 6 = 18]**

a) Decision Networks.

b) Inferences in First order Logic.

c) HTN Planning.

d) Bay's Theorem.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1410

[3965]-402

M.E. (Civil) (Construction & Management)

MANAGEMENT AND PROJECT PLANNING IN CONSTRUCTION

(2008 Course & 2002 Course) (501102) (Sem. I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The following table gives the cost-duration data for the activities of a small construction project. **[18]**

Activity code (*i-j*)	Normal		Crash	
	Duration (weeks)	Cost Rs.	Duration (weeks)	cost Rs.
1-2	7	10,000	7	10,000
1-3	8	8,000	6	10,000
1-4	10	14,000	6	20,000
2-6	14	17,000	13	19,000
3-4	6	9,000	5	10,600
3-5	9	12,000	7	14,000
4-5	8	10,000	5	14,800
4-7	13	15,000	13	15,000
5-6	11	11,000	9	13,400
6-7	6	7,000	6	7,000

a) Determine the normal project duration and the corresponding total project cost.

P.T.O.

b) Using stage by stage network compression, determine the minimum project overall cost and optimal project duration, if the overhead costs are Rs. 2,500/- per week.

c) Find the all crash solution.

Q2) a) Explain briefly any two theories of management. **[8]**

b) Explain the work breakdown structure for the construction of a hospital building. **[8]**

Q3) a) Explain in detail, the steps involved in Resource Levelling. **[8]**

b) Under what conditions is LOB technique used? Give suitable examples. **[8]**

Q4) a) What are the applications of MIS to construction industry? **[8]**

b) How will you mobilize the site for a Nuclear Power Plant? **[8]**

SECTION - II

Q5) Explain life cycle of a project in detail with an example. Explain the influence cost diagram and elaborate the role of the management function in achieving project success at different stages. **[18]**

Q6) Discuss various types of feasibilities with a detail case study of a construction project. **[16]**

Q7) Discuss the role of project management consultants during : **[16]**

a) Pre-tender stage.

b) Post-tender stage.

c) Handling over stage.

Q8) What is work study? What is its importance? How is work study conducted for improving the performance of a ready mix concrete plant? Explain in detail. **[1 + 2 + 13]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1411

[3965] - 403

M.E. (Civil) (Construction and Management)

CONSTRUCTION TECHNOLOGY

(2008 Course) (Sem. - I) (501103)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) A bored pile of 760 mm dia. and 15m. long was constructed by using Direct Mud Circulation Technique using Bentonite slurry with concrete mix of M 200. Explain with labeled sketches the sequence of concreting the pile by using Tremie pipes, and give in detail the specifications of the concrete used. **[9]**

b) In the design of a multistoried building an option of placing a large diameter pile directly beneath each column, against a group of three small diameter piles with a pile cap is given to you. Which is to be preferred? Explain giving advantages and disadvantages of each option indicating your preference. **[9]**

Q2) a) Explain in details sequence of operations involved in 'Under slung Method' used in launching precast segmental elements for a prestressed concrete girder having ten elements in one span. **[8]**

b) List out major equipments required for hauling, launching, matching and placing in position the precast elements mentioned in (a) above.**[8]**

P.T.O.

Q3) a) Draw a neat sketch of a single well point, name each part of the system and give specifications and materials used in the same. **[8]**

b) What is the maximum capacity output a single well point can give? What spacing you will recommend in following types of soils to match respective permeability of same. **[8]**

- Clayey soil
- Silty sandy soil
- Fine to coarse sand
- Sandy gravel
- Very porous ground
- Coarse gravel.

Q4) Write short notes on (any three) : **[16]**

a) Merits and demerits of R.M.C. (Ready mix concrete) in high-rise buildings.

b) Factors to be considered in design of Machine foundations.

c) Slip form technique used in high-rise buildings.

d) Accelerated curing methods used in high-rise buildings.

e) Chemical grounting and its applications.

SECTION - II

Q5) What are the precautions and items you will look into, in construction of a thirty storied building for following activities to achieve high quality of workmanship?

a) R.C.C. bored piles of 1.0 mtr. diameter with cut off level of 3.0 M. below ground level, for provision of a basement having water table at 1.5 M. below ground level. **[9]**

b) Each floor slab to be completed in a 11-day cycle. **[9]**

Q6) List out and explain each in a sequence, activities involved in determining the "Rate of Advance" in Hard Rock Tunneling using "Full Face Tunnel Boring Machine". **[16]**

Q7) a) A circular cofferdam of 11 m diameter was proposed wherein following options were considered for method of construction. **[8]**

i) R.C.C. diaphragm wall 60cms. thick.

ii) Interlocking circular piles of 800 mm dia.

Select any one of the above giving its advantages over the other.

b) Explain in details with neat sketches the sequence of operations involved for the method of construction selected by you in (a) above for completing the pier foundation. **[8]**

Q8) Write short notes on (any three) : **[16]**

a) Anchor Piles.

b) Open Caissons.

c) Mound type of Coffer dam.

d) Colgrout technique.

e) Shotcreting.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1412

[3965]-405

M.E. (Civil) Construction and Management

DISASTER MANAGEMENT

(2008 Course) (Elective - I) (Theory) (501104 B)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No. 1 and 5 are comulsory. Out of the remaining attempt any two questions from section I and two questions from section II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Population growth and lack of infrastructure in urban areas lead to large scale disasters in these areas. Explain this statement with suitable examples. **[9]**

b) One disaster can lead to another unexpected disaster. Explain this statement with suitable example. **[9]**

Q2) a) Enlist various disasters that occur in and around Pune. Are these repetitive or non - repetitive types? Enlist and explain the reasons for the occurrence of these disasters. **[8]**

b) Melting of glaciers leads to increased availability of water in perennial rivers. However the loss of glaciers has a significant impact on mountainous ecosystems. Explain with suitable examples the causes for such disasters and solutions to minimize its impact. **[8]**

Q3) a) Explain the phenomenon of volcanic eruption. With neat labeled sketch show the cross section of a volcano and explain various parts of the same. **[8]**

b) Explain the term induced earthquakes. Are they as disastrous as natural earthquakes? Can an induced earthquake lead to a natural earthquake? **[8]**

P.T.O.

Q4) Write short notes on (any four): **[16]**

a) Land slides.

b) Forest fires.

c) Ozone depletion and its effects.

d) Tsunamis.

e) Ecosystem based disaster management.

SECTION - II

Q5) Disaster response is a multi - disciplinary activity involving various organizations and functional specialists. Design an organization chart for a disaster response team to be dispatched for relief and rehabilitation work in a flood affected area.
Also enlist various local as well as international agencies that will be involved in this response.
Enlist various responsibilities and functions of people involved in this team. **[18]**

Q6) a) As per SPHERE guidelines enlist minimum standards for sanitation and food supplies. Design a suitable layout for sanitation facilities to be provided for a community of 3500 people affected by landslides. Assume suitable data if necessary. **[8]**

b) Explain the term vulnerability in detail. **[8]**

Q7) a) You are to design a relief kit for earthquake affected community. Explain the various components that you will include in this kit justifying its use. Assume suitable data if necessary. **[8]**

b) Discuss in detail various treatment procedures that you will adopt for water supply systems in disaster affected sites. Also state acceptable standards as per SPHERE guidelines for water quality. **[8]**

Q8) Write short notes on (any four): **[16]**

a) Community based disaster management.

b) Sphere handbook.

c) Ground water source vs. surface source.

d) International relief organizations.

e) Role of NGOs in disaster relief and management programmes.



Total No. of Questions : 08] **[Total No. of Pages : 3**

P1414

[3965]-414
M.E. (Civil) (Construction & Management)
OPERATIONS RESEARCH
(2002 & 2008 Course) (501110) (Sem. - II)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions form section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve by Big M method or Two phase method. **[12]**

Min $z = 5x_1 + 6x_2$

S. t

$3x_1 + 5x_2 \geq 15$

$3x_1 + x_2 \geq 12$

$x_1, x_2 \geq 0$

b) Explain any two applications of linear programming to civil engineering. **[4]**

Q2) The unit cost of supplying sand from three sources to three sites is given below, alongwith the availability at each source and the requirement at each site. **[18]**

source	site			supply
	A	B	C	
1	14	6	8	40
2	4	2	6	60
3	6	8	12	100
Demand	80	20	100	

Find the initial feasible solution by

a) Least cost method

b) VAM.

Using the solution obtained by VAM, find the distribution policy which will minimize the cost of transportation.

P.T.O.

Q3) a) A department has 5 subordinates and 4 jobs to be performed. The subordinates differ in efficiency and the time taken by them to complete each task is given below. How should the tasks be allotted to the subordinates so as to minimize the total completion time which subordinate does not get any job? **[10]**

subordinate	Jobs			
	A	B	C	D
1	12	18	16	20
2	11	15	16	17
3	17	19	16	16
4	20	14	13	12
5	15	17	18	19

b) What is an unbalanced Transportation problem? How will you solve it? **[6]**

Q4) a) Use Fibonacci method to maximize $Z = x(6 - 0.1x)$ within 0.1% accuracy, in the range (0 to 100). Carry out the first 4 iterations only. **[8]**

b) Use Newton's method to maximize the function $f(x) = 12x_1 + 8x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$ take the starting point as (0, 0). **[8]**

SECTION - II

Q5) a) Use Lagrange multiplier Technique to optimize $z = 3x_1^2 + 4x_2^2 - 5x_1x_2 - 8x_2$

subject to $x_1 + x_2 = 4$

$x_1, x_2 \geq 0$ **[6]**

b) A builder has Rs 60 crore to invest in three housing projects. The returns from the investments which are dependent on the level of investment are given below. Determine the amount to be invested in each of the projects so that the total returns are maximum. Use dynamic programming. **[12]**

Investment in Rs/. crore	Return From Project		
	A	B	C
00	0	0	0
10	14	12	13
20	28	34	40
30	52	50	54
40	66	64	68
50	80	82	80
60	100	110	110

Q6) A sample of 100 arrivals at a reservation counter is found to be according to the following distribution

Interarrival time in minutes	1	2	3	4	5	6	7
Frequency	4	8	13	27	22	17	09

A study of service time reveals the following distribution.

service time	2	3	4	5	6
Frequency	7	14	27	34	18

Calculate the average waiting time and percentage waiting time of an arrival, average idle time and percentage idle time of the server, by simulating 10 such arrivals use the following random numbers. **[16]**

Arrival	5	32	18	22	57	34	64	98	15	87
Service	74	30	93	82	81	12	75	44	53	66

Q7) a) Seven jobs are to be processed on three machines A, B & C in the order A-B-C The serial number of each job and the time required on each machine are given below. Find the sequence of processing the jobs so as to minimize the total time of processing. Find the total elapsed time and the idle time of the machines. **[10]**

Job	1	2	3	4	5	6	7
A	9	8	8	7	6	6	8
B	7	5	7	9	8	9	10
C	14	12	10	15	11	13	10

b) Explain the various factors affecting the choice of a project from amongst various alternatives. **[6]**

Q8) a) What are the situations under which the replacement of an equipment becomes necessary? What are the various replacement models? **[6]**

b) Solve the following game whose payoff matrix to A is given by the following table.

	B_1	B_2	B_3	B_4
A_1	10	7	6	17
A_2	12	7	4	5
A_3	20	1	9	3
A_4	3	2	6	0

Find the best strategy for both the players and the value of the game. **[10]**

♦♦♦♦

Total No. of Questions : 06] **[Total No. of Pages : 2**

P1416

[3965]-457
M.E. (Civil Structures)
DESIGN OF COMPOSITE CONSTRUCTION
(2008 Course) (501404) (Elective - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is composite construction? Explain the concept of composite beam and its behavior. **[10]**

b) For no interaction case, determine the slip and slip strain values at mid span and support. Also draw the typical deflection, slip strain and slip for above conditions. **[15]**

Q2) a) Explain the term composite floors and its structural elements. Also, state and explain the terms of the equation for neutral axis within the sheeting and full shear connection. **[10]**

b) Compare the stress block for concrete strength as per Eurocode and IS 456 - 200 using figures and equations. **[15]**

Q3) A composite column of 350mm × 350 mm × 3250 mm is cast with M30 grade of concrete and ISHB 250 steel section. It consists of 4 bars of 16mm dia of Fe 415. If the design axial load is 1600 kN and the design moment about XX axis is 150kN.m, check the adequacy of concrete encased composite section for uniaxial bending. For ISHB 250, f_y = 250 Mpa and E_a = 200 kN/mm^2. For M30, E_m = 31220 N/mm^2. Assume suitable partial safety factors. **[25]**

P.T.O.

SECTION - II

Q4) A composite truss has following parameters. **[25]**

a) Span = 12m

b) Truss spacing = 3m

c) Slab thickness = 150mm

d) Profile depth = 75mm

e) Self weight of deck slab = 2.80 kN/m^2

f) Max. laterally un - restrained length in top chord = 1.5m

g) Concrete grade = M20

i) Evaluate the precomposite stage loading.

ii) Design the top chord member.

iii) Design the bottom chord of composite stage.

iv) Determine the capacity of the composite section in compression.

Q5) Explain the design steps of multistoried commercial building for following components **[25]**

a) Slabs with profile deck.

b) Vertical cross bracings.

c) Foundation.

Q6) State IRC specifications and code of practice for loads and composite constructions in bridges. Enlist detailed steps in composite deck slab design. **[25]**



Total No. of Questions : 6] **[Total No. of Pages :2**

P1420

[3965] - 470
M.E. (Civil)(Structures)
BIOMATERIALS AND BIOMECHANICS
(2008 Course) (Elective - IV) (501412)

Time : 4 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Solve any two questions from each sections.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw sketches wherever necessary.***
5) ***Your answer will be valued as a whole.***

SECTION - I

Q1) Solve any three:

a) Explain in details with sketch various models of viscoelastic materials. **[9]**

b) Explain various criteria needed to compare the behaviour of elastic and viscoelastic material. **[8]**

c) What are polyamides and polyolefins. **[8]**

d) Explain use of ceramics as biomaterials. **[8]**

Q2) a) Explain properties of acrylic cement (bone cement) and its use as biomaterials. **[5]**

b) Name metalic & non metallic biomaterials. **[5]**

c) List mechanical properties of metallic bio materials Co. Cr, Titanium, Stainless steel. **[5]**

d) Explain concept of corrosion of orthopedic implant. **[5]**

e) Explain resorption of bone. **[5]**

Q3) a) List the recent bio compatible materials using new alloyes, ceramics. **[8]**

b) Write a note on selection of laboratory study before the clinical trial of a fixation device in patient. **[8]**

P.T.O.

c) Write a short note any three : **[9]**

i) Clinical trials.

ii) Clinical protocol.

iii) Investigational device, exemption & release.

iv) Standardisation of bio material.

SECTION - II

Q4) Solve any three :

a) Explain structure of bone tissue with neat sketch. State effect of structure of bone on its elastic properties. **[8]**

b) Explain experimental determination of mechanical properties of bone. **[9]**

c) Explain structural functions of articulating joints in skeletal system. **[8]**

d) Differentiate the features of tendon, ligament and articular cartilege. **[8]**

Q5) a) Draw free body diagram of elbow joint. Evaluate joint force at elbow joint. **[8]**

b) Draw free body diagram of hip joint and evaluate joint force in terms of body weight. **[8]**

c) Draw free body diagram of typical knee joint and derive relation for joint force from equilibrium equation. **[9]**

Q6) Solve any three:

a) What is Gait analysis, explain its importance and usefulness in Biomechanics. **[8]**

b) Enlist the technique used to measure body motion. **[9]**

c) Explain fandamental structural considerations for design of prosthesis. **[8]**

d) List the typical clinical problems which call for replacement of joint with prosthesis. **[8]**



Total No. of Questions : 6] **[Total No. of Pages :2**

P1421

[3965] - 471
M.E. (Civil-Structures)
MECHANICS OF MODERN MATERIALS
(2008 Course) (Elective - IV) (501412)

Time : 4 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is a composite material. **[5]**

b) Write detail note on classification, characteristics and mechanical behaviour of composite material. **[10]**

c) Write short-note on SMA and FGM. **[10]**

Q2) a) Write note on life-cycle cost Advantages and Weight advantages of composite materials. **[7]**

b) Develope stress-strain relations for Anisotropic materials. **[10]**

c) What are Invariant properties of orthotropic Lamina. **[8]**

Q3) a) Explain Tsai-Wu Tension failure criteria. **[7]**

b) What is Bonding-Techniques of Elasticity. **[8]**

c) Write note on shear mode failure of fibers. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain strain and stress variation in Laminates. **[9]**

b) Explain in detail any four : **[16]**

i) Symmetric Laminates.

ii) Anti Symmetric Laminates.

iii) Anti Symmetric Angle ply Laminates.

iv) Un-Symmetric Laminates.

v) Quassi - Isotropic Laminates.

vi) Balanced Laminates.

vii) Hybrid Laminates.

Q5) a) Write note on effect of stiffness on composite Laminates. **[8]**

b) Fatigue damage behaviour of composite materials and metals. **[8]**

c) Write note on Environmental effects on composite materials. **[9]**

Q6) a) Write note on Narrow optimum design and wide optimum design. **[8]**

b) What factors would you take into account while selection of composite materials. **[6]**

c) Typical stress-strain curves for various types of fibers. **[6]**

d) Optimization concepts of composite materials. **[5]**



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1422

[3965]-474
M.E. (Civil) (Environmental Engg.)
AIR POLLUTION AND CONTROL
(2010 Course) (501502) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain mechanism, effects and control of Ozone layer depletion. **[8]**

b) "Industrialisation and Urbanisation are the major causes of air pollution". Explain with examples. **[8]**

Q2) a) Explain the mechanism of formation of photochemical smog with chemical equations. Explain any one air pollution episode. **[8]**

b) In an air pollution survey the concentrations of various pollutants have been found to be : **[8]**

SO_2 : 1000 ppm.
CO : 1500 ppm.
NO_2 : 800 ppm.
NO : 1200 ppm.

Calculate the concentrations in $\mu g/m^3$.

Q3) a) Explain plume behaviour with the help of sketches. **[8]**

b) Explain in brief primary and secondary meteorological parameters which affect plume dispersion. **[8]**

P.T.O.

Q4) a) A thermal power plant burns 6 Tonnes of coal with 5% sulphur per hour and discharges through a stack of effective height 75 meters. The average wind velocity at the stack height is 5.8m/sec. Assume atmosphere to be moderately stable. Find concentration of pollutants at :

i) 3 Km from source directly down wind.

ii) 3 Km down wind and 0.45 Km across wind direction.

Assume $\sigma y = 280m$ and $\sigma z = 170m$ at 3 Km. **[8]**

b) Enlist various methods of sampling particulate matter and explain any one in detail. **[8]**

Q5) Write short notes on following (any three) : **[18]**

a) Wind rose diagram.

b) Inversion.

c) High volume sampler.

d) London smog episode.

SECTION - II

Q6) a) A multi tray settling chamber handles $8m^3$ of air at 20^oC. There are 8 trays including the bottom surface 0.3m apart. The chamber is 4m long and 1m wide. Calculate the efficiency of removal of particles of density $2000Kg/m^3$ and size $70\mu m$. Assume laminar flow. **[8]**

b) Draw a neat sketch of settling chamber and explain its working principle. Write the formula used to calculate efficiency of settling chamber. **[8]**

Q7) a) With a neat sketch explain working principle of Electro Static Precipitator (ESP). State advantages and disadvantages of ESP. **[8]**

b) Enlist various types of scrubbers. Draw a neat sketch of any one type of scrubber. Write advantages and disadvantages of wet scrubber. **[8]**

Q8) a) What are the sources of odour? Explain the effects of odour. Suggest suitable control measures. **[8]**

b) What are the factors considered while selecting filter medium for bag house? What are the operational problems associated with the use of fabric filter. **[8]**

Q9) a) Enlist the methods of control of NO_X. Explain any one in detail. **[8]**

b) Explain the important provisions made in "The Air (Prevention and Control of Pollution) Act 1981". **[8]**

Q10) Write short notes on following (any three) : **[18]**

a) Automobile pollution.

b) Tangible and intangible economic losses.

c) National Ambient Air Quality Standards.

d) Cyclone.

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Total No. of Questions : 08] **[Total No. of Pages : 2**

P1424

[3965]-484
M.E. Civil (Environment)
SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT
(Sem - II) (2010 Course) (501510)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from section I and 2 questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define solid waste and hence explain the hierarchy for integrated solid waste management. **[3+6=9]**

b) Discuss in brief the provisions made under solid waste management rules of Government of India. **[9]**

Q2) a) What are different types of solid waste? Explain in detail the sources of municipal solid waste. Also explain the impact of life style on solid waste generation. **[2+4+2=8]**

b) What are the important physical properties of municipal solid waste. Explain with reference to Indian contest. **[8]**

Q3) a) Explain various chemical characteristics of municipal solid waste. **[6]**

b) Explain in detail the physical transformation (treatment) of municipal solid waste. **[10]**

Q4) Explain in detail the biological and chemical methods of municipal solid waste treatment. Also compare the merits and demerits of these methods. **[6+6+4=16]**

SECTION - II

Q5) a) Explain in brief the components of Hazardous waste management plan. **[8]**

b) Explain in detail the methods of final disposal of hazardous waste. **[10]**

P.T.O.

Q6) a) Define risk and hence discuss the concept of zero - risk hazardous waste. **[8]**

b) Explain in brief the provisions made under Hazardous waste management and Handling rules of Government of India. **[8]**

Q7) a) Discuss the important provisions made under resource conservation and Recovery act (RCRA). **[8]**

b) Define Hazardous waste and discuss in brief the characteristics of hazardous waste as per (EPA). **[8]**

Q8) a) Describe in brief the chemical methods used for treatment of hazardous waste with suitable flow chart. **[8]**

b) Explain the biological methods used for treatment of liquid hazardous waste. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1426

[3965]-501

M.E. (Mechanical Heat Power Engineering)

MEASUREMENT TECHNIQUES AND DATA ANALYSIS

(2008 Course) (502109) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from section-I and three questions from section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different types of measuring instruments. **[8]**

b) Differentiate correlation and regression analysis. **[8]**

Q2) a) Compute Karl Pearsons co-efficient of correlation between age and playing habits from the data given below. Also find out probable error and comment on the value. **[12]**

Age :	20	21	22	23	24	25
No. of students :	500	400	300	240	200	160
Regular players :	400	300	180	96	60	24

b) Explain different types of correlations. **[6]**

Q3) a) The following table shows the ages (x) and blood pressure (y) of 8 persons. Obtain the regression equation of y on x and find the expected blood pressure of a person who is 49 years old. **[8]**

X :	52	63	45	36	72	65	47	25
Y :	62	53	51	25	79	43	60	33

b) Explain the characteristics of thermistors. **[8]**

P.T.O.

Q4) a) A copper resistor at 20°C is used to indicate the temperature of bearings of a machine. What resistance should not be exceeded if the maximum bearing temperature is not to exceed 150°C. The resistance temperature co-efficient of copper is 0.00393/°C at 20°C. **[6]**

b) Explain pneumatic P.I.D controller. **[10]**

SECTION - II

Q5) a) Explain Been Lambart's law. **[6]**

b) Explain chromatography and applications of spectroscopy. **[10]**

Q6) a) The proportional-Mode-Level control system is shown below i.e fig.1. **[8]**

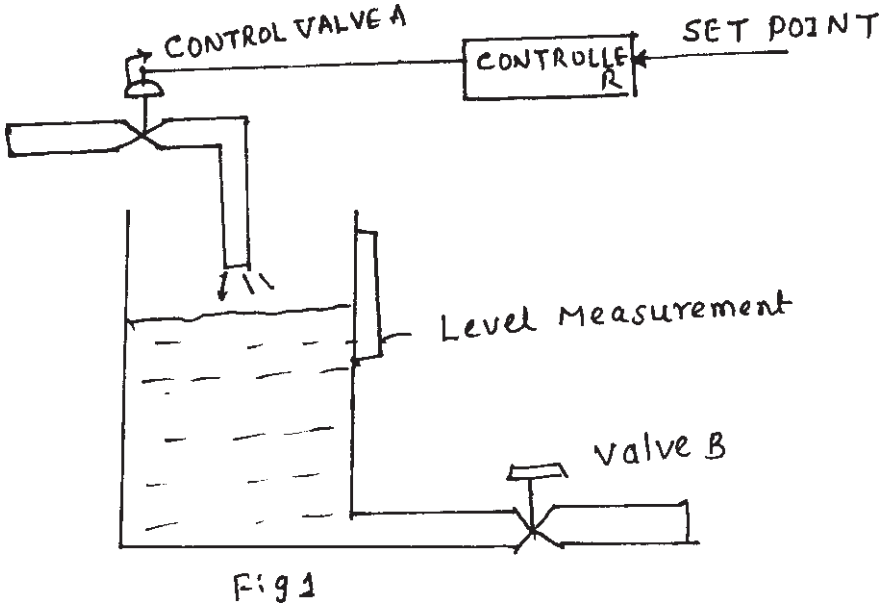


Fig 1

Value A is linear, with a flow scale factor of $10m^3/h$ per percent controller output. The controller output is nominally 50% with constant K_p = 10% per %. A load change occurs when flow through valve B changes from $500m^3/hr$ to $600m^3/h$. Find new controller output and offset error.

b) Explain method of measurement of force using load cell. **[8]**

Q7) a) Explain with a neat sketch the principle working merits and demerits of Laser Doppler Anemometer. **[10]**

b) How do you measure thermal diffusivity of a substance. **[6]**

Q8) Write short notes on any three : **[18]**

a) Optical shaft encoder.

b) Electromagnetic flow meter.

c) Calibration of accelerometer.

d) Dialatometer.

e) Sound Measurement Technique.



Total No. of Questions : 08] **[Total No. of Pages : 2**

P1427

[3965]-502
M.E. (Mech.) (Heat - Power Engg.)
ADVANCED FLUID MECHANICS
(Sem. - II) (2008 Course) (502110)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from section I and 3 questions from section II.***
3) ***Ansers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logrithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive governing equations for conservation of mass in differential and integral form. **[10]**

b) Explain the concept of hydrodynamic stability and instability for steady flow over flat plate. **[8]**

Q2) a) Explain the concept of stress tensor. **[6]**

b) Water is flowing over a thin smooth plate of length 4 m and width 2 m at a velocity of 1.0 m/s. If boundary layer flow changes from laminar to turbulant at $Re = 5 \times 10^5$. Find **[10]**

i) The distance from leading edge upto which boundary layer is laminar.

ii) The thickness of boundary layer at transition point and

iii) Drag force on one side of plate take viscosity of water $\mu = 9.81 \times 10^{-4}$ Ns/m^2.

Q3) a) Derive the exact solution of Navier stokes equation. **[8]**

b) Explain the concept of stream function and vorticity. **[8]**

P.T.O.

Q4) a) Derive Von karman momentum integral equation. **[8]**

b) A plate of 600 mm length and 400 mm wide is immersed in a fluid of sp. gravity 0.9 and kinematic viscosity ($\upsilon = 10^{-4}$ m^2/s. The fluid is moving with a velocity of 6 m/s. Determine **[10]**

i) Boundary layer thickness.

ii) Shear stress at end of plate.

iii) Drag force on one side of plate.

SECTION - II

Q5) a) Explain Prandt'l mixing length hypothesis. **[10]**

b) Explain K - Epsilon model in turbulant flow. **[8]**

Q6) a) Explain the concept of normal and oblique shock. **[8]**

b) Conside a fully developed flow of water through a smooth pipe of 6 cm inner diameter. If the flow rate is 5 litre/s. Calculate **[8]**

i) Friction factor.

ii) Pressure drop over the length of 10 m and

iii) The thickness of laminar sublayer.

Take $\rho = 1000$ kg/m^3 and $\upsilon = 1.02 \times 10^{-6}$ m^2/s for water.

Q7) a) Explain how fluid velocity varies with flow area in a isentropic flow. **[8]**

b) Explain the effect of backpressure on flow through convergent - divergent nozzle with neat sketch. **[8]**

Q8) a) Carbondioxide flows steadily through a varying cross sectional area duct such as nozzle at a mass flow rate of 8 kg/s. The carbondioxide enters the duct at a pressure of 1400 kPa and 200°C with a low velocity and it expands in a nozzle to a pressure of 200 kPa. The duct is designed so that the flow can be approximated as isentropic. Determine density velocity, flow area and mach number eat each location along the duct that corrosponds to a pressure drop of 200 kPa. Assume

$C_p = 0.846$ kJ/kg.K

$k = 1.289$

$R = 0.1889$ kJ/kg.K **[12]**

b) What are the boundary layer assumptions. **[6]**

♦♦♦♦

Total No. of Questions : 5] **[Total No. of Pages :9**

P1428

[3965] - 506

M.E. (Mech.) (Heat Power)

HEAT EXCHANGER SYSTEM DESIGN AND PERFORMANCE

(2008 Course) (Elective - IV) (502112)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed. Use attached graphs.***
4) ***Assume suitable data, if necessary.***
5) ***All questions are compulsory.***
6) ***Answer Q. No. 1, 2 and 3 in section I and Q. No. 4 and 5 in section II.***

SECTION - I

Q1) a) Air flowing at a rate of 5kg/s is to be heated in a shell and tube exchanger from 20ºC to 50ºC with hot water entering at 90ºC and exiting at 60ºC. The overall heat transfer coefficient is 400W/m^{2}K. The length of the heat exchanger is 2m. Determine the surface area of the heat exchanger and the number of tubes required by using :

i) 1 - 2 shell-and-tube type heat exchanger

ii) 2 - 4 shell-and-tube type heat exchanger

The tubes are schedule 40, with nominal diameter = 19mm. **[8]**

b) A two-pass on tube side, baffled single-pass shell, shell-and-tube heat exchanger is used as an oil cooler. Cooling water flows through the tubes at 20ºC at a flow rate of 4.082kg/s. Engine oil enters the shell side at a flow rate of 10 kg/s. The inlet and outlet temperatures of oil are 90ºC and 60ºC, respectively. Determine the surface area of the heat exchanger by both the LMTD and Є-NTU methods if the overall heat transfer coefficient based on the outside tube area is 262W/m^{2}K. The specific heats of water and oil are 4179 J/kg K and 2118 J/kg K, respectively. **[12]**

P.T.O.

Q2) a) Consider the following data to design a water cooled, shell-and-tube Freon condenser for the given heat duty.

Cooling load of the condenser :	125 kW
Refrigerant :	R - 22
	Condensing temperature, 37°C
	In-tube condensation
Coolant :	City Water
	Inlet temperature : 18°C
	Outlet temperature : 26°C
	Mean Presure : 0.4 MPa.
Heat transfer matrix :	19mm OD, 20 BWG(thk=0.9mm), Brass tubes.

Data for Shell and tube Condenser are : **[16]**

Np=1 tube pass; Ds = 0.387m; N_T = 137 tubes; P_T = 25.4mm square pitch;.

B=0.35m baffle spacing.

Properties of City water at the bulk temp 22°C are as under,

V_l=0.001002m^3/kg; C_{pl}=4.181KJ/kg K;k_l=0.606W/mK; μ_l=959×10^{-6}Pa-s; Pr=6.61

Properties of R-22 are as under,

P_{sat}=14.17 bar; V_l=8.734×$10^{-4}$$m^3$/kg; μ_l=0.000186Pa.s; k_l=0.082 W/mK.,i_{fg}=169kJ/kg

C_{pl} = 1.305kJ/kg K; V_g=0.01643m^3/kg; μg=0.0000139Pa.s; Pr=2.96.

$$h_{TP} = 0.05 Re_{eq}^{\ 0.8} Pr^{1/3} \frac{kl}{di}$$

R_{fi}, R_{fo}=0.000176m^2K/W for refrigerant liquids and for City water and k_{brass}=111W/mK.

b) Explain the design approaches to the selection of a heat transfer matrix geometry. **[4]**

Q3) Explain in brief

a) Classification of Heat Exchangers with application. **[6]**

b) Factors for Selection of Heat Exchangers **[4]**

c) Regenerative Heat Exchangers **[6]**

SECTION - II

Q4) a) Air at 2bar and 500K with a velocity of U_∞=20m/s flows across a compact heat exchanger and matrix having a configuration showing in fig. (surface 11.32-0737-S-R). Calculate the heat transfer coefficient and the frictional pressure drop. The length of the matrix is 0.8 m. **[10]**

b) Air enters the core of a finned tube heat exchanger of the type shown in figure at 1 atm. And 30°C. The air flows at a rate of 1500kg/hr perpendicular to the tube and exits with a mean temperature of 100°C. The core is 0.5m long with a 0.25m^2 frontal area. Calculate the total pressure drop between the air inlet and outlet and the average heat transfer coefficient on the air side. **[14]**

Q5) a) What are the various codes used in Heat Exchanger Design? Explain in brief. **[8]**

b) Write short notes on any two of the following : **[12]**

i) Performance testing of Heat Exchanger

ii) Use of CFD techniques in heat exchanger design.

iii) Techniques to control fouling.

iv) Mechanical design considerations of heat exchangers.

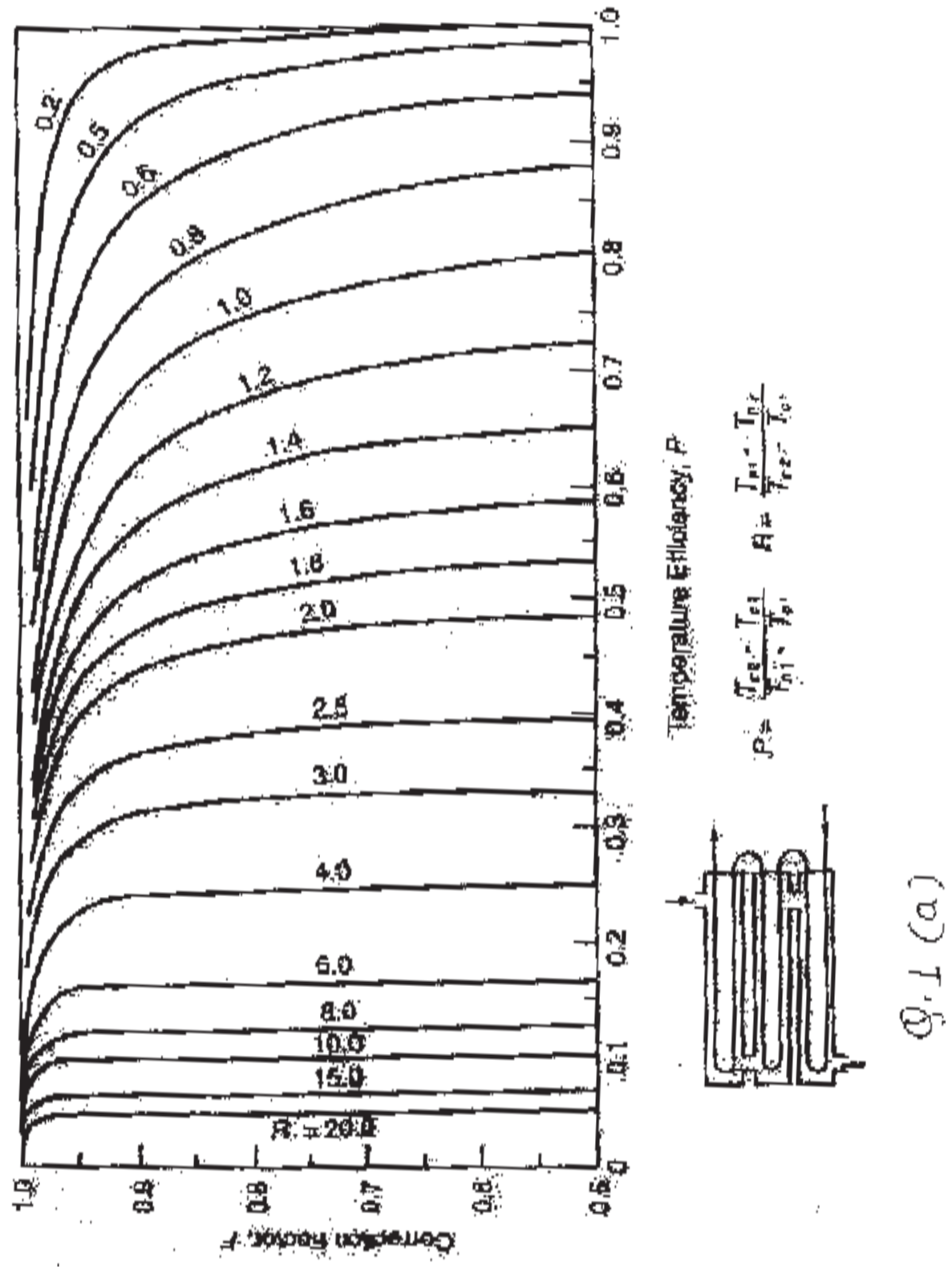
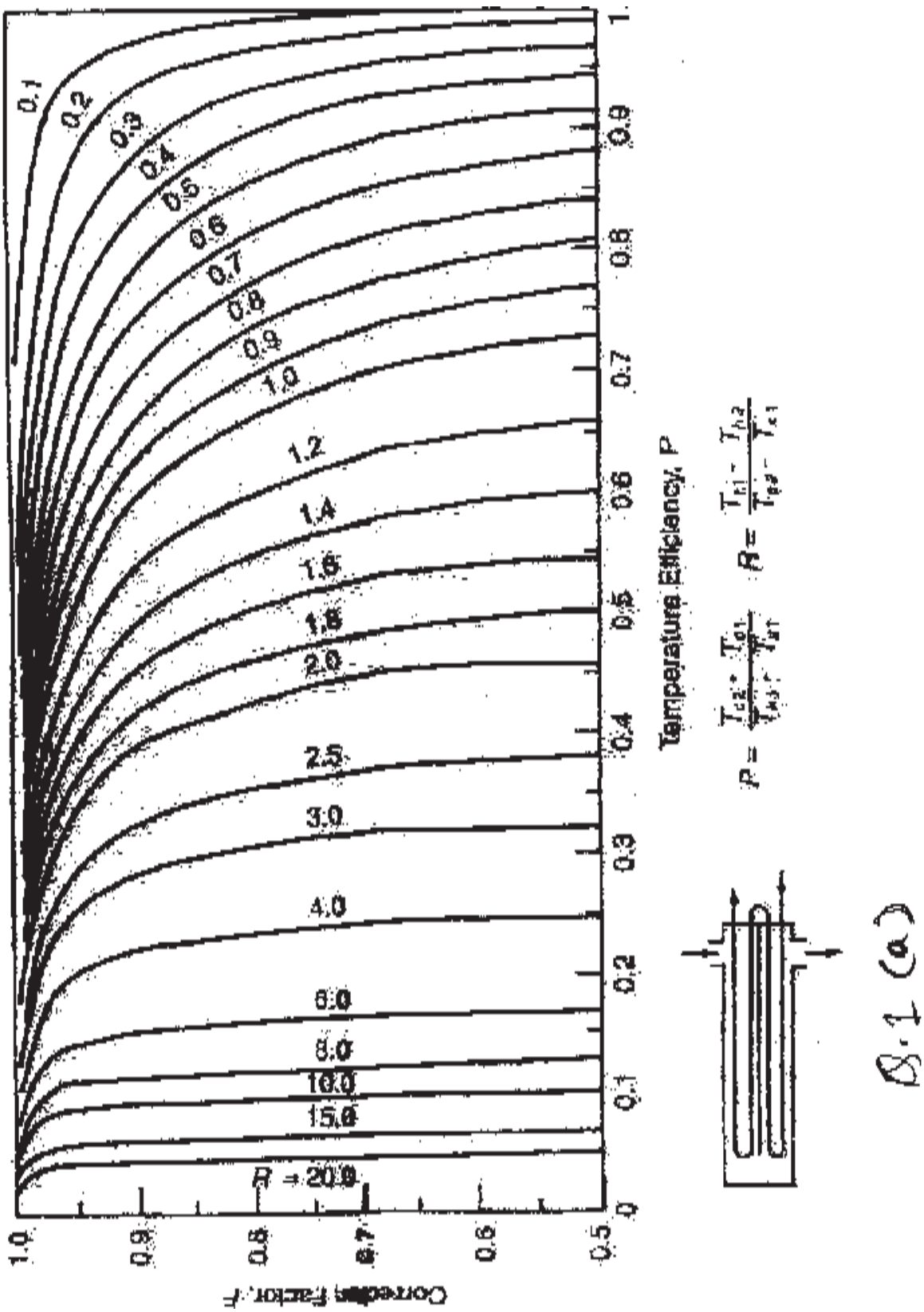

Temperature Efficiency, P
Correction Factor, F
0.2
0.5
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.5
3.0
4.0
6.0
8.0
10.0
15.0
R = 20.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

Fig. 7.7 (a)


Correction Factor, F
Temperature Efficiency, P
R = 20.0
15.0
10.0
8.0
6.0
4.0
3.0
2.5
2.0
1.8
1.6
1.4
1.2
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1

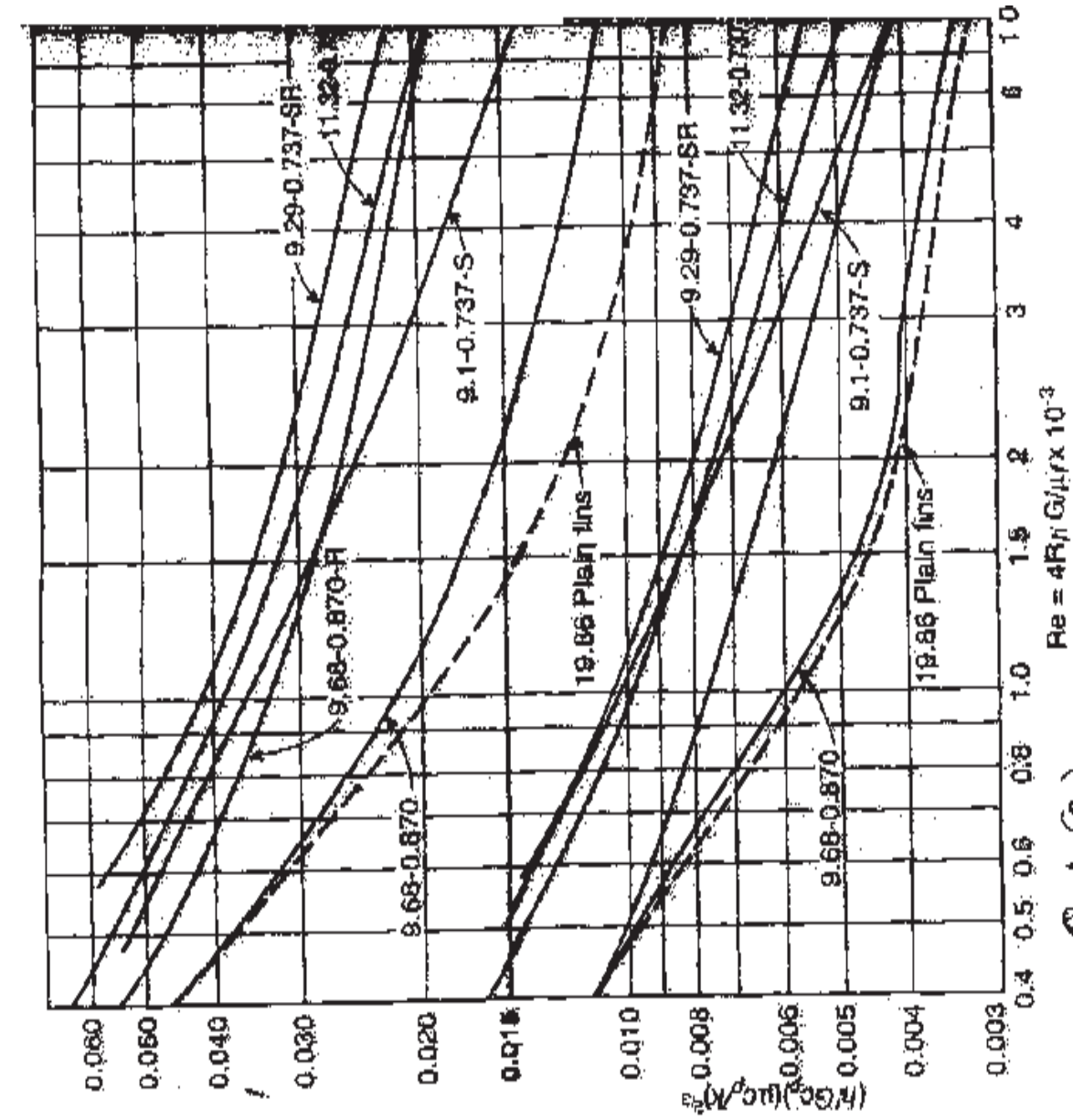
8.1 (a)

Correction Factor, F
1.0
0.9
0.8
0.7
0.6
0.5
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.2
1.4
1.6
1.8
2.0
2.5
3.0
4.0
6.0
8.0
10.0
15.0
R = 20.0
Temperature Efficiency, P
$P = \frac{T_{c2} - T_{c1}}{T_{h1} - T_{c1}}$ $R = \frac{T_{h1} - T_{h2}}{T_{c2} - T_{c1}}$
$NTU = \frac{1}{(1+C^{*2})^{1/2}} \ln \left[\frac{2 - \epsilon[1 + C^* - (1+C^{*2})^{1/2}]}{2 - \epsilon[1 + C^* + (1+C^{*2})^{1/2}]} \right]$
$C^* = \frac{C_{min}}{C_{max}}$

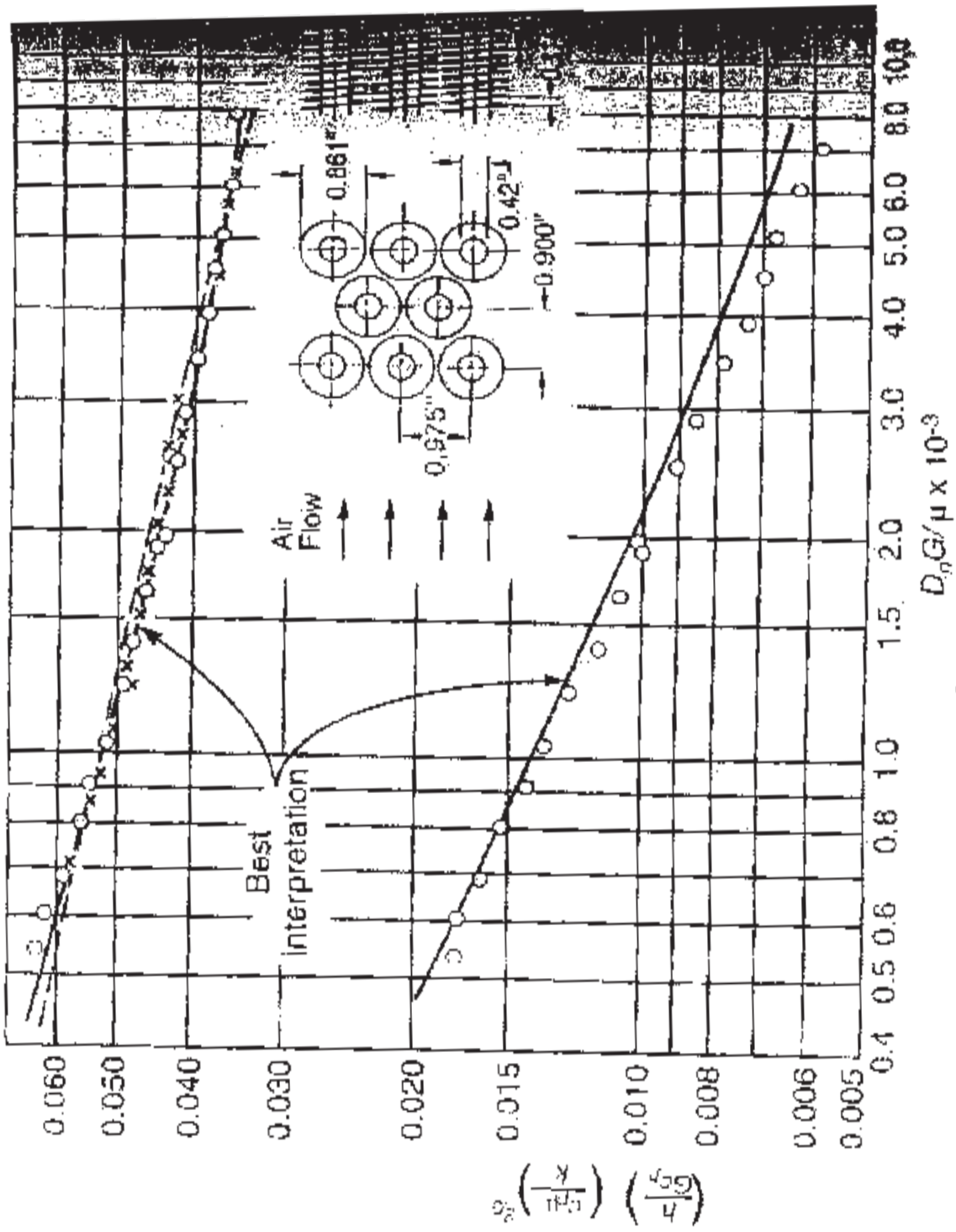
Fig. 1. (a) & (b)

0.100"
0.55"
0.797"
0.18"
0.79"
0.110"
Surface 9.1-0.737-S
Air flow
0.120"
1.05"
0.87"
0.103"
Surface 9.68-0.870
0.100"
0.737"
0.18"
0.79"
0.25"
0.105"
0.025"
Surface 9.29-0.737-S-R
0.120"
0.436"
1.05"
0.87"
0.103"
0.25"
0.025"
Surface 9.68-0.870-R
0.100"
0.797"
0.18"
0.79"
0.25"
0.088"
0.025"
Surface 11.32-0.737-S-R

Fig. 4 (a)


9.29-0.737-SR
11.32-0.737
9.1-0.737-S
9.68-0.870-R
9.68-0.870
19.86 Plain fins
Re = 4R_H G/μ x 10^-3
(h/Gc_p)(μc_p/λ)^2/3

Q. 4 (a)


0.861"
0.42"
0.900"
0.975"
Air Flow
Best Interpretation
0.060
0.050
0.040
0.030
0.020
0.015
0.010
0.008
0.006
0.005
0.4 0.5 0.6 0.8 1.0 1.5 2.0 3.0 4.0 5.0 6.0 8.0 10.0
$D_p G/\mu \times 10^{-3}$

Q. 4 (b)

✪✡✪✡

Total No. of Questions : 10] **[Total No. of Pages : 4**

P1429

[3965]-510
M.E. (Mechanical - Design Engineering)
ADVANCED STRESS ANALYSIS
(Sem - I) (2008 Course) (502202)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The stress function :

$$\phi = \left(Ar^3 + \frac{B}{r} + Cr + Dr\log r \right)\cos 2\theta$$

represents the stress distribution in semi circular ring with inner radius $r_i = 75$ mm and outer radius $r_o = 100$ mm with 'd' as thickness. The constants A,B, C and D involved in the stress function ϕ are to be evaluated for the following boundary conditions.

a) The inner and outer surface of the ring is free from radial stresses as well as shear stresses.

b) At horizontal cross section total tangential force i.e. $d\int_{ri}^{ro} \sigma\theta.dr = p$ at $\theta = 0$

where r_i and r_o are inner and outer radius of the ring and p is vertical load supported by-the ring. Also investigate the stress distribution along the cross-section of the ring. If the ring is used to support load p = 25 kN. Determine the maximum shear stress developed in the ring and its location. **[16]**

Q2) Explain soap film analogy to study torsion. A 300 mm I beam with flanges and with a web 12.5 mm thick subjected to a torque T = 4900 N.M. Find the maximum shear stress and the angle of twist per unit length.

P.T.O.

In order to reduce the stress and the angle of twist 12.5 mm thick flat plates are welded onto the sides of the section as shown by dotted lines in fig.1. Find the maximum shear stress and the angle of twist. **[16]**

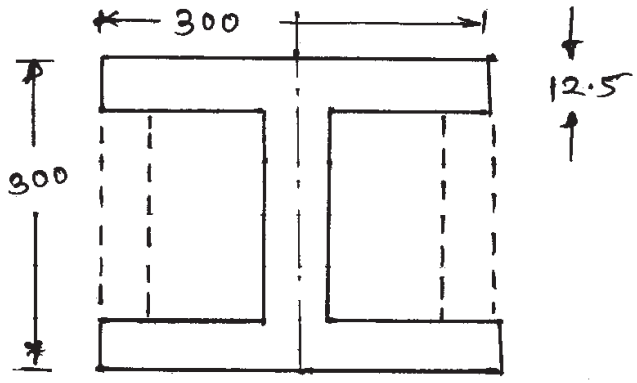


fig-1 (Q.2)

Q3) State the assumptions made in solutions of problems in contact stresses. Derive from fundamental the expression for contact stresses between two rollers having axis parallel to each other under compressive load. How this relation is used to find contact stresses between two spur gears and then to find the wear strength of mating gear teeth? **[16]**

Q4) a) A steel disc of uniform thickness and of diameter 400 mm is rotating about its axis at 2000 rpm. The density of the material is 7700 kg/m^3 and Poisson's ratio is 0.3. Determine the variations of circumferential and radial stresses. **[10]**

b) Derive expression for shrinkage pressure '*p*' in compound cylinders.**[6]**

Q5) Write notes on any 'THREE' : **[18]**

a) Mohr's circle for three dimensional stresses.

b) Castigliano's theorem.

c) Torsion of noncircular shaft.

d) Analysis of low speed impact.

SECTION - II

Q6) a) Explain the terms isoclinics and isochromatics in photoelasticity. What is there physical significance in measurement of stresses? **[8]**

b) A strain gauge rosette has three gauges A, B and C so arranged that angle between A and B is 60°, angle between B and C is 30°, the strains given by gauges A, B and C are

$\in_A = -400\times10^{-6}$; $\in_B = 50\times10^{-6}$

$\in_C = 300\times10^{-6}$

Find principal stresses and their directions with respect to the axis of gauge A. Assume E = 210 GPa and $\mu = 0.29$ for the material of specimen. **[8]**

Q7) Derive the governing equations for evaluation of stresses and deflection in circular plate with edge simply supported and subjected to central force '*p*'. State any assumptions made while deriving the equation and explain limitations. **[16]**

Q8) Explain the importance of bending axis and shear centre for thin walled section elements. Locate the shear centre for section shown in fig.2 **[16]**

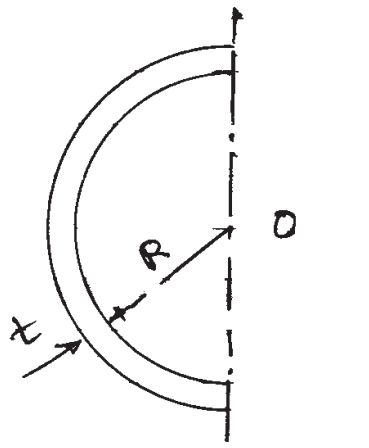


Fig. 2 (Q.8)

Q9) a) What is importance of shape factor, explain with suitable example. **[6]**

b) An edged cracked plate loaded in tension made of material has fracture toughness of 60 MPa $m^{1/2}$ and tensile strength of 550 MPa. Width of plate is 60 mm and crack length 5 mm. Find the ultimate tensile strength that would cause unstable propagation of the crack. For this geometry of the specimen the stress intensity factor is, **[10]**

$$K_1 = f(g)\sigma\sqrt{\pi a}$$

where, $f(g) = 1.2 - 0.23\left(\frac{a}{b}\right) + 10.5\left(\frac{a}{b}\right)^2 - 21.7\left(\frac{a}{b}\right)^3 + 30.4\left(\frac{a}{b}\right)^4$

a = crack length.
and b = plate width.

Q10) Write short notes on any THREE : **[18]**

a) Brittle coating method.

b) Spring back effect in plastic bending.

c) Plastic action in thick walled cylinders.

d) Two dimensional photoelastic stress.



Total No. of Questions : 08] [Total No. of Pages : 2

P1430

[3965]-512
M.E. (Mechanical) (Design - Engg.)
INSTRUMENTATION AND AUTOMATIC CONTROL
(Elective - I) (2008 Course) (502204)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from section I and 3 questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain probable error and standard error. **[8]**

b) Explain properties of correlation co - efficient. **[8]**

Q2) a) The following table gives the distribution of items of production and also the relatively defective items among them, according to size groups. Find the correlation co - efficient between size and defect in quality and its probable error. **[12]**

Size group	15-16	16-17	17-18	18-19	19-20	20-21
No. of items	200	270	340	360	400	300
No. of defective items	150	162	170	180	180	114

b) Explain the measurement of humidity. **[6]**

Q3) a) Explain with a neat sketch working of hot wire anemometer. **[8]**

b) A thermometer is calibrated between 150°C and 220°C. The specified accuracy is within ± 0.5% of instrument span. Find maximum static error. **[8]**

P.T.O.

Q4) a) Calculate the co - efficient of correlation by Charle's spearman method for following data **[10]**

X	45	56	39	54	45	40	56	60	30	36
Y	40	36	30	44	36	32	45	42	20	36

b) Explain the different types of thermo couples. **[6]**

SECTION - II

Q5) a) Explain any one method of measurement of ultra low pressure. **[10]**

b) A McLeod gauge has a volume of 160 cm^3 and a capillary diameter of 1.6 mm. Find the gauge reading for a pressure of 50 μm of mercury. **[8]**

Q6) a) Explain the principle and working of double beam spectrophotometer. **[8]**

b) Explain the method of measurement of very high temperature. **[8]**

Q7) a) Explain Mechanical/pneumatic type P + I + D controller. **[8]**

b) Explain electromagnetic flowmeter with its distinct merits & applications. **[8]**

Q8) Write short notes on any four: **[16]**

a) Measurement of torque.

b) Piezoelectric accelerometer.

c) Installation of strain gauges.

d) Calibration of thermocouples.

e) LDA.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1431

[3965]-514
M.E. (Mechanical) (Design Engineering)
OPTIMIZATION TECHNIQUES
(Revised 2008 Course) (502204 - (C)) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to each section should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of pocket calculator is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) How to identify the given problem requires optimization or not? What are the methods to classify the problems of optimization? **[6]**

b) Find the second-order Taylor's series approximation of the function. **[10]**

$f(x_1, x_2, x_3) = x_2^2\ x_3 + x_1\ e^{x_3}$

about the point $x^* = \begin{Bmatrix} 1 \\ 0 \\ -2 \end{Bmatrix}$

Q2) a) The step-cone pulley shown in fig.1 is to be designed for tansmitting a power of at least 0.75 HP. The speed of the input shaft is 350 rpm and the output speed requirements are 750, 450, 250 and 150 rpm for a fixed centre distance of 'a' between the input and output shafts. The tension on the tight side of the belt is to be kept more than twice that on the slack side. The thickness of the belt is 't' and the coefficient of friction between the belt and the pulley is 'μ'. Formulate the problem of finding the width and diameters of the steps for minimum weight. **[12]**

P.T.O.

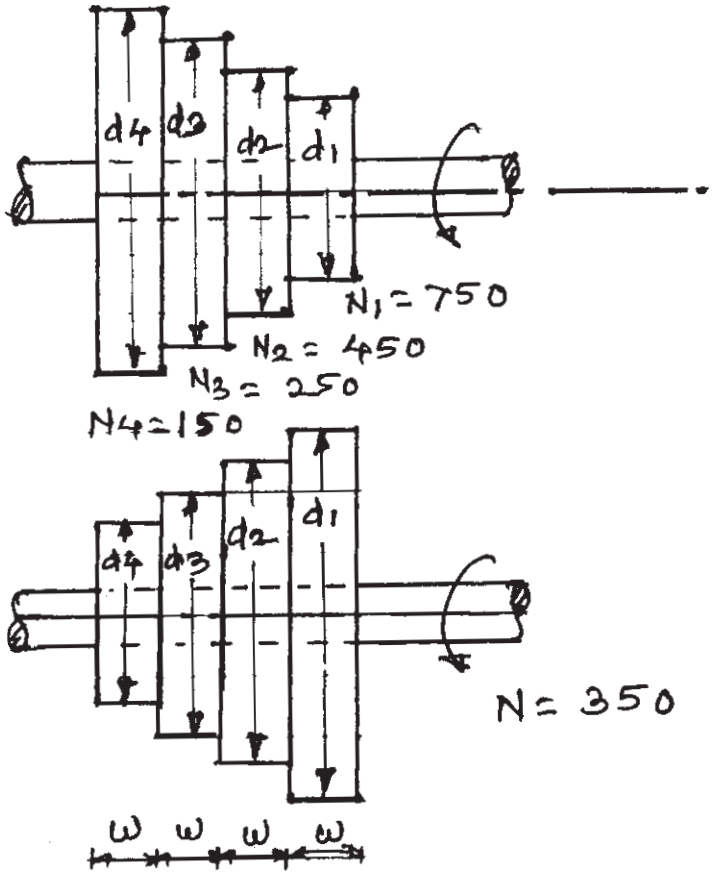


Fig .1 step-cone pulley

b) What is graphical optimization and what are its limitations. **[4]**

Q3) a) State the necessary and sufficient conditions for the maximum of a multivariable function $f(X)$. **[6]**

b) Find the maximum of the function
$f(X) = 2x_1 + x_2 + 10$ subject to
$g(X) = x_1 + 2x_2^2 = 3$, using the Lagrange multiplier method. Also find the effect of changing the right hand side of the constraint on the optimum value of f. **[10]**

Q4) a) What is the pivotal reduction of general system and how it differs from simplex algorithms? **[6]**

b) Find all the basic solutions corresponding to the system of equation by pivotal reduction system. **[10]**

$$2x_1 + 3x_2 - 2x_3 - 7x_4 = 1$$
$$x_1 + x_2 + x_3 + 3x_4 = 6$$
$$x_1 - x_2 + x_3 + 5x_4 = 4$$

Q5) Write short note on any THREE : **[18]**

a) Inequality constraint.

b) Convex programming problems.

c) Postoptimality analysis.

d) Engineering applications of optimization.

SECTION - II

Q6) a) What are the limitations of classical methods in solving a one-dimensional minimization problem? **[6]**

b) Find the minimum of the function

$$f(\lambda) = 0.65 - \frac{0.75}{1+\lambda^2} - 0.65\,\lambda \tan^{-1}\left(\frac{1}{\lambda}\right)$$

using quasi-Newton method with the starting point $\lambda_1 = 0.1$ and the step size $\Delta\lambda = 0.01$ in central difference formulas. Use $\in = 0.01$ for checking the convergence. **[10]**

Q7) a) State the iterative approach used in unconstrained optimization. **[6]**

b) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using Powell's method. **[10]**

Q8) Find the minimum of $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ by the cubic interpolation method. **[16]**

Q9) a) Formulate the equivalent unconstrained objective function that can be used in random search methods. **[6]**

b) Minimize $f(x_1, x_2) = x_1 - x_2$
Subject to
$g_1(x_1, x_2) = 3x_1^2 - 2x_1x_2 + x_2^2 - 1 \le 0$ using the cutting plane method. Take the convergence limit in step 5 as $\in = 0.02$. **[10]**

Q10) Write short note on any THREE : **[18]**

a) Descant method.

b) Penalty function method.

c) Grid search method.

d) Golden section method.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1433

[3965]-519
M.E. (Mechanical) (Design Engineering)
ADVANCED MACHINE DESIGN
(2008 Course) (502209) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an expression for maximum space efficiency of helical springs. **[8]**

b) A disc spring is made of 3mm sheet with an outside diameter of 125mm and an inside diameter of 50mm. The spring is dished 4.5mm. The maximum stress is to be 560N/mm^2. Determine : **[8]**

i) The load that may be safely carried.
ii) The deflection at this load.
iii) Stress produced at outer edge.

Q2) a) What is the cumulative fatigue damage? How the life of component subjected to different values of fluctuating stresses in cycle, is estimated by using Miner's equation? **[6]**

b) A cold drawn steel rod of circular cross section is subjected to a variable bending moment which varies from 565 N-m to 1130 N-m, as the axial load varies from 4500 N to 13500 N. The maximum bending moment occurs at the same instant that the axial load is minimum. The effect of stress concentration may be neglected. If the factor of safety is '2', determine the diameter of rod using maximum shear stress theory. Assume the following data.

S_{ut} = 550 N/mm^2; S_{yt} = 470 N/mm^2

surface finish factor = 0.82

Size factor = 0.8, Reliability factor = 0.897 **[10]**

P.T.O.

Q3) a) Explain the following terms in context with creep : **[8]**

i) Estimated time to rupture.
ii) Stress relaxation.

b) A cantilever beam has a rectangular cross-section 4cm wide and 8cm deep. The length is 250cm with 2000 N load at free end. The material is 0.35 carbon steel with n = 8 and B = 40×10^{-35} $(cm^2/N)^n$ per day. Find the permanent deflection after 10 yrs of service. **[8]**

Q4) a) Explain the use of composite materials in mechanical engineering with two examples, state reasons for preference in favour of such materials. **[6]**

b) A unidirectionally reinforced composite of 'Toray' Filament and 'Nameo' resin has the following moduli and poisson's ratio. **[10]**

E_{xx} = 181 GPa; E_{yy} = 10.3 GPa; υ_{xy} = 0.0159; G_{xy} = 7.17 GPa; $(1 - \upsilon_{xy}\, \upsilon_{yx})^{-1}$ = 1.045 estimate the components of moduli for an off-axis orientation of

i) $\theta = +30^o$ and
ii) $\theta = +45^o$

Q5) Write short note on the following : **[18]**

a) Regression analysis.
b) Hybrid materials and applications.
c) Vibration and surging of helical springs.

SECTION - II

Q6) a) Suggest a simple method of handling multiple objectives in an optimization problem. **[6]**

b) A manufacturing firm produces two products A and B, using two limited resources. The maximum amounts of resources 1 and 2 available per day are 1000 and 250 units respectively. The production of 1 unit of product A requires 1 unit of resources 1 and 0.2 unit of resource 2, and the production of 1 unit of product B requires 0.5 unit of resource 1 and 0.5 unit of resource of 2. The unit costs of resources 1 and 2 are given by the relations $(0.375 - 0.000054_1)$ and $(0.75 - 0.00014_2)$, where u_i denotes the number of units of resource i used (i = 1, 2). The selling prices per unit of products A and B, p_A and p_B are given by

$p_A = 2.0 - 0.0005\, X_A - 0.00015\, X_B$
$P_B = 3.5 - 0.0002\, X_A - 0.0015\, X_B$

where, X_A and X_B indicate, respectively, the number of units of product A and B sold. Estimate the problem of maximizing the profit assuming that the firm can sell all the units it manufactures. **[10]**

Q7) a) Explain fault tree analysis with suitable example. **[6]**

b) If a device has a failure rate of 2×10^{-6} failure/h what is its reliability for an operating period of 500 h? It there are 2000 items in the test, how many failures are expected in 500h? Assume that strict quality control has eliminated premature failures so we can assume a constant failure rate. **[10]**

Q8) a) Based on correction aspect how gearing is classified, explain S_0 gearing and S gearing. **[6]**

b) Two 20^o full depth gear of 20 and 30 teeth are to be designed on the extended centre distance system using the recommended values for clearance $f = (0.25/P_d)$. Make the calculations for $P_d = 1$. Find the following : **[10]**

i) Values of q_1 and q_2.
ii) The actual angle ϕ.
iii) The radius of actual pitch circle and centre distance.
iv) The tooth thickness on actual pitch circle.

Q9) a) Discuss the various design consideration for connecting rod of I.C. Engine. **[6]**

b) Design a cast iron piston for a single acting four stroke engine for the following specifications. **[10]**

Cylinder bore = 100mm.
Stroke = 120mm.
Max. gas pressure = $5N/mm^2$.
Brake mean effective pressure = $0.65N/mm^2$.
Fuel consumption = 0.227kg/kW/hr.
Speed = 2200 rev/min.

Assume suitable data.

Q10) Write a short note on following : **[18]**

a) Design for assembly.

b) Classical lamination theory of composite material.

c) Design for fatigue failure.



Total No. of Questions : 10] **[Total No. of Pages : 2**

P1434

[3965]-520
M.E. (Mechanical) (Design Engineering)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(2008 Course) (502210) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer - books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Solve Graphical problems on drawing sheets.***

SECTION - I

Q1) a) Give 2 examples each of : **[6]**

i) Cylindrical pairs.

ii) Spherical pairs.

iii) Higher pairs.

b) What is the difference between Degrees of freedom and mobility? **[4]**

c) How many minimum links and joints we can add in a mechanism so as to keep its degrees of freedom unaltered? Justify. **[6]**

Q2) Derive expression for instantaneous linear velocity of the reciprocating link from a scotch yoke mechanism when the crank is rotating with uniform velocity. Hence find out linear velocity of similar reciprocating link when 200mm long crank, rotating at 5 rad/s is at 45° with horizontal. **[16]**

Q3) a) Explain the effect of inertia on the force analysis of any mechanism along with supporting sketches. **[8]**

b) Write a short note on : 'Analysis of elastic mechanisms'. **[8]**

Q4) a) State and prove the mathematical condition for the 4 - Bar coupler curve to be symmetrical. **[8]**

b) Explain the term 'Opposite Pole Quadrilateral' and state its significance. **[8]**

P.T.O.

Q5) Write short notes on : **[18]**

a) Ball's point.

b) Matrix Method.

c) Cubic of stationery curvature.

SECTION - II

Q6) a) Give examples of synthesis problems for 'Path', 'Function', and 'Motion' Generation . **[10]**

b) Explain : 'Synthesis process for path generation'. **[6]**

Q7) a) A four bar mechanism is to be synthesized by using three precision points, to generate the function $Y = 2X + 2$, for the range $0 \leq x \leq 8$. Input link is to start from 0° and is to have a range of 90°.The output link is to start at 0° and is to have a range of 180°. Find out values of x, y, θ (input angles) & ϕ (output angles) corresponding to the four precision points. **[8]**

b) Explain 'Circle point' and 'Centre point' curves. **[8]**

Q8) a) If link1, Link 2, Link 3 & Link 4 are input, Coupler, Output and Ground links respectively and if at a particular instant $\omega_1, \omega_2, \omega_3, 0$ and $\alpha_1, \alpha_2, \alpha_3, 0$ are their instantaneous angular velocities and instantaneous angular accelerations respectively, explain how to find out link lengths to satisfy given conditions using Complex Number Method. Hence find link lengths if $\omega_1 = 8^c/s, \omega_2 = -2^c/s, \omega_3 = 2^c/s, \omega_4 = 0$ and $\alpha_1 = 0, \alpha_2 = 5 rad/s^2, \alpha_3 = \alpha_4 = 0$. **[10]**

b) Explain 'Dyad Method'. **[6]**

Q9) a) State 'Roberts Chebychev Theorem' and give its use. **[4]**

b) A four bar mechanism consists of 40mm long crank OA and 90mm long horizontal grounded link OC. At a particular instant the crank is at 25° with respect to horizontal position. Coupler AB is horizontal and is 30mm long. BC is the fourth link.
Treating AB as the base of coupler, construct equilateral triangle with 'P' as its vertex. Draw its cognate mechanisms to trace the coupler curve as traced by point 'P'. **[12]**

Q10) Write Short Notes on :(Any Three) **[18]**

a) Errors in Mechanisms.

b) D - H parameters.

c) Bermester point.

d) Complex number Method.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1436

[3965]-531
M.E. (Mechanical) (Mechatronics)
DIGITAL SIGNAL PROCESSING
(2008 Course) (Elective - I) (502804)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Considering digital filter as a system explain when this system can be considered as time invariant, causal, linear and dynamic. **[8]**

i) $y(n) = e^{x(n)}$

ii) $y(n) = x^2(n)$

b) Consider the analog signal $x_a(t) = 5 \cos 200 \Pi t$. **[8]**

i) Determine the minimum sampling rate required to avoid aliasing.

ii) Suppose that the signal is sampled at the rate Fs = 400Hz, what is the discrete time signal obtained after sampling?

iii) Considering that signal is sampled at the rate Fs = 100Hz, what is the discrete-time signal obtained after sampling.

Q2) a) State and explain nyquist's criteria for band limited signal. What is aliasing effect? **[6]**

b) The impulse response of LTI system is $h(n) = \{-2, 4, 6, \underset{\uparrow}{1}\}$, the response of the system to the input signal $x(n) = \{3, -2, \underset{\uparrow}{4}, 6\}$. **[10]**

P.T.O.

Q3) a) State and explain Linearity and convolution property of 'Z' transform. **[8]**

b) Determine the 'Z' transform of the following discrete time signal and ROC of each. **[8]**

i) $x(n) = A \sin w_0 n$.

ii) $x(n) = -4(-n-1)$.

Q4) a) Determine the 4 point DFT of the following sequence

$x(n) = 5 \sin w_0 n \qquad 0 \leq n \leq 3$

$= 0 \qquad$ otherwise

where $f_0 = 50$Hz. **[8]**

b) Explain DIT-FFT with help of butterfly diagram for 4 point FFT. **[8]**

Q5) Write short notes on (any three) : **[18]**

a) Comparision between energy and power signal.

b) Basic DSP system.

c) Merits and demerits of DSP.

d) Power spectral density.

e) Classification of digital signals.

SECTION - II

Q6) a) Explain with the help of neat block diagram architecture of any DSP processor. **[8]**

b) Explain in brief concept of barrel shifter and multiplier-Accumulator unit (MAC). **[8]**

Q7) a) What are the different types realization techniques for digital filters. Explain any one in detail. **[8]**

b) Establish the system transfer function for the system defined by

$$y(n) = 2x(n) + 9x(n-1) + \frac{4}{5} x(n-2) \frac{-1}{3} y(n-1)$$

Also realize the same using DF-I and DF-II methods. **[10]**

Q8) a) Perform the circular convolution of the following two sequences. **[8]**

$x_1(n) = \{1, 3, 9, 6\}, x_2(n) = \{-2, 4, 6, 8\}$.
$\uparrow$ $\uparrow$

b) What are the different techniques used for IIR filter design? Explain any one in detail. **[8]**

Q9) a) Give the comparison between IIR and FIR filters. **[8]**

b) Explain the concept of windowing in design of FIR filters using two windows. **[8]**

Q10) Write short notes on (any four) : **[16]**

a) Auto/cross correlation.

b) Vibration analysis.

c) Over Lap and save method for DFT.

d) System classifications in DSP.

e) DSP in mechatronics.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1438

[3965]-557

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE ENGINE DESIGN

(2008 Course) (502301) (Sem. I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn where necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if required, but state the assumptions clearly.***
6) ***Use of Pocket Calculator is allowed.***

SECTION - I

Q1) a) Distinguish between Otto and Diesel cycle for reciprocating IC engines. **[6]**

b) Following data refers to a 2 stroke diesel engine running for 20 minutes at full load. Determine the BSFC, ISFC and indicated thermal efficiency as well as plot the heat balance sheet.

Speed = 350 rpm, Ambient Temp = 298, IMEP = 3 Bar, Exhaust gas temp = 300ºC, Brake load = 650 N, Bore = 200 mm, Stroke = 280 mm, Fuel consumption = 1.5 kg, Brake drum diameter = 1m, Coolant flow = 160 kg, CV of fuel = 42000 kJ/Kg, Water inlet temp = 35ºC, Water outlet temp = 60ºC Steam formation per kg of fuel = 1.35 kg, Cp of steam = 2.1 kJ/kgK. AF ratio by mass = 30:1 Cp of dry gas = 1.01 kJ/kgK. **[10]**

Q2) a) Discuss the criteria for selecting bore to stroke ratio for any engine. What are the factors affecting cylinder arrangement? **[8]**

b) Design the thickness of a cylinder head for a 20 mm bore cylinder with combustion pressure 200 N/mm^2. The allowable stress is 4000 N/mm^2. **[4]**

c) Explain in brief the effect of valve timing on engine performance. **[4]**

Q3) a) State the process of designing a connecting rod by Rankine formula. For a connecting rod, the stress is 1200 N/mm^2. The cross sectional area is 100 mm^2 and the load is 600 N. The radius of gyration is 15 mm and the value of constant k is 1.5. Calculate its length. **[8]**

b) Explain the process of piston ring design. Derive the expression for unit stress in section of the ring and explain all the terms. **[8]**

P.T.O.

Q4) Write short notes on : **[18]**

a) Principle of similitude.

b) Flywheel design.

c) Engine Performance Characteristics.

d) Materials for principal engine components.

SECTION - II

Q5) a) Discuss the design of valve train for variable valve opening. **[6]**

b) Explain the importance of a cam profile selection. **[4]**

c) Calculate the bore of an engine and length of crankpin if the bending moment on crankshaft is 5000 N-mm and allowable stress is 15000 N/mm^2. The piston pressure is 20,000 N/mm^2 and area of cross section is 250 mm^2. **[6]**

Q6) a) What are torsional vibrations? Write a formula for natural frequency of torsional vibrations and explain the terms. **[8]**

b) What is the importance of firing order in an engine? **[4]**

c) Explain the process of balancing for a three cylinder engine. **[4]**

Q7) a) Explain the process of lubrication design and importance of selection of lubricant. **[8]**

b) Explain the importance of exhaust manifold design. How is the size and shape of manifold calculated and decided respectively. **[8]**

Q8) Write short notes on : **[18]**

a) Methods of engine friction reduction.

b) Design of Carburetor for SI engine.

c) Governor design for CI engine.

d) Design of cooling system.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1440

[3965]-566
M.E. (Mechanical Automotive Engineering)
AUTOTRONICS
(2008 Course) (502307) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the advantage of Gear Reduction Starter Motor in strarting system? **[4]**

b) What are the latest improvements in vehicle Head Lights to improve the night time driving in automobiles? **[4]**

c) What is the functions of battery in an Automobile? **[4]**

d) How do you improve the performance of an Alternator to maintain a healthy electrical system in the vehicle? **[6]**

Q2) a) Explain the role of different types of sensor used to help the driver to park his vehicle. **[4]**

b) What are the different non-contact type speed sensors used in an automobile? **[6]**

c) What are the special requirements in specification that sensors should meet for automotive application? **[6]**

Q3) a) Draw block diagram of an electronic instrument cluster used in cars and how it can be converted to a Driver Information System (DIS)? **[8]**

b) Explain with the block diagram the working of a micro-controller based ECU and its interface to real time sensor and actuator? **[8]**

P.T.O.

Q4) a) How does the ABS System help to improve the safety of vehicle during driving. **[8]**

b) What are the various types of anti-theft devices used in vehicle for safety and security purpose? **[8]**

SECTION - II

Q5) a) What are the actuators/outputs used to control the working of a MPFI SI petrol Engine? **[4]**

b) What is the role of Lambda Sensor (Oxygen Sensor) to control emission in an engine? **[4]**

c) How does electronics in engine helps to improve the fuel consumption in the vehicle? Give specific examples. **[10]**

Q6) How does an Electronic Control System work in a CRDI (Common rail direct injection) for diesel Engine? **[16]**

Q7) a) Explain the working of a HVAC system in the vehicle and what are the controls used in it? **[8]**

b) Compare the functions, advantages and drawbacks of manual gear shift system and automatic gear shift system. **[8]**

Q8) a) "EMI/EMC has become critical to today's automobiles". Explain with at least four illustrative examples. **[8]**

b) Write short note (any two) : **[8]**

i) OBDC (On Board Diagnostics Control).
ii) Networking of controllers in automobiles.
iii) Safety devices to control short circuit currents.

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1441

[3965] - 576
M.E. (Electrical) (Control Systems)
NON LINEAR CONTROL SYSTEMS
(2008 Course) (503103) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the nonlinearilies in control system components : **[8]**

i) Relay with Hysteresis. ii) Saturation.

iii) Dead zone. iv) Back lash.

b) Classify different types of singular points and discuss their significance. Comments on stability based on types of singular points. **[9]**

OR

Q2) a) Explain nonlinear characteristics : **[9]**

i) Jump Resonance.

ii) Soft & Hard Excitation.

iii) Limit cycles / self excited oscillations.

b) Give advantages & disadvantages of describing function method & isocline method to plot phase plane trajectory. **[8]**

Q3) a) Describe pell's method for constructing phase plane trajectory. **[8]**

b) Using isoclines method draw phase plane trajectory of $\ddot{x} + 2\dot{x} + 4x = 0$, starting point as ($x = 0.5,\ \dot{x} = 0$). **[9]**

OR

P.T.O.

Q4) In unity feedback control system a saturating amplifier is connected in cascade with G(S) = $\frac{1}{S(S+3)}$, the gain of amplifier in linear zone is 2 and it saturates at input level of ± 2. Draw phase plane trajectory for given control system. Also examine the existance of limit cycle. **[17]**

Q5) a) Derive describing function for saturation. **[8]**

b) Develop describing function for on-off relay with hysteresis. **[8]**

OR

Q6) Explain : **[16]**

a) Circle criterion.

b) Popov criterion.

SECTION - II

Q7) a) Test the following function for positive definiteness **[8]**

$$x_1^2 + 2x_2^2 + x_3^2 + 4x_1x_2 - 6x_1x_3 - 4x_2x_3$$

b) Explain the terms in the sense of Lyapunov. **[9]**

i) Asymptotic stability.

ii) Global stability.

iii) Instability.

OR

Q8) a) An autonomous system is given below $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix}$ **[8]**

Select Lyapunov function and examine stability.

b) Explain briefly positive definite, Negative definite, positive semidefinite and negative semi definite. **[9]**

Q9) A nonlinear system is represented by state equations **[17]**

$$\dot{x}_1 = x_1 - 2x_1^2 - 2x_1x_2$$

$$\dot{x}_2 = x_2 - x_2^2 - \tfrac{1}{2}x_1x_2$$

Using linearization at each equilibrium point, determine the type of equilibrium point and behaviour of phase portrait near each equilibrium point.

OR

Q10)a) Explain Krasovski method to assess the stability of equilibrium point. **[8]**

b) For autonomous state equation of linear time invariant system, derive the expression $A^T P + PA = - Q$. **[9]**

Q11)a) Explain full state linearization by state feedback. **[8]**

b) Explain briefly with illustration notion of sliding mode control. **[8]**

OR

Q12)Explain : **[16]**

a) Input output linearization.

b) Input state linearization.

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1442

[3965]-577
M.E. (Electrical) (Control System)
AUTOMATION & ROBOTICS
(2008 Course) (Elective - I) (503104)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by degree of freedom? How many DOF are required to position an end effector at any point in 3D space. **[9]**

b) What are common methods of Teaching a Robot? State the merits and demerits of each. **[8]**

OR

Q2) a) Briefly enumerate a cronology of historical events in the development of robotics. **[9]**

b) Sketch two views to indicate the work envelope of a **[8]**
   i) Cartesion robot.
   ii) Cylindrical robot.
   iii) Polar robot.
   iv) Anthropanorphic robot.

Q3) A part weighting 5 kgF is tobe held by a robot end effector having two fingers. The coefficient of friction between the fingers and the part is 0.25. Assume g factor tobe 3.0. Assuming that the weight of the part is applied in a direction parallel to the contacting finger's surfaces, estimate the gripping force. **[17]**

OR

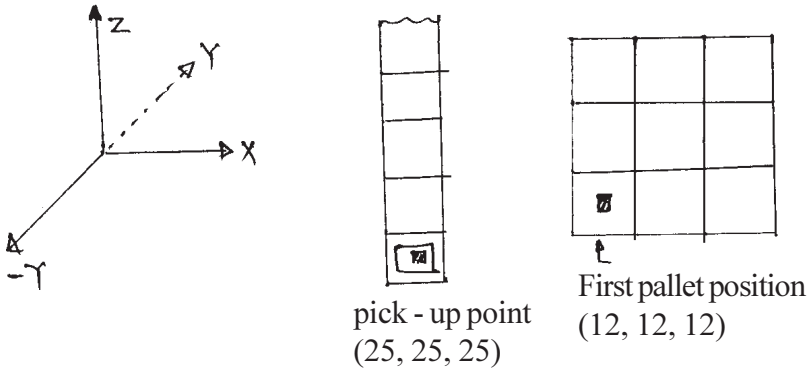
Q4) a) What are the types of hydraulic actuators used in robotics? **[5]**

b) Distinguish between servoed and non-servoed grippers. What are the actuators used for such grippers? **[5]**

c) Sketch some linkage mechanisms for mechanical grippers. Using a diagram, briefly explain parallel action robot grippers. **[7]**

P.T.O.

Q5) Write a program to pick the blocks off a conveyor belt and place them in a pallet in 3 × 3 array positions as shown in figure. The blocks are precisely positioned on the conveyor, and conveyor stops at the pick - up points. Conveyor is reactivated manually. **[16]**



OR

Q6) a) How does spray painting works? Describe a spray painting booth for painting auto - mobile cars using a suitable spray painting robot. **[10]**

b) What are trends in future application areas of robotics? **[6]**

SECTION - II

Q7) a) Discuss Lagrange method to get dynamical equations for a robot manipulator starting with KE and PE of a robot manipulator. **[12]**

b) Find relation between forces and acceleration of the links. **[5]**

OR

Q8) a) Enlist seven properties of Robot Arm Dynamics. **[7]**

b) Write the homogeneous transform matrix for rotation of 90° about the z -axis followed by a rotation of – 90° about the x - axis followed by a translation of (3, 7, 9). **[10]**

Q9) a) Write steps denote the systematic derivation of the D - H parameters. Also enlist the properties of rotation matrix. **[12]**

b) Write short notes on direct approach in inverse kinematic problem. **[5]**

OR

Q10) a) Explain multiple - View geometry for inverse kinematic solutions by geometric approach. **[10]**

b) Write rules for establishing link co - ordinate frames. **[7]**

Q11) a) Write short notes on Feed back linearization control. **[8]**

b) Explain in brief PD and PID control in robotics. **[8]**

OR

Q12) Write short notes on: **[16]**

a) Jacobian for prismatic and revolute joint.

b) Joint position control of Robot Manipulator.

c) Torque control of robot manipulator.

d) Force control of robot manipulator.



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1446

[3965]-592

M.E. (Electrical) (Power Systems)

POWER SECTOR ECONOMICS, MANAGEMENT AND RESTRUCTURING

(2008 Course) (503202) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give the salient features of regulatory process in Nordic Pool. **[8]**

b) Explain option contracts and contract for differences. **[8]**

c) How transmission pricing can be done under open access conditions. **[9]**

Q2) a) Why there is congestion in power system? Explain effects of congestion. **[8]**

b) Discuss various independent system operator models used in power system. **[9]**

c) Explain pricing structure of real and reactive power based on locational marginal and dynamic spot pricing. **[8]**

Q3) a) What is arbitrage? How it can be exercised? With suitable example explain cross commodity arbitrage. **[9]**

b) Write a note only : **[8]**

i) Open access model.
ii) Energy auction.

c) What is market power? Explain implications of market power and it's control? **[8]**

P.T.O.

SECTION - II

Q4) a) What is deregulation of power industry? Explain conditions that favoured deregulation. **[9]**

b) Explain price cap and revenue cap regulation with it's merit and demerits. **[8]**

c) Discuss the process of tariff setting under deregulated power structure. **[8]**

Q5) a) Estimate internal rate of return for the following project. The initial investment in the project is Rs.10,00,000. The savings realized from the project for subsequent five years are Rs.20,0000, Rs.20,0000, Rs.30,0000, Rs.30,0000 and Rs.35,0000. Use following discounting rates to calculate IRR. The discounting rates are 10%, 12% and 14%. **[9]**

b) Explain role of central electricity authority and power finance corporation in today's competative power industry. **[8]**

c) What is regulatory asset and liability? With suitable example explain how quality of supply is linked with tarift. **[8]**

Q6) a) Give salient features of Electricity Act 2003. **[8]**

b) Explain various reliability, quality and economy indices used by regulators to evaluate performance of utility. **[9]**

c) Write notes on following with reference to tariff : **[8]**

i) Price based on marginal cost principle.
ii) Hidden cost of externalities.



Total No. of Questions : 06] **[Total No. of Pages : 2**

P1447

[3965]-594

M. E. (Electrical) (Power System)

DIGITAL SIGNAL PROCESSING & ITS APPLICATIONS

(Elective - I) (2008 Course) (503204)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) State and explain sampling theorem. Also explain the concept of frequency aliasing. **[8]**

b) Determine whether the following systems are time invariant or time variant. **[4]**

i) $y(n) = x(n) + x(n-1)$

ii) $y(n) = x(-n)$

c) Determine whether the following systems are linear or non - linear. **[4]**

i) $y(n) = \dfrac{1}{x(n-1)}$

ii) $y(n) = nx(n)$

d) State and prove initial value theorem and final value theorem for 2 transform. **[9]**

Q2) a) Perform the circular convolution of the following two sequences using the method of DFT & IDFT **[13]**

$x_1(n) = \{1,1,1,2\}$

$x_2(n) = \{1,2,3,2\}$

b) Explain radix 2 DIF - FFT algorithm in details. **[12]**

P.T.O.

Q3) a) Explain direct form and cascade form realization of FIR filts. **[10]**

b) Using a rectangular window technique design a lowpass filter with passband gain of unity, cutoff frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7. **[10]**

c) Explain the concept of symmetric and antisymmetric FIR filters in brief. **[5]**

SECTION - II

Q4) a) Explain direct form I, direct form II, cascade form and parallel form realization for IIR filters. **[16]**

b) Explain design of IIR filter using impulse invariance technique. **[9]**

Q5) a) Explain the concept of pipelining and its implementation. **[10]**

b) Explain following concepts: **[15]**

i) Memory mapped register addressing.

ii) Effect of finite word length.

iii) Multiple access memory and multiported memory.

Q6) a) With the help of a functional block diagram, explain the features of TMS 320C50 DSP processor. **[15]**

b) Write a note on DSP based power system harmonic measurement system. **[10]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1448

[3965]-599
M.E. (Electrical) (Power Systems)
POWER SYSTEM PLANNING AND RELIABILITY
(2008 Course) (503209) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is load forecasting? Explain different approaches to load forecasting. **[13]**

b) Explain : **[12]**

i) Reactive load forecasting and
ii) Non weather sensitive load forecasting.

Q2) a) Describe short term, Medium term and Long term planning in Power System. **[13]**

b) Explain the role of power system engineer in long term planning. **[12]**

Q3) a) Explain two state model of reliability and show that MTTF is reciprocal of failure rate. **[13]**

b) Explain in details continuous Markov process. **[12]**

SECTION - II

Q4) a) Explain Loss of Load Probability with respect to the generation planning. **[12]**

b) A generating station has four units each of 80MW capacity. Forced outage rate for each unit is 0.05. Develop capacity outage probability table. **[13]**

P.T.O.

Q5) a) Explain the objectives of transmission planning. Explain transmission line constraints. **[15]**

b) Explain different system and customer oriented interruption indices. **[10]**

Q6) Explain different factors to be considered for distribution system planning for : **[25]**

a) Radial networks.

b) Parallel and meshed networks.



Total No. of Questions : 6] **[Total No. of Pages :2**

P1450

[3965] - 604
M.E. Electrical (Power-System)
PARTIAL DISCHARGES IN ELECTRICAL POWER APPARATUS
(2008 Course) (503212) (Elective - IV)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***

SECTION - I

Q1) a) Define following terms : **[10]**

i) Partial discharge in electrical insulation system.

ii) Internal discharge.

iii) Surface discharge.

iv) Corona discharge.

v) Permissible discharge magnitude.

b) Explain non-electrical PD characteristic parameters. **[5]**

c) Discuss train of PD current pulses in relation to the temporally assigned instantaneous value of high voltage. **[10]**

Q2) a) Discuss PD charge measuring equipments.

i) Explain integration in the frequency domain.

ii) Explain narrow band system. **[15]**

b) Discuss the procedure followed for calibration of PD measuring setup. **[10]**

P.T.O.

Q3) Write short notes on

a) Need for screening. **[8]**

b) Completely enclosed screen. **[7]**

c) Design of filters. **[10]**

SECTION - II

Q4) a) Discuss effects of PD on gaseous insulating materials. **[10]**

b) Explain effect of PD in solid and mixed dielectrics insulation system. **[15]**

Q5) a) Derive relation between measured and actual charge. **[10]**

b) Explain relation between the time dependent occurrence of PD and the extent of damage due to it. **[15]**

Q6) Write short notes on :

a) Problems during PD measurements on long cables. **[10]**

b) Methods of locating PD. **[7]**

c) Need for PD measurement. **[8]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1451

[3965] - 608

M.E. (E&TC) (Microwave)

RF WAVE AND MICROWAVE CIRCUIT DESIGN

(2008 Course) (504223) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) Explain in details the concept of stability consideration related to amplifier design? **[10]**

b) A microwave transistor has the following S parameters at 10 GHz with a 50Ω reference impedance. The source impedance is ZL = 30Ω. Compute the power gain, the available gain and transducer power gain. S11 = 0.45∠150° S12 = 0.01∠-10° S21 = 0.40∠-150° S22 = 2.05∠10° **[15]**

Q2) a) Explain in detail p-channel MOSFET along with its operating frequency and electronic applications. **[13]**

b) An abrupt p-n junction made of Si has the acceptor and donor concentration of $N_A = 10^{13}$ cm^{-3} and $N_D = 5 \times 10^{09}$ cm^{-3} respectively. Assuming that device operates at the room temperature, determine:**[12]**

i) The barrier voltage.

ii) The space charge width.

iii) The peak electric field across the junction

The junction capacitance for a cross sectional area is 10^{-4} cm^2 and $\varepsilon_r = 10$.

P.T.O.

Q3) a) Explore the concept sensitivity, conversion gain and dynamic range related to RF design. **[12]**

b) Describe in detail operating principal of TRAPATT diode. **[13]**

SECTION - II

Q4) A GaAs FET is biased for a minimum noise figure, and has the following S parameters and noise parameters at 4GHz (Zo = 50Ω) : S11 = 0.6∠-60° S12 = 0.5∠26° S21 = 1.9∠81° and S22 = 0.5∠-60° Fmin = 1.6 dB, Γ' opt = 0.62∠100°. R_N = 20Ω, Assume device to be unilateral, Calculate the maximum error in G_T. Design an amplifier having a 20 dB noise figure with the maximum gain that is compatible with the noise figure. (Drawing of smith chart is must). **[25]**

Q5) a) Focus on design of multistage amplifier for microwave circuits. **[12]**

b) Find the stability regions of a transistor whose S parameters are as : S11 = 0.7∠-70°, S12 = 0.2∠−10° S21 = 5.5∠85° and S22 = 0.7∠-45°. (note : angles are expressed in degree) **[13]**

Q6) a) Design a BJT colpitts oscillator for 200 MHz. The parameters are V_{ce} = 3v, Ic = 3 mA at room temperature. C_{bc} = 0.1pF, R_{be} = 2KΩ, R_{ce} = 10KΩ, C_{be} = 100pF. If the inductance should not exceed L_3 = L = 50 nH, find the value of capacitances in the feedback loop. **[13]**

b) Explain single balanced mixer. **[12]**

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Total No. of Questions : 06] **[Total No. of Pages : 2**

P1452

[3965]-609

M.E. (E & TC) (Microwave)

APPLICATIONS OF MICROWAVE TO RADAR AND SATELLITE

(Elective - I) (2008 Course) (504224)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any TWO questions from each section.***
2) ***Figures to right indicate full marks.***
3) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) Explain Ambiguity function related to Synthetic Aperture Radar in detail. **[12]**

b) Elaborate application of S.A. Radar for ship monitoring. **[13]**

Q2) a) Explain the all the factors affecting the CW radar range. **[10]**

b) An MTI radar operates at 8GHz with a prf of 3500pps. Calculate the lowest three blind speed. **[7]**

c) Determine the fixed error in range of radio altimeter to achieve a 15% frequency range for a carrier in the 500-5000 MHz range. **[8]**

Q3) a) What is radar beacon? Derive its range equation. **[12]**

b) An L band radar operating at 1.25 GHz uses a peak pulse power of 3 MW and must have a range of 182 Km for objects whose radar cross section is $1m^2$. If the minimum receivable power is 2×10^{-13} W, what is the smallest diameter the antenna reflector could have, assuming it to be paraboloied with k = 0.65? **[13]**

SECTION - II

Q4) a) Elaborate the term satellite. Explain satellite communication technique. Also state three Kepler's law of motion of an object in an orbit. **[12]**

b) Explain what is meant by the reciprocity theorem as applied to antenna. A voltage of 100 v applied at the terminal of a transmitting dipole results in induced current of 3 mA in receiving dipole. Calculate the current induced in first antenna when a voltage of 350 v is applied to the terminals of second antenna. **[13]**

P.T.O.

Q5) a) Explain why a minimum of four satellites must be visible at any earth location utilizing the GPS system for position determination. To what does the term dilution of position refers. **[12]**

b) Calculate the frame efficiency for an Intelsat frame given in the following information: **[13]**

Total frame length = 120832 symbols.
Traffic bursts / frame = 14
Reference burst / frame = 2
Guard interval = 103 symbols.

Q6) a) In satellite communication, explain the technique or procedure for measuring and calculating Intermodulation noise. **[13]**

b) Find the earth station transmitter power and received (C/N) when the system is operated: **[12]**

i) In TDMA with the transponder saturated by each earth station in turn.

ii) In FDMA with 5-dB input and output backoff.

♦♦♦♦

Total No. of Questions : 08] **[Total No. of Pages : 2**

P1453

[3965]-610
M.E. (E & TC) (Microwave)
DIGITAL IMAGE PROCESSING AND ANALYSIS
(Elective - I) (2008 Course) (504224)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q 1 and Q 5 are compulsory. Solve any two questions from the remaining.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss BMP and tiff image file formats. **[8]**

b) With the help of a neat block diagram explain a typical image processing system. Also discuss the significance of each block considering an application. **[10]**

Q2) a) What is image filtering operation? Write an algorithm to perform this operation. **[8]**

b) With the help of a suitable image, show that median filtering is better than averaging filter in removing salt - and - pepper noise. **[8]**

Q3) a) What is image restoration? Discuss any one image restoration technique. **[8]**

b) Write an algorithm to convert an RGB image to HSI image and vice versa. **[8]**

Q4) a) Explain any one technique for lossless image compression. **[8]**

b) How to enhance image in frequency domain? **[8]**

SECTION - II

Q5) a) Explain image dilation, erosion and closing with the help of a binary image and a suitable structuring element. **[10]**

b) Discuss edge detection using Sobel and Prewitt operator. Compare their performance. **[8]**

Q6) a) Explain how edge linking can be done using Hough transform. **[8]**

b) Explain thresholding. With the help of an example, illustrate how the selection of threshold is a crucial aspect. **[8]**

P.T.O.

Q7) a) Explain template matching. Give an example where it can be used for object recognition. **[8]**

b) Explain image thinning operation. **[8]**

Q8) a) Explain any two boundary descriptors. **[8]**

b) Explain the process of object recognition using fuzzy systems. **[8]**

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1456

[3965]-616
M.E. (E & T/C) (Microwave)
SIGNAL PROCESSING FOR WIRELESS COMMUNICATION
(2008 Course) (504229) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Define : **[10]**

i) Discrete random signals.
ii) Stochastic process.
iii) Wide sense stationary random process.
iv) Likelihood and sufficiency.

b) Explain Gauss Markov model. **[6]**

Q2) a) Explain the term noise. Explain the different types of noise with their properties. **[6]**

b) Explain the correlation receiver for binary decision problem along with block diagram. **[10]**

Q3) a) Explain the basic principle of adaptive filter and what are the main components of adaptive filter. **[6]**

b) Explain the basic Wiener filter theory and derive Wiener Hopf equation. Draw the error performance curve and explain it. **[10]**

Q4) Write short notes on (any three) : **[18]**

a) Probability distribution models.
b) LMS algorithm.
c) RLS algorithm.
d) Fundamentals of estimation.
e) Receiver structure of colored noise.

P.T.O.

SECTION - II

Q5) a) Explain the term power spectrum estimation. **[2]**

b) Explain the basic difference between parametric and non parametric methods of power spectrum estimation. **[8]**

c) Explain the periodogram method of power spectrum estimation. **[6]**

Q6) a) Explain the following with respect to Radar Target. **[9]**

i) Steady point target.
ii) Slowly fluctuating point target.
iii) Spread target.

b) Draw and explain the receiver structure for baseband digital communication system with equal energy signals. **[7]**

Q7) a) What is spread spectrum communication? Explain the different spread spectrum systems in detail. **[10]**

b) Draw and explain the block diagram of BPSK spread spectrum system. **[6]**

Q8) Write short notes on (any three) : **[18]**

a) Kalman filter.
b) Adaptive filters as noise canceller.
c) Optimum receiver for on-off Reying (OOK).
d) Dynamic target tracking.
e) Intersymbol interference in digital communication.

☒☒☒☒

Total No. of Questions : 08] **[Total No. of Pages : 2**

P1457

[3965]-617
M.E. (E & TC) (Microwave)
MOBILE COMMUNICATION - GSM & CDMA
(2008 Course) (504230) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q1 and Q5 are compulsory, Solve any two questions from the remaining.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Write a note on evolution of cellular mobile communication with pros and cons at each stage of evolution. **[8]**

b) With the help of neat diagrams explain the access technologies. Compare them. Give an example where they are deployed. **[10]**

Q2) a) Explain the terms: **[8]**

i) Traffic measurement units.

ii) Grade of service.

iii) Blocking probability.

iv) Traffic usage.

b) If a total of 33 MHz of bandwidth is allocated to a particular Cellular telephone system which uses two 25 kHz simplex channels to provide full duplex voice and control channels calculate the number of channels available per cell if system uses a **[8]**

i) 4 cell cluster,

ii) 7 cell cluster. If 1 MHz of the allocated spectrum is dedicated to control channels, determine how control and voice channels can be distributed for each of the two systems.

P.T.O.

Q3) a) Explain how directional antennas reduce the cochannel interference. **[8]**

b) Consider a cellular system with a one way spectrum of 12.5 MHz and channel separation of 200 kHz. There are three control channels per cell and the reuse factor is 4. Assuming an omni directional antenna with six interferers in the first tier and path loss slope equal to 40dB/decade, calculate the number of call per cell site per hour with 2% blocking probability during busy hour and an average holding time of 120 seconds. Also find the S/I ratio. (Given: traffic load = 110 Erlangs) **[8]**

Q4) a) Explain the architecture of GSM with a neat block diagram. **[10]**

b) Explain the algorithms used for providing security in GSM. **[6]**

SECTION - II

Q5) a) Discuss the features of IS 95. Explain IS 95 CDMA forward channel. **[10]**

b) Discuss packet and frame format in IS 95. Also describe the handoff procedure in IS 95 CDMS. **[8]**

Q6) a) Explain GMSK modulation technique in detail. **[8]**

b) Explain Direct Sequence Spread Spectrum (DSSS) modulation technique. **[8]**

Q7) a) Discuss call processing in IS 95 CDMA. **[8]**

b) Write a note on RAKE receiver. **[8]**

Q8) a) Explain GPRS standard in detail. **[8]**

b) Write a note on wireless standards. **[8]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1460

[3965] - 640
M.E. (E&TC - VLSI)
EMBEDDED AUTOMOTIVE SYSTEMS
(2008 Course) (504192) (Elective - IV)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Explain the current trends in Automotive systems. What is Hybrid vehicle? **[10]**

b) Which are the components for Electronic engine management systems? Explain briefly. **[8]**

Q2) a) How onboard diagnostic system is achieved? **[8]**

b) What are the different types of interferences? How they can be overcome? **[8]**

Q3) a) Write short note on following : **[8]**

i) Electronic management of chassis system.

ii) Vehicle motion control.

b) Which different types of fuel injection systems? Explain. **[8]**

Q4) a) Write short note on any two sensors: **[8]**

i) Crank angle position sensors.

ii) Flow sensors.

iii) Vehicle speed sensors.

b) What are ECUs ? Explain their significance in modern vehicles. **[8]**

P.T.O.

SECTION - II

Q5) a) Describe briefly solid state ignition system techniques. **[8]**

b) How fuel metering is done? Which are the different techniques? **[8]**

Q6) a) Briefly explain the technique of Integrated engine control and exhaust emission control technique. . **[8]**

b) How artificial intelligence plays role in modern automobiles? **[8]**

Q7) a) Write short note on cruise control of car. **[8]**

b) Draw and explain following fields of standard format of CAN protocol. **[8]**

i) Arbitration.

ii) Control

iii) Data

iv) CRC

Q8) a) Explain the following systems in modern vehicles. **[10]**

i) Lane departure warning.

ii) Curve over speed countermeasures.

iii) Blind spot monitoring.

iv) Parallel parking assistance.

v) Lane change assistance.

b) How vehicle tracking system is achieved using GPS. **[8]**



Total No. of Questions : 8] [Total No. of Pages :2

P1461

[3965] - 641
M.E. (E&T/C) (VLSI & Embedded Systems)
SYSTEMS ON CHIP (SOC)
(Elective - IV) (504192) (2008 Course)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any THREE questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***For metal-2 : $C_{metal\text{-}2,\ plate} = 0.02fF/\mu m^2$, $C_{metal\text{-}2,\ fringe} = 0.06fF/\mu m$, $R_{metal\text{-}2} = 0.07\Omega/$***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) How parasitic capacitance is measured? **[8]**

b) Why copper is preferred over aluminum as interconnecting material? **[8]**

Q2) a) Define design rule and explain its role in : **[8]**

i) Fabrication error.

ii) Scalable design.

b) How hot electrons are formed? What is its effect on CMOS operation? **[8]**

Q3) a) Prove that LOW to HIGH transition is ½ to ⅓ the speed of HIGH to LOW transition? **[8]**

b) Explain hierarchy of design abstraction? Draw logic diagram of full adder. Draw four bit adder from full adder. Name each component in full adder and define four bit adder as a type. Draw the component hierarchy, showing the four bit adder, the full adder and logic gates. **[8]**

Q4) Justify following statements :

a) Why n-diffusion to p-diffusion spacing is so large? **[6]**

b) Why is metal-1-metal-1 spacing is large than poly-poly spacing? **[6]**

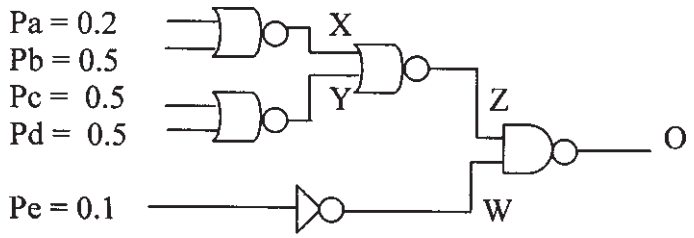
c) Why is metal2- metal2 spacing is larger than metal 1-metal l spacing? **[6]**

P.T.O.

SECTION - II

Q5) a) Explain how area and delay cost can be reduced by optimization at each level of abstraction. **[8]**

b) Compute the zero delay signal probabilities for all signals in these network assuming the signal probabilities for primary input as shown:**[8]**



Q6) a) Explain Kitchen timer floor plan. Discuss area and speed issue in detail.**[8]**

b) List the advantages of all carry adders by comparing the average power consumption carried out by them? Which one is most suitable for low power designs? **[8]**

Q7) a) What is difference in fall time of two neither input static complementary NOR gate (assuming minimum size load capacitance) when one pulldown and when two pulldown are activated? **[8]**

b) Differentiate MTCMOS over VTCMOS? How VTCMOS overcome problem of MTCMOS. **[8]**

Q8) a) Plot the Elmore delay for a metal-2 wire of size 3000 λ X 4λ using. **[8]**

i) 2 sections

ii) 4 sections

iii) 8 sections

b) Design and analyze 8 X 8 Wallance tree multiplier **[10]**

i) Draw the block diagram for an 8-bit carry save adder.

ii) Draw the complete block diagram for the multiplier.

iii) Draw the basic floorplan for multiplier including the partial product generators and Wallance tree.

iv) Identify the critical path through the multiplier.

Total No. of Questions : 10] [Total No. of Pages :2

P1462

[3965] - 642
M.E. (Electronics / E&TC)
SOFTWARE DEFINED RADIO
(VLSI and Embedded Systems)
(2008 Course) (504192) (Elective - IV)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Justify the SDR is nothing but the convergence of Technologies. **[8]**

b) Draw the typical transmitter and receiver block diagram suitable for SDR. **[9]**

Q2) a) Write advantages and disadvantages of SDR. **[8]**

b) What are the different characteristics required for SDR and explain them in detail. **[9]**

Q3) a) Discuss essential components requirement of SDR in short. **[8]**

b) What are the different development tools are available for SDR developments? **[8]**

Q4) a) Draw the block diagram of multipass ADC and explain its operation. **[8]**

b) Differentiate SDR, CR and Intelligent Radio. **[8]**

Q5) a) What are the aims and requirements of SCA ? **[8]**

b) Justify that ADC/DAC and DSP are key components of SDR? **[8]**

P.T.O.

SECTION - II

Q6) a) Write JTRS software communication architecture specifications. **[8]**

b) W.r.t. JTRS write short note on : **[10]**

i) Network overview.

ii) Core frame work.

Q7) a) Why RTOS is required in SDR?List possible RTOS suitable for SDR. **[8]**

b) Write short note on "CORBA". **[8]**

Q8) What do you mean by smart antennas? Draw and explain typical block diagram of Smart antenna system? **[16]**

Q9) a) Describe any low cost experimental Software Radio Platform. **[8]**

b) How EDA tools can help software design development? **[8]**

Q10) a) Write short note on "convergence between military & commercial system". **[8]**

b) Write algorithm to generate at least any two digital modulation scheme suitable for SDR. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1467

[3965]-653
M.E. (E & TC) (Signal Processing)
ADVANCED DIGITAL SIGNAL PROCESSING
(2008 Course) (504508) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that an up sampler is a time varying system. **[6]**

b) Show that the down sampler is a linear system. **[6]**

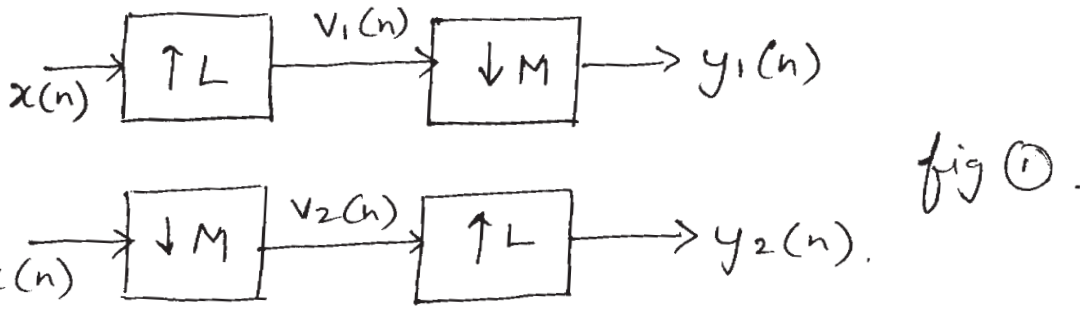
c) 

fig ①.

Show that the 2 possible cascade configurations of factor of L up sampler and a factor of M down sampler in **fig.1** are equivalent if and only if L and M are mutually prime. **[6]**

Q2) a) 

fig ②

Simply the structure **fig.2** and derive a function of $y(n)$ in terms of $x(n)$. **[6]**

P.T.O.

b) Explain "imaging" in an up sampler and "aliasing" in a down sampler. **[4]**

c) Show that the transpose of M channel analysis filter bank is an M channel synthesis bank. **[6]**

Q3) a) Draw functional block diagram of barrel shifter of TMS 320C 54 XX processor. **[6]**

b) List out different addressing modes of ADSP 21XX. **[6]**

c) Draw direct form adaptive FIR filter. **[4]**

Q4) a) Explain the concept of forward and backward linear prediction. **[4]**

b) Explain Levinson and Durbin algorithm to determine autoregressive parameters of linear predictive filter. **[8]**

c) Define AR, MA and ARMA process. **[4]**

SECTION - II

Q5) a) Explain application of adaptive filtering for adaptive channel equalization. **[5]**

b) Compare the features of TMS 320 54XX and ADSP 21XX. **[8]**

c) Explain "system identification" based on an all pole (AR) system model. **[5]**

Q6) a) Determine the least square FIR inverse filter of length 2 to the system with inpulse response. **[8]**

$$h(n) = \begin{cases} 1 & \text{for} \quad n = 0 \\ -\alpha & \quad\quad n = 1 \\ 0 & \text{otherwise} \quad \text{where } |\alpha| < 1 \end{cases}$$

b) Draw internal architecture of TMS 320C 54XX. **[8]**

Q7) a) Explain widrow LMS algorithm. **[8]**

b) Elaborate the use of adaptive filters in speech signals. **[8]**

Q8) a) Write a note on Shank's method for determining zero model parameter of least square. **[8]**

b) Elaborate on "Singular Value decomposition". **[8]**



Total No. of Questions : 8] [Total No. of Pages :2

P1468

[3965] - 657
M.E. (E&TC) (Signal Processing)
MULTIMEDIA TECHNIQUES
(2008 Course) (Elective - III) (504510)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare different standards used by the different countries for colour TV transmission & reception. **[8]**

b) Explain the working of NTSC encoder & decoder with the help of suitable diagrams. **[8]**

Q2) a) With the help of appropriate block diagram, explain JPEG compression standard for video. **[8]**

b) With the help of suitable diagram, explain MPEG - I audio encoder. Comment on the bit rates of compressed audio. **[8]**

Q3) a) Explain different types of scanners. **[8]**

b) Explain the features of a typical scanning software. **[8]**

Q4) Write short notes on : **[18]**

a) Text compression methods.

b) Multimedia software tools.

c) Lossy & lossless compression techniques.

P.T.O.

SECTION - II

Q5) a) Explain in detail the uses of Graphics. **[8]**

b) Explain the line-drawing & circle drawing algorithms. **[8]**

Q6) a) Explain in detail the MIDI - Specifications. **[8]**

b) What are MIDI messages? **[8]**

Q7) a) An NTSC encoded video clip has a frame size of 720 × 480 pixels & is digitized using a bit-depth of 8-bits for each y, cb & cr. The chroma sub-sampling scheme used is 4 : 2 : 2. Calculate the file size of 1 minute video clip & also the total time taken for it to be transmitted over a 10 mbps transmission line. **[10]**

b) Explain the digital video standards & state the advantages of each. **[6]**

Q8) Write short notes on : **[18]**

a) File formats for Text.

b) Digital Camera.

c) WAV file & bmp file format.



Total No. of Questions : 8] **[Total No. of Pages :2**

P1469

[3965] - 660
M.E. (E&TC) Signal Processing
COMPUTER VISION
(2008 Course) (Elective - IV) (504511)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagram must be drawn wherever necessary.***
5) ***Assume suitable data if required.***

SECTION - I

Q1) a) With the help of diagram explain working of full frame CCD camera. **[8]**

b) Explain image formation by pinhole camera. What are the limitations of this camera? How these limitations are overcome by modern digital camera? **[8]**

Q2) a) Explain following terms : **[8]**

i) Foreshortening.

ii) Vanishing point.

b) What is homogeneous coordinate system? What is significance of scaling factor? Give homogeneous transformation matrix for transforming coordinates of a point from one coordinate frame to other coordinate frame. **[8]**

Q3) a) What is camera calibration? Explain procedure of camera calibration. **[8]**

b) What is orthographic and weak orthographic projection. **[8]**

Q4) a) Define and explain epipole, epipolar line, epipolar plane. **[9]**

b) What is essential matrix? Find essential matrix in case of canonical camera configuration. **[9]**

P.T.O.

SECTION - II

Q5) a) Explain iterative procedure of optical flow estimation using Kalman filter. **[8]**

b) What is aperture problem in optical flow estimation? How it is solved. **[8]**

Q6) a) What is the significance of image rectification? How image rectification is achieved. **[8]**

b) What are assumptions and constraints in finding stereo correspondence. **[8]**

Q7) a) Explain optical flow estimation for large motion (more than one pixel). **[8]**

b) What is depth image? How we can obtain depth image? **[8]**

Q8) Write short notes on : **[18]**

a) Radon transform and straight ray tomography.

b) Infrared imaging and its applications.



Total No. of Questions : 08] [Total No. of Pages : 2

P1472

[3965]-672

M.E. (Electronics) (Digital system)

IMAGE PROCESSING AND PATTERN RECOGNITION

(2008 Course) (Sem. - II) (504203)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Answer any three questions from each section.***
3) ***Answers to the two sections must be written in separate answer books.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data if required.***

SECTION - I

Q1) a) Explain what is bit plane slicing? Write a program in MAT LAB to generate 8 bit plane images given the image using 8 bit quantization. **[8]**

b) Explain how the mask for the sobel edge operator is used to detect the edge. why thresholding is required to generate edge detected image. **[9]**

Q2) a) Explain how the mask for the Laplacian operator is developed? Why the second derivative generates double edge if zero crossing is not used? **[9]**

b) Explain how to generate unsharp image? How will you use unsharp image to generate a sharp image? **[8]**

Q3) a) What is n method of histogram equalization? Write an algorithm for histogram equalization. What will be the nature of the image if the histogram is concentrated between pixel values zero to 100? **[8]**

b) Generate a gray scale transformation for boosting the intensity of the pixels with pixel intensity values between 100 to 150. Explain its operation. **[8]**

Q4) a) Explain basics of spectial filtering using a filter mask convolution. **[8]**

b) Explain how will you select a probability distribution for a given random variable. **[8]**

P.T.O.

SECTION - II

Q5) a) What is a risk? Explain the method of minimum risk estimation. **[8]**

b) Two coins are flipped simaltaneously one coin has probability of getting head = 0.6 and the other coin has P(H) = 0.7. What is the probability. That coins have both heads or both tails? **[8]**

Q6) a) Explain how to obtain an optimal decision boundary? Assume that the feature x is normally distributed in class A and Class B. Compute the decision boundary if $\mu_A = 26$, $\sigma_A = 2$, $\mu_B = 22$ and $\sigma_B = 3$ with P(A) = 0.8 and P(B) = 0.2. **[10]**

b) Explain fractional counting method. For estimation of error rates? **[8]**

Q7) a) Clearly explain nearest neighbour classification technique. Why the expected error rate for nearest neighbour will be always greater than or equal to the Bayesian classifier. **[8]**

b) What is a k - nearest neighbour technique? How is it superior to Nearest neighbour classifier. Why is it required to apply scale factors to the features before computing the distances? **[8]**

Q8) a) Explain Hierarchical clustering using complete linkage algorithm with a suitable example. **[8]**

b) Explain partitional clustering using forgy's algorithm. Write the algorithm. **[8]**

OR

Explain back propagation algorithm. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1476

[3965] - 689
M.E. (E & TC)
(Communication Networks)
NETWORK TRAFFIC ANALYSIS AND QoS
(2010 Course) (504608) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain need of traffic shaping along with its advantages & limitations. **[8]**

b) During 4 hours busy period 48 calls arrived in exchange. Average holding time per call is 4 minutes. Calculate Traffic load in **[8]**

i) Erlangs ii) CCS

iii) CS iv) CM units

Q2) a) What is traffic management & traffic planning? Explain process for traffic management. Explain its advantages. **[8]**

b) Explain network traffic performance metrics. Classify traffic Management. **[8]**

Q3) Explain in detail : **[16]**

a) QoS and its requirement.

b) QoS service model.

c) QoS benefits.

d) Components of QoS.

P.T.O.

Q4) Write short notes (any two) : **[18]**

a) Leaky bucket Technique.

b) Token bucket Technique.

c) Reservation protocol (RSVP).

SECTION - II

Q5) a) What is role of congestion in traffic management? How congestion is controlled? **[8]**

b) Explain video conferencing in detail. **[8]**

Q6) a) Explain multi-protocol labeling switch (MPLS). **[8]**

b) Explain bandwidth allocation traffic control. **[8]**

Q7) a) What is Network attack? Explain different types of Network attack. **[8]**

b) Explain in brief different Network attack protection mechanism. **[8]**

Q8) Write short notes (any two) : **[18]**

a) Differentiated services.

b) Integrated services.

c) LAN traffic management.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1478

[3965]-698
M.E. (Production)
CAD/CAM/CIM
(2008 Course) (511102) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt not more than five questions of which at least two questions must be from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Solve any TWO of the following :

a) Classify solid modeling techniques and explain any one advanced solid modeling technique. **[10]**

b) Explain the parametric transformation of an ellipse. **[10]**

c) Perform the following transformation if the co-ordinates of the vertices of the pentagon are A(4, 1), B(8, 1), C(10, 4), D(6, 7) and E(2, 4). Determine the new position of pentagon after the rotation by 30º in anticlockwise about X-axis. **[10]**

Q2) Solve any TWO of the following :

a) Given S(1, 1), T(2, 3), U(4, 3) and V(3, 1) are the vertices of a Bezier polygon. Determine the equation of Bezier curve controlled by these vertices. **[10]**

b) Explain the effect of the multiple control points and degree of B-spline curve on its shape. **[10]**

c) Explain different solid entities with parameters and its importance in solid modeling. **[10]**

P.T.O.

Q3) Solve any TWO of the following :

a) Write various G and M codes usually used in CNC programming on machining centre. **[10]**

b) Write a CNC manual part program with appropriate G and M codes for a part shown in Fig No.1. **[10]**

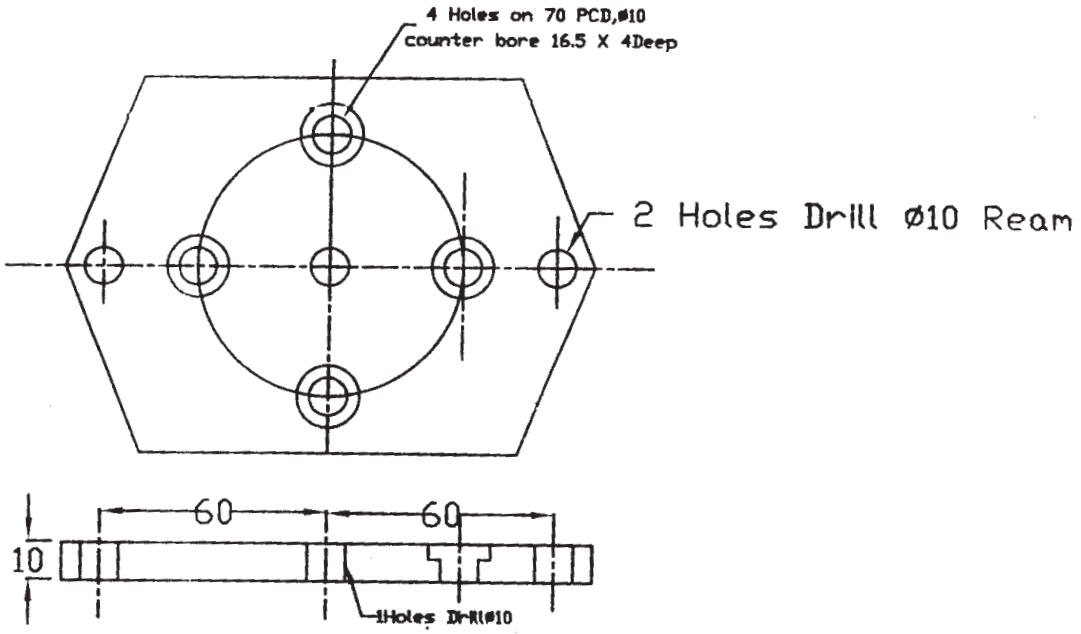


Fig.No.1

c) Explain the concept of high speed manufacturing. What are the necessary requirements of machine tool for the same? **[10]**

Q4) Solve any TWO of the following :

a) Explain the sequence of steps to start meshing in finite element analysis. **[10]**

b) In the figure below, a load P = 60 kN is applied as shown in Figure No.2. Determine the displacement field, stress and support reaction in the body. Take A = 250 mm^2 and E = 20 kN/mm^2. **[10]**

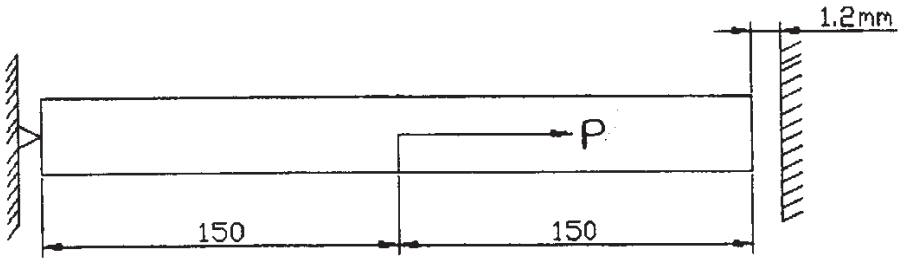


Fig.No.2

c) Derive an expression for the element stiffness matrix of the two noded truss element. Also show the element stress calculations. **[10]**

SECTION - II

Q5) a) Classify the different methods of manufacturing cell formation. **[10]**

b) Differentiate variant type CAPP and Generative CAPP. **[10]**

Q6) a) Explain with neat diagram computer aided material requirement planning. **[10]**

b) Explain with neat diagram computer aided process planning and control. **[10]**

Q7) a) With a neat sketch, explain FMS layout and its components. **[10]**

b) Enlist the steps for computer aided quality control. **[10]**

Q8) Write SHORT NOTES on any TWO : **[20]**

a) Benefits and limitations of Group technology.

b) Robot applications in industry.

c) Models of Computer Integrated Manufacturing.

d) Virtual cell formation.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1483

[3965] - 709
M.E. (Production)
MANUFACTURING MANAGEMENT
(2008 Course) (511109) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the importance of a manufacturing excellence in a modern manufacturing environment. **[8]**

b) Enlist the contributions of any two recent manufacturing management scientists after 1980. **[8]**

Q2) a) A small project is composed of activities whose time estimates are listed in the table below. Activities are identified by beginning (i) and ending (j) node numbers : **[8]**

Activity	Estimated duration (in days)		
(i-j)	Optimistic	Most likely	Pessimistic
1-2	1	4	7
1-3	5	10	17
2-4	3	3	3
2-6	1	4	7
3-4	8	15	26
3-5	2	4	8
4-5	5	5	5
5-6	2	5	8

P.T.O.

i) Draw the project network.

ii) Find the expected duration and variance of each activity and expected project length.

iii) What is the probability that it would take 5 days more than the expected duration?

b) Explain the need for close cooperation between product design engineering and manufacturing engineering. Explain any two considerations made in Design for X concept. **[8]**

Q3) a) Describe various types of wastes identified in lean management for a manufacturing industry. What tools and techniques do you suggest to eliminate / minimize the same? **[8]**

b) What is OEE? How OEE is calculated in TPM organization? **[8]**

Q4) Write short notes on any three : **[18]**

a) DFMA.

b) SMED.

c) Value stream mapping.

d) JIT.

SECTION - II

Q5) a) What are the contributions of Hawthorne studies in the organizational behavior point of view? **[8]**

b) Describe the four dimensions of MBTI (Mayers Briggs Type Indicator) that yield 16 types. How these can be used effectively? **[8]**

Q6) a) What are the four leadership styles? Which leadership style is more suited for work environment as presently exist in any manufacturing industry in India? **[8]**

b) Describe any two theories of motivation. Still why these theories can not motivate more people. **[8]**

Q7) a) Job stress can have physiological, psychological and behavioral effects. Give an example of each and cite some research findings on the relationship between job stress and these outcomes. **[8]**

b) Enumerate some characteristics of good team work. How do you measure the team effectiveness? How can we make a team more effective? **[8]**

Q8) Write short notes on any three : **[18]**

a) The Gallup path.

b) Linkert scale & its measurement.

c) Sources of interpersonal conflicts and their resolution.

d) Contributions of McGregor in organizational behavior.

❖❖❖❖

Total No. of Questions : 08] [Total No. of Pages : 3

P1484

[3965]-710

M.E. (Production) (Manufacturing and Automation)

INDUSTRIAL AUTOMATION

(2008 Course) (Sem. - II) (511110)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) The following list defines the precedence relationship and element time for new model toy **[8]**

Element	1	2	3	4	5	6	7	8	9	10
Element time (min)	0.5	0.3	0.8	0.2	0.1	0.6	0.4	0.5	0.3	0.6
Immediate predecessors	-	1	1	2	2	3	4,5	3,5	7,8	6,9

If the ideal cycle time is to be 1 min., what is the theoretical minimum number of stations required to minimize the balance delay? Also compute the balance delay.

b) Explain the analysis of two stage assembly line with storage buffers. **[8]**

Q2) a) a pump has a displacement of 15 cm^3/rev is driven at 1000 rpm and 100 bars. The volumetric efficiency is 0.90 and overall efficiency is 0.80. Calculate

i) Pump delivery in liters per minute. **[2]**
ii) The input power at the pump shaft in kW. **[2]**

b) A punching operation requires 120 lpm for 0.6 seconds. Determine the volume change in accumulator during discharging if the total cycle time is 4 seconds. **[6]**

c) Explain with neat sketch the regenerative circuit. **[6]**

P.T.O.

Q3) a) Explain the working of FRL unit used in pneumatic system. **[8]**

b) Draw a pneumatic circuit to actuate the cylinder if sensors C and D are in the same state (ON or OFF) as that of sensor B and sensor A is in opposite state. **[8]**

Q4) Write short notes on any three: **[18]**

a) Design of hydraulic reservoir.

b) Electro - hydraulic valves.

c) Pressure compensated flow control valves.

SECTION - II

Q5) a) How many status flag does 8085 microprocessor have? Discuss the role of each flag. **[6]**

b) Draw ladder diagram to perform following operations of a washing machine: **[10]**

i) Switch on the motor pump.

ii) Switch off the pump after 70 seconds.

iii) Switch on the heater for 30 seconds.

iv) Switch off the heater.

Q6) a) Explain with suitable example the gravity fed magazine, weight operated magazine, and friction fed magazine. **[8]**

b) Explain the effect of part population, speed, and number of reciprocating strokes on the feed rate in case of reciprocating fork feeder used in automated assembly systems. **[8]**

Q7) a) One axis of a RPL robot is a linear slide with a total range of 915 mm. The robot control memory has 10 bit capacity. It is assumed that the mechanical errors associated with the arm are normally distributed with a mean at a given taught point and an isotropic standard deviation of 0.1 mm. Determine. **[8]**

i) The control resolution for the axis:

ii) The spatial resolution of axis.

iii) The defined accuracy.

iv) The repeatability.

b) Explain types of robot control. **[8]**

Q8) Write short notes on any three: **[18]**

a) Expert systems.

b) Low cost automation.

c) Servo and non - servo manipulators.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1485

[3965]-712

M.E. (Production)

PRODUCT LIFE CYCLE MANAGEMENT

(2008 Course) (Elective - III) (511111)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the product petrification and product cannibalisation. **[8]**

b) Explain 'Kano Model' related product design. **[8]**

Q2) a) Explain three types of new products being created in today's global competitive environment. **[8]**

b) Explain 'Kansei Engineering' Methodology for the design of product. **[8]**

Q3) a) Explain 'Conjoint Analysis' approach for product design. **[8]**

b) Explain PDM system architecture. **[8]**

Q4) a) Explain 'Concept classification free' during concept generation phase. State the benefits of classification tree. **[8]**

b) Write short note on: **[10]**

i) Product Architecture.

ii) QFD & HOQ.

P.T.O.

SECTION - II

Q5) a) Explain product configuration chain in relation to Product Design Activity. Design Management Activity and Subcomponent Design Activity. **[12]**

b) Explain the strategic phase of product development. **[6]**

Q6) a) Explain six types of modularity for mass customization of product and services. **[12]**

b) Explain the operational phase of product development. **[4]**

Q7) a) Explain the principles of 'User - Friendly' product design. **[12]**

b) Explain 'S-Curve' related to technology advancement. **[4]**

Q8) Write short note on:

a) Market Segmentation. **[5]**

b) Decision support system in NPD. **[5]**

c) Methods of technology forecasting. **[6]**



Total No. of Questions : 12] **[Total No. of Pages :2**

P1486

[3965]-713
M.E. (Production)
WELDING & JOINING
(511111) (2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

UNIT - I

Q1) a) How welding and allied processes are classified? Give sub classifications also. **[8]**

b) Explain what do you understand the term "weldability"? Explain the effects of alloying elements on weldability. **[8]**

OR

Q2) a) Explain different methods of weldability testing in brief. **[8]**

b) Explain the relation between the peak temperatures experienced by various regions in HAZ. Show how these correlate with iron - carbon phase diagram. **[8]**

UNIT - II

Q3) a) Explain flux cored electrode wires, with construction, manufacturing and functions of compound contained. **[9]**

b) What is arc blow? Discuss the causes of arc blow and suggest suitable remedies to overcome them. **[9]**

OR

Q4) a) Explain different electrical characteristics of arc. **[9]**

b) Explain role of electrode polarity on arc behaviour and arc stability. **[9]**

P.T.O.

UNIT - III

Q5) a) Discuss the "Influence of microstructure on fatigue crack of stainless steel welds. **[8]**

b) Discuss on process stability evaluation of MMAW welding. **[8]**

OR

Q6) a) Explain "electroslag" welding process" in detail. **[8]**

b) What is the effect of electrode angle on weld size and penetration in case of SAW process. **[8]**

SECTION - II

UNIT - IV

Q7) a) Explain solid state Inverter system used in welds. **[8]**

b) Explain working principle of thyristor controlled rectifiers. **[8]**

OR

Q8) a) What is "Duty Cycle"? Explain in brief. **[8]**

b) What are special power sources used for welding application? Explain any two in detail. **[8]**

UNIT - V

Q9) a) Explain pulse transfer - plasma are welding in brief. **[9]**

b) What are the different modes of metal transfer? Explain minimum three in brief. **[9]**

OR

Q10) a) With the help of graph explain "Droplet transfer frequency for steel with different welding processes". **[9]**

b) Explain effect of gravity, surface tension, electromagnetic pinch effect and drag forces on metal transfer. **[9]**

UNIT - VI

Q11) a) Explain explosive welding in detail. **[8]**

b) Describe "Ultrasonic Welding Process" and give its advantages over other process. **[8]**

OR

Q12) a) Explain the mechanism of cold welding? What are the applications of cold welding? **[8]**

b) Explain Laser Beam welding with its advantages, disadvantages and applications. **[8]**

♦♦♦♦

Total No. of Questions : 8] [Total No. of Pages :2

P1487

[3965] - 715

M.E. (Production) (Manufacturing and automation)

OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - IV) (511112)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Formulate an optimization problem for minimum weight design of a spring supporting 6000 N load subjected to constraints on deflection to be less than 2.5 mm and shear stress to be less than 100 MPa. Consider wire diameter, coil diameter, and number of turns as process variables. **[8]**

b) Define : **[8]**

i) Nonlinear programming problem.

ii) Geometric programming problem.

iii) Quadratic programming problem.

iv) Linear programming problem.

Q2) a) Minimize the function $f(x) = x^5 - 5x^3 - 20x + 5$ using golden section method within the bounds of 0 to 5. **[8]**

b) Draw flowchart for Fibonacci search method. **[8]**

Q3) a) Perform two iterations of steepest descent method to minimize the function $f(x) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$. Consider starting point as $x_1 = -1.2$ and $x_2 = 1$. **[8]**

b) Write the algorithm for evolutionary optimization method. **[8]**

P.T.O.

Q4) Write short notes on : **[18]**

a) Hessian matrix of a function.

b) Minimization of multimodal function.

c) Multi-objective optimization.

SECTION - II

Q5) a) Perform two iterations of generalized reduced gradient method to maximize $f(x) = 2x_1 + x_2 + 10$ subject to $g(x) = x_1 + 2x_2^2 = 3$. Consider starting point as $x_1 = 1$ and $x_2 = 1$. **[8]**

b) Explain the gradient projection method for constrained optimization problems. **[8]**

Q6) Solve following optimization problem using geometric programming Minimize x_1.

Subject to following constraints :

$-4x_1^2 + 4x_2 \leq 1$; $x_1 + x_2 \geq 1$; $x_1, x_2 > 0$ **[16]**

Q7) a) Explain various steps in genetic algorithm to obtain global optimum solution of unconstrained optimization problem. **[8]**

b) For a minimization problem, using simulated annealing, the function value of 120 is updated to new value of 142 at temperature 200ºC. What is the probability of accepting the new solution? **[8]**

Q8) Write short notes on : **[18]**

a) Non-dominated sorting genetic algorithm.

b) Branch and bound method.

c) Limitations of simulated annealing algorithm.



Total No. of Questions : 12] [Total No. of Pages :3

P1488

[3965] - 717

M.E. (Production)

INTELLECTUAL PROPERTY RIGHTS AND PRODUCT DESIGN

(2008 Course) (Elective - IV) (511112)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Attempt one question from each unit of Section I and Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

UNIT – I

Q1) a) How can one say that intellectual property is a dynamic area? **[6]**

b) What are the various types and categories of signs which can serve as trademarks? Explain giving suitable examples. **[6]**

c) Why and how is copyright different from patent rights? **[6]**

OR

Q2) a) What useful information can be obtained from the study of patent applications for the R&D and business development purposes? **[9]**

b) Discuss the limitations and exceptions applicable to copyright protection. **[9]**

UNIT – II

Q3) a) Discuss the main steps involved in the processing of PCT application during the international phase. **[5]**

b) What are the challenges faced by the developing countries in enforcing IPRs? **[5]**

c) Discuss the consequences of a disregards of IPRs in a country for its economy and the society in general. **[6]**

OR

P.T.O.

Q4) a) Enumerate the three kinds of fees payable at the receiving office with the PCT international application. **[5]**

b) What are the basic criteria of patentability? **[5]**

c) Discuss the issues related to enforcements of IPRs in developing countries. **[6]**

UNIT - III

Q5) a) Name the national and international bodies that are spreading IPR awareness programmes. **[8]**

b) What are the legal instruments for technology transfer? **[8]**

OR

Q6) a) When did the Geographical Indications of Goods (Registration and Protection) Act, 1999, come in to force? Where in India is the Geographical Indication Registry located. **[8]**

b) Show by flow diagram the progress of a patent application from the date of filing to the grant and sealing of patent. **[8]**

SECTION - II

UNIT - IV

Q7) a) What is meant by the term 'Defendant' in a case of infringement? **[6]**

b) Give the pros and cons of the various IPR instruments you may adopt to protect your IP asset, if the asset happens to be : **[6]**

i) a biotechnological invention and

ii) biotechnological data

c) Explain briefly the current international developments in the protection of traditional knowledge. **[6]**

OR

Q8) a) Discuss the technological challenges to IP with reference to computer software industry. **[6]**

b) What subject matters are protectable under the industrial designs? **[6]**

c) How have the technological developments impacted on the protection of related rights? **[6]**

UNIT – V

Q9) a) Explain in brief the importance of product design in industry. **[6]**

b) State the principle requirements of good product design. **[5]**

c) List the important considerations affecting product design. **[5]**

OR

Q10) a) Outline the factors affecting product design. **[6]**

b) Classify the methodology and techniques in product design. **[5]**

c) Describe how the ergonomic factor plays an important role in product design. **[5]**

UNIT - VI

Q11) a) Discuss the factors to be considered when deciding upon the most appropriate manufacturing process for any engineering product of your choice. **[8]**

b) State different ways in which packaging can be made more environmentally friendly. Give different reasons why product should be packaged. **[8]**

OR

Q12) a) Discuss the extent to which advances in technology influence the design of graphic products. **[8]**

b) Discuss the implications of the increasing use of plastics in the production of automobile parts. Explain with suitable example. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1489

[3965]-720
M.E. (Production) (CAD/CAM)
COMPUTER AIDED MANUFACTURING
(2010 Course) (511202) (Sem. I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of high speed manufacturing. What are the essential changes made in the machine tools for adapting it for high speed manufacturing? **[8]**

b) Explain the concept of Direct Numerical Control. Why DNC was not popularized? **[8]**

Q2) a) Explain with sketch the positioning of axes on CNC milling & CNC lathe along with job axes. **[8]**

b) Write a CNC manual part program with appropriate G and M codes for a part shown in Fig. No.1. **[8]**

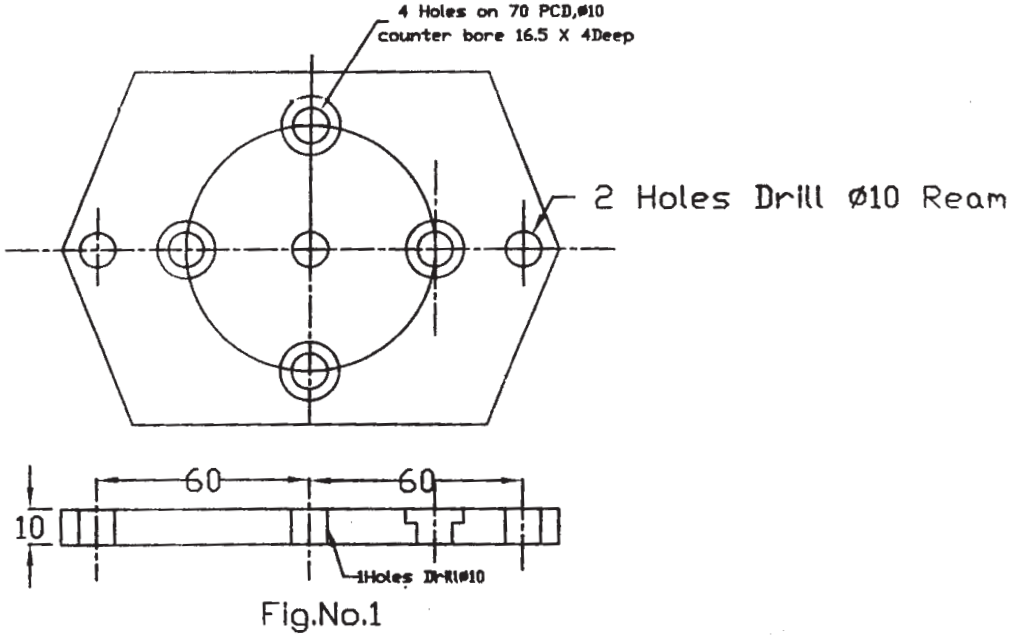


Fig.No.1

P.T.O.

Q3) a) Write an APT program for the part shown in Fig. No.2. Write a remark for each instruction. **[8]**

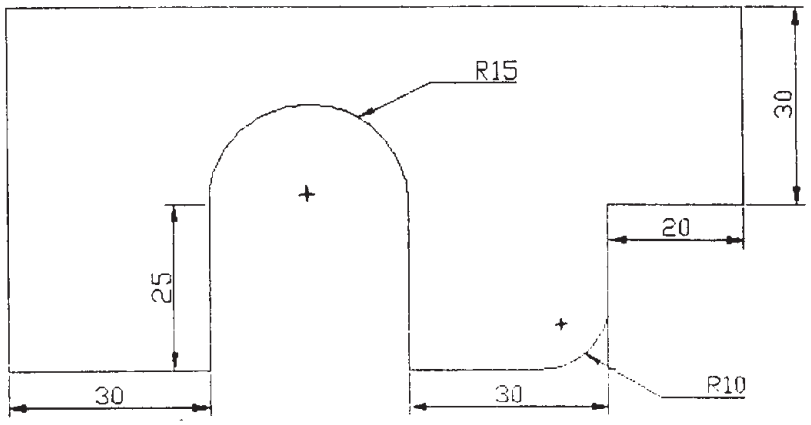


Fig.No.2

b) What do you understand by Smith Trigger? Explain other essential components of CNC machines. **[8]**

Q4) Write SHORT NOTES on any THREE : **[18]**

a) CNC-WEDM.

b) CNC-CMM.

c) CNC-Molding.

d) CNC-Automated welding.

SECTION - II

Q5) a) Write a note on AGV system applied in FMS. How petrinets are used in the system? **[8]**

b) In CIM database comprise four classes of data : Product data, Manufacturing data, Operational data and Resources data. Explain how this is integrated with material handling data? **[8]**

Q6) a) Explain low level and high level machine vision system used in automated assembly system. **[8]**

b) Explain the factors which affect the quality of job and performance of NC/CNC machines. **[8]**

Q7) a) Explain with neat diagram : **[8]**

i) Computer aided material requirement planning.

ii) Computer aided quality control.

b) Explain with neat diagram, computer aided shop floor control system. **[8]**

Q8) Write SHORT NOTES on any THREE : **[18]**

a) Various types of tool magazines on CNC.

b) Coolant and chip removal system on CNC.

c) Future automated factories.

d) Sensors used in automated inspection.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1490

[3965] - 721
M.E. (Production) (CAD/CAM)
OPTIMIZATION TECHNIQUES
(2010 Course) (511203) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain the various methods available for solving a multivariable optimization problem with equality constraints. **[8]**

b) Solve the following LPP by simplex method. **[8]**

Maximize $Z = 15X_1 + 6X_2 + 9X_3 + 2X_4$

Subject to constraints

$10X_1 + 5X_2 + 25X_3 + 3X_4 \leq 50$

$12X_1 + 4X_2 + 12X_3 + X_4 \leq 48$

$7X_1 + X_4 \leq 35$

$X_i \geq 0, i = 1, 2, 3, 4$

Q2) a) Find the value of X in the interval (0, 1) which minimizes the function $F = X(X-1.5)$ to within 0.05 by Fibonacci method. **[8]**

b) Solve the above problem by Newton-Raphson method and write its algorithm. **[8]**

Q3) a) What is the difference between random jumping and random walk methods? **[8]**

b) Minimize $F = 2X_1^2 + X_2^2$ from the starting point (1, 2) using the univariate method (two iterations). **[8]**

P.T.O.

Q4) Write short notes on any three : **[18]**

a) Classification of optimization methods.

b) Limitations of Gradient based methods.

c) Powell's conjugate direction method.

d) Steepest decent method.

SECTION - II

Q5) a) What are the different methods of constraints handling? Explain any one method in detail. **[8]**

b) Complete one iteration of the reduced gradient technique for any NLP problem. Use the suitable starting solution. Assume $\alpha = 0.25$ and all termination factors equal to 0.01. **[8]**

Q6) a) What are the advantages of using geometric programming over linear programming? Illustrate. **[8]**

b) Find the solution of following integer LPP by Branch and Bound method. **[8]**

Maximize $Z = 3\ X_1 - X_2$

Subject to constraints

$2X_1 + X_2 \geq 2$

$X_1 + 3\ X_2 \leq 3$

$X_2 \leq 4$ and X_1, X_2 are positive integers.

Q7) a) Illustrate the working principles of Genetic Algorithms with an example of unconstrained optimization method. **[8]**

b) Illustrate the working principles of Simulated Annealing method with an example of unconstrained optimization method. **[8]**

Q8) Write short notes on any three : **[18]**

a) Gradient projection method.

b) Gomory's cutting plane algorithm.

c) Differences between GA and traditional methods.

d) Methods of feasible direction.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1497

[3965] - 749

M.E. (Computer Engineering / Computer Networking)

HIGH PERFORMANCE DATABASE SYSTEMS

(Sem. - II) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answer to each section should be written on different answer sheets.***
3) ***Assume suitable data, if necessary.***
4) ***Draw neat diagram wherever required.***

SECTION - I

Q1) a) Explain TP-Monitor architecture and its components with neat diagram. **[6]**

b) What is performance tuning and Performance monitoring. Discuss the types of Performance Monitoring. **[6]**

c) Enlist and explain in brief purpose of those TPC Benchmarks. **[4]**

Q2) a) Discuss cost-based, dynamic programming & heuristic optimization. **[6]**

b) How is relational algebra useful in query optimization. **[6]**

c) Describe the various issues for efficient evaluation of XML queries transactions. **[4]**

Q3) a) Explain ACID properties, their role, examples and discuss how they are typically achieved in the DBMS. **[6]**

b) Draw a wait for graph indicating a deadlock. Explain three actions that need to be taken for recovery from deadlock. Also explain any one method for dealing with deadlock in a distributed system. **[6]**

c) Explain the difference between system crash and a disaster. **[4]**

P.T.O.

Q4) a) Discuss the activities associated with a data warehouse for financial services with the help of following points : **[6]**

- Business process.
- Business questions expected in data warehouse environment.
- Design Schemes.
- Failure and Backup strategies.

b) Explain different indexing techniques used in warehouse. **[6]**

c) Explain various OLAP operations in detail. Support your answer with suitable examples. **[6]**

SECTION - II

Q5) a) State True/False **[5]**

i) Goal of Association Rule Mining is to find rules with low lift and high Confidence.

ii) The amount of computation needed to generate association rules depends critically on the minimum support specified only.

iii) Rule Support and Confidence respectively reflect the usefulness and certainty of discovered rules.

iv) OLAP operations are mainly used in online transaction systems.

v) Web crawler is one of distinct way where a user can find information on web.

b) Explain Kimball's nine steps design for Data warehouse. **[5]**

c) Clustering can be performed on nominal data. How does this work. What are its inputs and outputs. In what way is clustering with nominal data similar to text mining. **[6]**

Q6) a) Following transaction ID items are given : **[8]**

T01 {X, Z}

T02 {U, V, W, X, Y, Z}.

T03 {U, W, Y}

T04 {V, X, Z}

T05 {U, Y}

T06 {W, X, Y}

T07 {X, Y, Z}

T08 {U, Z}

T09 {V, Y}

T10 {V, W, X}

Using above data, for each of the rules given below compute Support and Confidence.

$V \rightarrow W$

$X \rightarrow Z$

$U \rightarrow Y$

$Z \rightarrow V$

$W \rightarrow U$

$Y \rightarrow X$

b) List the various approaches to data mining problems. Explain any two in detail. **[8]**

Q7) a) Explain XML applications for storing and communicating data and for accessing web services. **[6]**

b) Explain Active and deductive databases. Explain its merits and demerits. **[6]**

c) Explain LDAP in short. **[4]**

Q8) Write short note on (any three) : **[18]**

a) Hibernate.

b) SQL aggregation.

c) OR database.

d) Directory services.

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Total No. of Questions : 08] **[Total No. of Pages :3**

P1498

[3965]-750
M.E. (Computer Engineering)
NETWORK DESIGN, MODELING AND ANALYSIS
(Sem. - II) (2008 Course) (510110)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe exponential random variable and memoryless property of random variable. **[8]**

b) There are 150 terminals feeding a network node. Each terminal sends one transaction every 3 minutes, while the node can only process 60 transactions per minute. What is the probability that there are no more than 60 transactions arrival per minute? **[8]**

Q2) a) What do you mean by delay in communication subnet? Describe components of delay. **[8]**

b) A communication link capable of transmitting at a rate of 50kbps will be used to accomodate 10 sessions, each generating poisson traffic at a rate of 150 packets per minute. Packet lengths are exponentially distributed with mean 1000 bits. For each session, find **[8]**

i) Average number of packets in queue.
ii) Average number of packets in system.
iii) Average waiting time in queue.
iv) Average service time for each packet.

Q3) a) "Infinite buffer case is a good approximation for finite buffer case". Justify this statement for a single server queuing model. **[8]**

b) Explain in detail - queuing system with infinite servers, and analyse the same. **[8]**

Q4) Write short note on (ANY THREE): **[18]**

a) Network components.
b) Jackson's theorem.
c) Reservation and polling.
d) Little's Theorem.

P.T.O.

SECTION - II

Q5) a) Describe in detail network analysis. Explain the importance of network analysis process. **[6]**

b) Explain subnetworking in brief.
Given a Host A with IP address 192. 168. 2.10 and Host B with IP address 192. 168. 4.10, What subnet mask one should use to bring these two hosts on same network and on two different networks. Justify. **[10]**

Q6) Using Esau - Williams algorithm, find CMST for the network with link cost given below.
Consider node O as center. Capacity of link is three weight of each node is one except node 3 which has weight two. **[16]**

	1	2	3	4	5	6
0	5	6	9	10	11	15
1	0	9	6	6	8	17
2	9	0	7	9	8	12
3	6	7	0	10	5	11
4	6	9	10	0	14	9
5	8	8	5	14	0	8
6	17	12	11	9	8	0

Q7) a) Explain following performance characteristics of network and/or network components. **[4]**

i) Capacity
ii) Delay.
iii) Reliability, maintainability and availability.

b) Solve following terminal assignment problem using augmentation path algorithm. Weight of each node is 01
Maximum capacity of concentrator is 02 **[12]**

		concentrator		
		G	H	I
Terminal	a	6	3	8
	b	2	9	4
	c	3	1	4
	d	2	5	9
	e	1	6	3
	f	2	7	9

Q8) Write short note on [ANY THREE]: **[18]**

a) PSN node architecture.

b) Bandwidth management.

c) Role of network administrator.

d) Network virtualization.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1499

[3965]-752

M.E. (Computer Engg.)

PATTERN RECOGNITION AND MACHINE VISION

(2008 Course) (510111B) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Bayes minimum error rate pattern classifier with the help of an example. **[8]**

b) What is the use of a discriminant function? Discuss different methods used as discriminant functions. **[8]**

Q2) a) Explain the technique of minimizing an error function for the polynomial fitting to a set of 'N' data points. **[8]**

b) What is a multi-category pattern classification? Discuss the LMS procedure for multi-category pattern classification. **[8]**

Q3) a) What is the affine projective model? Derive the affine projective equations. **[8]**

b) Explain any one of the Kernel-based methods for estimating probability density. Illustrate it with an example. **[8]**

Q4) Write short notes on: **[18]**

a) Unbiased modeling.

b) Invariants and cross ratios.

c) Principal Component Analysis.

P.T.O.

SECTION - II

Q5) a) Explain the correlation method for stereo matching, in detail. **[8]**

b) Discuss different approaches for the optical flow computation of an image sequence. **[8]**

Q6) a) Write and explain the "expectation maximization" (EM) algorithm for color and texture image segmentation. **[8]**

b) What is stereo data fusion? How it is used in reconstruction of stereo vision? Explain. **[8]**

Q7) a) What is pattern clustering? How it can be used for object recognition? **[8]**

b) Define a path coherence function. State the four principles followed by path coherence. How it is used in object tracking? **[8]**

Q8) Write short notes on: **[18]**

a) Fundamental Matrix.

b) Geometric Hashing.

c) Pose clustering.



Total No. of Questions : 8] **[Total No. of Pages :2**

P1505

[3965]-768
M.E. (Computer) (Computer Networking)
ADVANCED SOFTWARE ENGINEERING
(2008 Course) (510310) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the term system architecture? Why it is important to produce description of a system architecture in early stage of the system specification? **[4]**

b) Explain relation between system availability and system security. **[4]**

c) Explain requirements management planning. **[4]**

d) Differentiate between centralized control and Event driven system. **[4]**

Q2) a) Design a process architecture for an environmental monitoring system that collects data from a set of air quality sensors situated around a city. There are 50000 sensors organized into 100 neighborhoods. Each sensor must be interrogated four times per second. When more than 30% of the sensors in particular neighborhoods indicate that the air quality is below an acceptable level, Local warning lights are activated. All sensors return the reading to a central computer, which generates reports every 15 minutes on the air quality in the city. **[10]**

b) Explain RUP in detail. **[8]**

Q3) a) Briefly describe forward and backward fault recovery strategies. Why is backward fault recovery used more often than forward error recovery? Give two examples of classes of systems where backward error recovery might be used? **[8]**

b) Under what circumstances might an organisation decide to scrap a system when the system assessment suggests that it is of high quality and high business value. **[4]**

c) Explain why it is very difficult to validate a reusable component without the component source code. In what ways would a formal component specification simplify the problems of validation? **[4]**

P.T.O.

Q4) a) Consider the error messages produced by MS - windows, Linux or some other operating system. Suggest how these might be improved. **[4]**

b) Suggest six reasons why dependability is important in critical systems. **[3]**

c) Why programs that are developed using evolutionary development are likely to be difficult to maintain? **[3]**

d) Write short note on: Iterative software development. **[6]**

SECTION - II

Q5) a) Why it is not necessary for a program to be completely free of defects before it is delivered to its customers? To what extent can testing be used to validate that the program is fit for its purpose? **[5]**

b) What are driver and stub modules in the context of integration and unit testing of a software product? Why are stub and driver modules are required? **[6]**

c) Describe two metrics that have been used to measure programmer productivity. Comment briefly on the advantages and disadvantages of each of these metrics. **[7]**

Q6) a) Explain the following extreme programming practices. **[8]**

i) Refactoring.

ii) Pair programming.

b) Write short note on : formal methods. **[8]**

Q7) a) Prove /Disprove the following statement "If we get behind schedule we can add more programmers and catch up" **[4]**

b) Suggest two specialized software tools that might be developed to support a process improvement programme in an organisation. **[4]**

c) What are the different types of maintenance that a software might need? **[6]**

d) What is meant by software quality? **[2]**

Q8) Write short notes on (Any Two) **[16]**

a) Software Economics.

b) Software configuration management.

c) Risk management.



Total No. of Questions : 8] [Total No. of Pages :2

P1507

[3965] - 772
M.E. Computer (Computer Networking)
CONVERGENCE TECHNOLOGY
(2008 Course) (Elective - IV) (510312)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the benefits of Convergence Technology? Explain what convergence technologies are used in Mobile Communication? **[8]**

b) The premier factors that determine voice quality are choice of CODEC, latency, Jitter and packet loss. Justify? **[8]**

Q2) a) An organization has decided to go for an ISDN connection to provide concurrent Internet facility to its 50 users. Discuss the various components required to satisfy the given criteria. Also draw and explain the topology of the network. **[8]**

b) Why contention resolution function is required? Explain the D channel contention resolution algorithm. **[8]**

Q3) a) Related to Q.931 massage format explain protocol discriminator and types of message field in details. **[8]**

b) Compare the protocol architecture of Frame-mode bearer service with that of X.25. **[8]**

P.T.O.

Q4) Write a short notes on (ANY THREE) : **[18]**

a) Approaches to congestion control is FR.

b) Functions of the B-ISDN Layers.

c) Effect of error in cell Header.

d) SS7 Protocol Architecture.

SECTION - II

Q5) a) How does ATM provide convergence of various data types? What is the role of the adaptation layer in this? **[8]**

b) In a real time system if we digitize voice at 8000 samples per second where each sample is one byte, how long will it take to fill 500 byte packet? For interactive voice if delay of 100ms is considered the limit, what fraction of this 100ms is spent in packetization? **[8]**

Q6) a) What is the Cell Delineation procedure? Is this procedure, explain clearly the safeguards against false misalignments due to bit-error and against false delineation during resynchronization? Comment on how the values of ALPHA and DELTA affect misalignments and resynchronization. **[8]**

b) Which fields of ATM cell header can be modified by an ATM switch? Under what Condition does this modification take place? **[8]**

Q7) a) In ATM, why does call establishment require three-way handshaking while call release requires two-way handshaking? Explain the call establishment and call release flows with reference to the message used and the role they play. **[8]**

b) Explain IPTel Gateways with essential functions. **[8]**

Q8) Write a short notes on (ANY THREE) : **[18]**

a) Open Issues in Internet Telephony.

b) H.323 Protocol.

c) ATM Service Level Agreement.

d) MGCP functional architecture.



Total No. of Questions : 8] **[Total No. of Pages :3**

P1509

[3965]-781
M.E. (Chemical)
INDUSTRIAL POLLUTION CONTROL
(2008 Course) (509105) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A multiple settling chamber handles 6 m^3/s of air at 20°C. There are 8 trays including the bottom surface, spaced, 0.25 m apart. The chamber is 4 m long and 1 m wide. For particles of density 2000 kg/m^3 and sizes i) 70 μm ii) 25 μm calculate the residence time, the distance settled and the efficiency of collection. Is the tray spacing sufficient to collect all the particles of each size. Assume laminar flow. What will be the efficiency if the flow regime is turbulent in each case? **[8]**

b) With neat sketches explain the mechanism of inertial impaction, direct interception and diffusion. **[8]**

Q2) a) Explain various types of plume behavior with neat sketches. **[8]**

b) A 1000 MW power plant burns 10,000 metric tons of 1.5% sulphur coal per day. The flue gases are emitted into the atmosphere through a stack whose height is 200 m. The diameter of the stack is 5 m. The velocity and the temperature of the plume at the exit are 10 m/s and 120°C respectively. What is the downmind SO_2 concentration in the plume centreline on the ground at a distance of 5 km on a thin over cast night when the environmental lapse rate is equal to zero? Assume that the ambient air temperature is 15°C and the mind speed at the stack altitude is 6 m/s. Atmospheric pressure = 1000 mb, $\alpha = 0.28$, A = 0.098, B = 0.373, P = 0.587. **[10]**

P.T.O.

Q3) a) What is the concept of osmosis and reverse osmosis? Explain in detail the construction, and working of reverse osmosis plant. **[8]**

b) Before the installation of an electrostatic precipitator (ESP), the stack gas of a power plant contained 6.0 gm particulates /m^3 of gas. The gas flow rate is 350 m^3/min and the new precipitator can remove 2500 kg particulates/ day. **[8]**

i) What is the emission rate of particulates before and after pollution control in kg/day.

ii) What is the efficiency of ESP?

iii) Will the new system meet an emission standard of 0.70 gm/m^3?

Q4) Explain the pollution caused by petroleum and petrochemical industries and explain the methods and equipments which are used for pollution control in the same industry? **[16]**

SECTION - II

Q5) a) 10,000 m^3/day of liquid effluent from food processing industries is to be treated by the activated sludge process at 30°C from an initial $(BOD)_5$ of 650 ppm to a final value of 25 ppm. Bench scale studies at 20°C and mixed liquor biomass concentration of 3000 mg/lit gave BOD removal rate coefficient of 14 (days). Estimate the retention time and size of the unit. Temp. Coefficient $\theta_1 = 1.02$. **[8]**

b) Derive an expression for finding the concentration of microorganisms in the effluent in a complete mix reactor without recycle. **[8]**

Q6) a) Discuss the points which must be considered while designing activated sludge process. What are the main points for activated sludge process control. **[8]**

b) A secondary clarifier is to be designed to produce an under flow concentration of 35000 mg/L from an influent with mixed liquor solids content of 5000 mg/L. The wastewater flow rate is 0.08 m^3/s. Calculate the required clarifier area. The following data are obtained from a settling test in a 100 cm cylinder. **[8]**

Time, min	0	2	4	6	8	10	14
Interface height, cm	100	88	76	64	54	47	37
Time, min	18	22	26		30		
Interface height cm	30	26	24		20		

Q7) a) Explain different methods of landfilling. **[10]**

b) Write a note on waste classification. **[8]**

Q8) a) Explain incineration and composting. **[8]**

b) Discuss nuclear waste disposal. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1511

[3965] - 786
M.E. (Chemical Engg.)
ADVANCED TRANSPORT PHENOMENA
(Sem. - II) (2008 Course) (509109)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the r-component of $(\nabla.r)$ in spherical coordinates. **[8]**

b) Explain the fundamental operations with tensor. **[8]**

Q2) A solid sphere of radius R is rotating slowly at a constant angular velocity Ω in a large body of quiescent fluid (refer fig.). Develop expressions for the pressure and velocity distributions in the fluid and for the torque T_2 required to maintain the motion. It is assumed that the sphere rotates sufficiently slowly that it is appropriate to use creeping flow version of equation of motion, use spherical coordinates. **[16]**

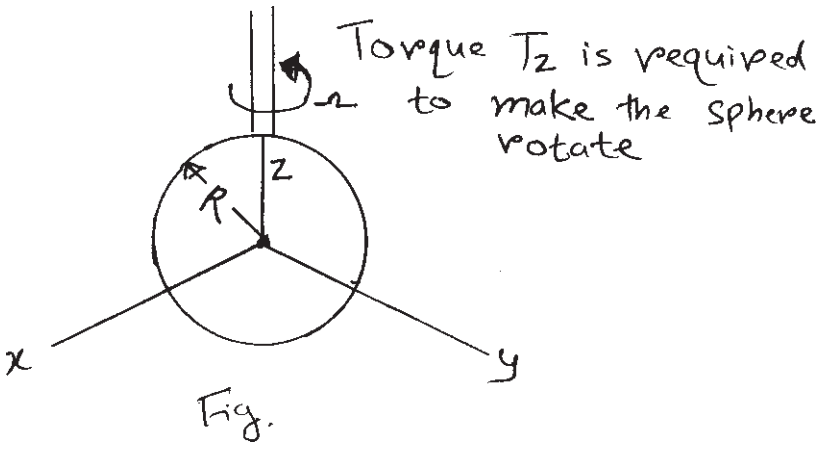


Fig.

P.T.O.

Q3) a) Determine the temperature distribution in an incompressible liquid confined between two coaxial cylinders, the outer one of which is rotating at steady angular velocity Ω_0 and the radius ratio K to be fairly small so that the curvature of the fluid streamlines must be taken into account. The temperatures of the inner and outer surfaces of the annular region are maintained at T_k and T_1 respectively, with $T_k \neq T_1$. Assume steady laminar flow and neglect the temperature dependence of the physical properties. **[10]**

b) Summarize all the steps required in obtaining the equation of change for the temperature. **[8]**

Q4) Obtain the equations of a continuity for a multicomponent mixture. Assume binary systems with constant ρ^{DAB}, with constant C^{DAB} or with zero velocity. **[16]**

SECTION - II

Q5) a) Explain boundry layer separation and formation of wakes. **[8]**

b) Explain effective thermal conductivity of composite solids. **[8]**

Q6) a) Discuss in detail concentration and time smoothed concentration. **[8]**

b) A spherical drop of 0.05 cm in diameter, is falling at a velocity of 215 cm/s through dry, still air at 1 atm pressure with no internal circulation. Estimate the instantaneous rate of evaporation from the drop, when the drop surface is at $T_0 = 70°F$ and the air (far from drop) is at $T_\infty = 140°F$. The vapour pressure of water at 70°F is 0.0247. Assume quasisteady state conditions. **[8]**

Q7) a) How can you estimate the Lennard-Jones potential for a binary mixture, if you know the parameters for the two components of the mixture. **[8]**

b) What is Reynolds analogy and what is its significance. **[8]**

Q8) Write short notes on : **[18]**

a) Concentration profile at gas-liquid interface.

b) Heat transfer coefficient for free and mixed convection.

c) Turbulent flow in ducts.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1514

[3965]-796
M.E. (Chemical) (Environmental Engg.)
ENVIRONMENTAL GEOSCIENCES
(2008 Course) (509132) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions are compulsory.***

SECTION - I

Q1) Define EI Nino describe early stages, characteristics and effects of EI nino. **[16]**

Q2) Describe following aspects : **[16]**

a) Cause of volcanicity.

b) Discordant and concordant Intrusions.

c) Extrusive volcanism.

Q3) Describe Atmosphere, Lithosphere and Hydrosphere of the Earth. **[18]**

OR

Explain the following :

a) Earths energy budget. **[10]**

b) Food chain and food web. **[8]**

SECTION - II

Q4) Describe Acid mine drainage. Its formation and problems created by Acid mine drainage. **[16]**

Q5) Write detailed note on applications of remote sensing and GIS in environmental science. **[16]**

P.T.O.

Q6) Write notes on :

a) Classification and mobility of trace elements. **[6]**

b) Geochemical cycles. **[6]**

c) Biochemical factors in environmental health. **[6]**

OR

a) Write a note on principles of remote sensing. **[6]**

b) Formation and chemistry of AMD. **[6]**

c) Imbalance of trace elements. **[6]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1515

[3965] - 797

M.E. (Chemical) (Environmental Engineering)

ENVIRONMENTAL CHEMISTRY

(2008 Course) (509133) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Environmental chemistry?

b) What are cyclic pathways in the environment? **[16]**

Q2) a) What are the unusual physical properties of water?

b) Write in short about biosynthesis of DNA & RNA. **[18]**

Q3) Describe the constituents and properties of soils in detail. **[16]**

Q4) a) Give the classification of pesticides.

b) What are the environmental effects of Hydrocarbons. **[16]**

SECTION - II

Q5) Draw a neat sketch and explain the construction, principle and working of HPLC and spectroscopy. **[16]**

Q6) Define the following term and discuss the measurement procedure of them. **[18]**

a) BOD b) COD

c) TOC d) pH

P.T.O.

Q7) Give the estimation procedure of heavy metal-copper from industrial waste water. **[16]**

Q8) Write short notes on : **[16]**

a) Polarography.

b) Ion Exchange Chromatography.

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1519

[3965]-808
M.E. (Environmental) (Chemical)
INDUSTRIAL WASTE TREATMENT
(2008 Course) (509140) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is common effluent treatment plant? **[9]**

b) Discuss the concept, objectives and cost benefit analysis of common effluent treatment plant. **[9]**

Q2) Discuss the treatment techniques for removal of **[16]**

a) Heavy metals.

b) Oil & Grease.

Q3) a) Explain the concept of Reuse, Recycle in water management. **[8]**

b) Write the classification and characterization of Industrial wastewater. **[8]**

Q4) Write short notes on: **[16]**

a) Activated sludge process.

b) Water Budget

SECTION - II

Q5) Draw the flow sheet for the treatment of sugar Industry wastewater and explain in detail. **[18]**

Q6) Explain the sources characteristics and treatment of dairy waste water. Draw the complete flow sheet of it. **[16]**

P.T.O.

Q7) Plot the BOD curve and calculate K_1 & L_4 for the following data. **[16]**

Time, days	2	4	6	8	10
BOD mg/lit	10	17	23	25	27

Q8) What is sedimentation? Why sedimentation is required in waste treatment? Explain advantages & disadvantages of chemical aided sedimentation. **[16]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1520

[3965] - 810
M.E. (Chemical) (Environmental Engg.)
WATER QUALITY MODELING
(2008 Course) (509141) (Elective - III)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) It is desired to model the concentration of suspended solids Ms in water, write the model equation. **[6]**

b) A sodium chloride tracer resulting in a concentration of 5000 mg/L in the discharged effluent of a sewage treatment plant is used to determine the dispersion coefficient, Exx. The Concentration of sodium chloride in background stream is 50 mg/L. If the plant flow is 200 m^3/day. What is the resulting salt concentration in the mixed stream. Given : The stream flow is 2456 m^3/day. **[12]**

Q2) a) A river flow of 200 Cfs has a mean depth 5ft and a mean width of 40 ft. The bed slope is 0.0014. Using the keefers proposed equation, calculate Exx.**[8]**

b) A river sample is put in a settling column. At two points in time, samples are taken at the sampling port, producing the following results: at 0 day, m_s = 20 mg/L, at 2 days m_s = 15 mg/L Determine the settling coefficient K_s. **[8]**

Q3) Derive the relation **[16]**

$$\frac{D\,(\eta\, C_{sp})}{Dt}\left(\frac{1}{f_{cp}\ K_{sc}}+m_s\right)=\frac{\partial}{\partial t}\,(\eta\ C_{sp})\left(\frac{1}{f_{cp}\ K_{sc}}+m_s\right)$$

$$+\frac{\eta}{f_{cp}\ K_{sc}}\left(u\frac{\partial C_{sp}}{\partial x}+v\frac{\partial C_{sp}}{\partial y}+w\frac{\partial C_{sp}}{\partial z}\right)$$

The notations have their usual meaning.

P.T.O.

Q4) a) Write the approach for eutrophication modeling. **[8]**

b) Discuss the components of water quality model. **[8]**

SECTION - II

Q5) a) Explain the problems associated in model application with example related to QUAL 2. **[8]**

b) Explain the problems in model formulation with example related to QUAL 2. **[8]**

Q6) Discuss and explain sensitivity analysis of streeter-phelps models. **[18]**

Q7) a) H_2S is liberated if an organic substance containing sulfur is degraded anaerobically (a) If there is 10^{-7} mol/L of H_2S in water at equilibrium, what is its concentration Ca in air expressed in mole fraction and in atmosphere (b) If the concentration in water of H_2S is 10^{-6} mol/L, with the concentration in air found in part (a), what is R_v under these concentration conditions. K_H for H_2S is 0.0483×10^4 atm/mol fraction at 20ºC. Assume that temperature is 20ºC. **[8]**

b) Benzene, whose solubility equals 0.07 part per 100 parts of water by weight, was spilled into an aquifer having a hydraulic conductivity K_{xx} = 100 m/day. What is the centerline concentration of the plume when it reaches the river bank 3300 m down stream. Field investigation showed that the elevation of the groundwater table is 30 m above the river. Use the following additional information : $f_{cp} = 0.1$, $\eta = 0.55$, formation of specific gravity = 2.65, $E_{xx} = 3.76 \times 10^{-4}$ cm^2/S and K = 0.07 per day. **[8]**

Q8) Tiny droplets of benzene are slowly leaking from an on-ground storage tank. Tensiometers show readings of – 88cm and – 126 cm of water at depths of 30 cm and 100 cm, respectively below the ground. The vertical unsaturated hydraulic conductivity K_{22} is 5.4 m/day. The porosities are $\eta = 0.55$, $\eta_d = 0.38$ and $\eta_a = 0.17$. The other pertinent information are $f_{cp} = 0.1$, $K_{sc} = 104.7$ L/day, $m_d = 1.19 \times 10^3$ Kg/m^3 and $E_{22} = 0.0012$ m^2/day. The half - life of benzene is 10 days and its solubility in water is 0.07 part per 100 parts by weight. The vapour pressure of benzene is 0.1 mm Hg. Calculate the benzene concentration 10 m below surface. **[16]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1521

[3965] - 813
M.E. (Chemical) (Environmental)
GROUND WATER CONTAMINATION & POLLUTION CONTROL
(2008 Course) (509142) (Elective - IV)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the laplace equation for steady state groundwater flow. **[8]**

b) What do you understand by groundwater movement? What are the factor affecting movement. **[6]**

c) Describe the groundwater subsystem & water profiling. **[4]**

Q2) a) Determine the transmissibility of an water bearing strata connecting 2 aquifer, 50 km apart. During investigation it was found that the current groundwater potential was a result of 15,000 years of groundwater movement between aquifer.
The aquifer has a thickness of 40 m & runs inclined at 25 m/km. The hydraulic gradient was found to be 0.5 m/km. **[6]**

b) Explain various approaches to classify aquifer. **[6]**

c) State Daray's law & it limitation. **[4]**

Q3) a) What are the main factor that produce a change in groundwater quality. **[6]**

b) Describe briefly the image well theory with parallel boundaries. **[6]**

c) A 30cm well fully penetrates a confined aquifer 25m deep. After a long period of pumping at a rate of 10001 pm, the drawdown in wells at 18m & 40m from pumping well was found to be 2.0m & 1.5 m respectively. Determine the transmissibility of aquifer. What is the drawdown in the pumped well. **[4]**

P.T.O.

Q4) a) Obtain an expression for discharge through a flownet for an isotropic aquifer. **[6]**

b) What is a flownet & what are the guiding rules for construction of flownet. **[6]**

c) What are the various geophysical techniques in groundwater exploration. Explain any one technique. **[4]**

SECTION - II

Q5) a) What is meant by groundwater pollution control? Explain vyredox method for in situ chemical treatment of groundwater. **[8]**

b) What are the various method of treatment of organic matter in groundwater. Explain any one method with its applications & cost economics. **[8]**

c) List out any 4 methods of artificial recharge of groundwater. **[2]**

Q6) a) What are the various steps involved in groundwater modelling? What are the utilities acheived by modelling. **[6]**

b) Explain Dipole pumping test model. **[6]**

c) Discuss subsurface barrier & pressure ridge method for controlling sea water intrusion into coastal aquifer. **[4]**

Q7) a) Discuss the mechanism of solute transport in vadose zone. **[6]**

b) Describe Dispersion in fractared rock. **[6]**

c) What are karstic land forms? How are they developed. **[4]**

Q8) a) How are lechates developed. How does the unsaturated flow, disposal site size & water balance affect groundwater contamination. **[8]**

b) What is passive transport phemenon? Discuss **[8]**

i) diffusion

ii) facilitated diffusion

iii) osmosis



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1522

[3965] - 837
M.E. (Information Technology)
ADVANCED OPERATING SYSTEMS
(2008 Course) (Sem. - I) (514403)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Discuss the relative advantages and disadvantages of using the NRNMB, NRMB, RMB and RNMB strategies in the design of a DSM system. **[10]**

b) What is the primary motivation behind the development of a light weight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. **[8]**

Q2) a) Explain the four types of buffering strategies in a message passing system. **[8]**

b) Discuss the desirable features of a good process migration mechanism. **[8]**

Q3) a) What is a stub? How are stubs generated? Explain how the use of stubs helps in making an RPC mechanism transparent. **[8]**

b) Discuss the two protocols that are used to ensure sequential consistency in a DSM system that uses the RMB strategy. **[8]**

Q4) a) Describe the implementation of logical clocks using : **[8]**

i) Counters. ii) Physical clocks.

b) Describe four distributed computing system models with the help of neat diagrams. **[8]**

P.T.O.

SECTION - II

Q5) a) A system uses the preemption method for deadlock prevention. Suppose the system currently has five transactions T_1, T_2, T_3, T_4 and T_5, their timestamp values being t_1, t_2, t_3, t_4 and t_5, respectively ($t_1 > t_2 > t_3 > t_4 > t_5$). Explain what happens if : **[8]**

i) The system uses the wait-die scheme and T_2 requests for resource held by T_5.

ii) The system uses the wait-die scheme and T_4 requests for resource held by T_1.

iii) The system uses the wait-wound scheme and T_3 requests for resource held by T_4.

iv) The system uses the wait-wound scheme and T_5 requests for resource held by T_2.

b) What are the factors influencing block size selection in a DSM system? What are the advantages of using the page size as the block size in a DSM system? **[8]**

Q6) a) Explain the different issues involved in client server binding. **[8]**

b) State the desirable features of a good global scheduling algorithm. **[8]**

Q7) a) What are the differences between replication and caching? What are the advantages of replication of data in a distributed file system? **[8]**

b) Describe the system architecture of Amoeba. State in brief the design goals of Amoeba. **[8]**

Q8) Write short notes (Any three) : **[18]**

a) Group communication in Chorus.

b) Gifford Quorum protocol.

c) Transparency.

d) Thread synchronization in Mach.

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Total No. of Questions : 08] **[Total No. of Pages : 2**

P1525

[3965]-846
M.E. (IT)
MANAGEMENT TRENDS IN INFORMATION TECHNOLOGY
(Sem. - II) (2008 Course) (514427)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question Nos. 4 and 8 are compulsory. Out of the remaining attempt 2 questions from section I and 2 questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider the automation of a supply chain management system for retail outlets / malls. Create a project charter for the same by listing down the functionalities and elements of the system. **[8]**

b) Write a note on Corporate Social Responsibility. **[8]**

Q2) a) Consider the building of a remote desktop controller system. The system should include a mobile handset which is used to perform simple desktop functions such as document processing and also complicated desktop processing such as software downloading, installation etc. By connecting with the remote desktop from anywhere through the internet. Decide upon the best software process model that can be used for this system and justify the same. Build the project plan for the system. Draw the project network diagram and calculate the slack by analyzing the PND and elaborate on the steps to adjust the slack. **[10]**

b) Write a note on IPR in general and IPR in India. **[6]**

Q3) a) Consider an inflight passenger service. What are the expectations and perceptions of good service in this service. This system is heavily dependent on database (s) and they are transaction intensive. Explain. **[8]**

b) Write a note on Team management w.r.t. importance of Teams, Formation of Teams, Term Work, Leading the Team. **[8]**

Q4) Write notes on **[18]**

a) Project quality standards.

b) Ethical conduct and ethical judgements.

c) Decision support system as MIS.

P.T.O.

SECTION - II

Q5) a) India would like to provide effective health care to all its citizens by the year 2020. The ministry of health is developing an automated system to this effect by making use of the unique identification being provided to the people. Design this system as a MIS and elaborate on how to provide quality of service through MIS support. **[8]**

b) Write a note on IT/IS audit. **[8]**

Q6) a) XYZ university has launched an ambitious plan of conducting on - line examinations for first year engineering students (UG) for practicals. The first year the university decided to conduct the examination by providing CD's to the colleges with the requisite software to conduct the exam and by submitting hard copies of the result back to the university by the colleges. Create a WBS for the system by specifying the need for a WBS and a list of deliverables for the same. Explain how change management should be brought about if the examination should be conducted through internet by downloading the software for examination conduction and subsequent result uploading. **[8]**

b) Elaborate on the dynamics of group formation, group types, conflict types and conflict management in any organization. **[8]**

Q7) a) A gift shop prepares gift boxes for sale during New Year, Diwali, Christmas and for marriages. The shop has over 1000 gift articles which are uniquely identified by a bar code. A customer places an order for a gift box packed with assorted gift articles. A box may contain one or more items but not exceeding four. Since the business is seasonal, quick enquiry and order processing is necessary. An order of less than 100 boxes is not accepted. Draw an application system flow chart starting from enquiry processing to order processing, including, packaging delivery and billing. **[8]**

b) Explain CRF as a MIS **[8]**

Q8) Write notes on : **[18]**

a) Energy management and energy audit.

b) Knowledge management as an MIS.

c) Budgeting a project with suitable example.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1528

[3965]-851
M.E. (CSE) (IT)
INTERNET ROUTING DESIGN
(2008 Course) (Elective - IV) (514428)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three question from each section.***
2) ***Answers to the two section should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the architectural components in Network routing? Identify the key differences between the differentiated services architecture and the integrated services architecture. **[8]**

b) What are major bottleneck in routers? Explain their causes and sample solutions. **[8]**

Q2) a) Develop a specialized *k*-shortest paths algorithm, given that a path cannot consist of more than two links. **[8]**

b) For the network example presented in Figure.1, compute the shortest paths from node 2 to all other nodes using the centralized Bellman-Ford algorithm. **[8]**

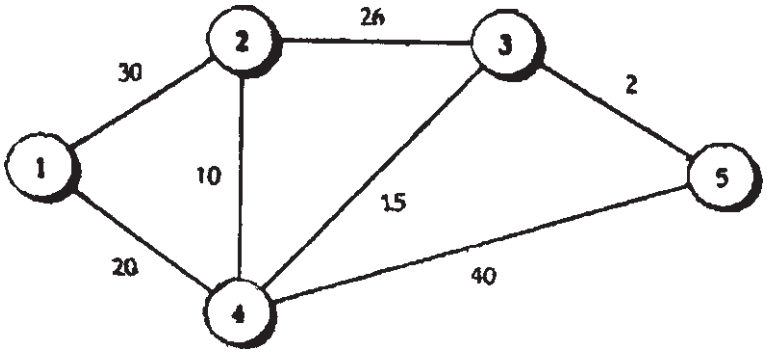


Figure 1: A 5-node example.

P.T.O.

Q3) a) Identify issues faced in a distance vector protocol that are addressed by a path vector protocol. **[9]**

b) Investigate how to resolve a stuck in active (SIA) situation that can occur in a distance vector protocol that is based on the diffusing computation with coordinated update. **[9]**

Q4) a) What are the key elements of a router? Explain each of them in detail. **[8]**

b) What are the basic functions of a router? Discuss the strengths and weaknesses of various router architectures. **[8]**

SECTION - II

Q5) a) What are major challenges in IP address routing lookups? Explain each with suitable examples. **[8]**

b) What is prefix expansion and why is it required? Explain why longest prefix match is important and define, in your words, the longest prefix matching problem. **[8]**

Q6) a) Define the packet classification problem. What are the different types of matches allowed in packet classification rules? **[8]**

b) Explain the preprocessing stage and classification stage in packet classification algorithm. **[8]**

Q7) Generalize the network flow model for traffic engineering for a network of L links and K demands in which $K1$ customers require path protection, $K2$ customers allow traffic trunk to be split, and $K3$ require no-split traffic trunks. **[16]**

Q8) Write short notes on any three : **[18]**

a) Routing Protocols for QoS Routing.

b) MPLS/GMPLS.

c) VPN Traffic Engineering.

d) HiCuts/HyperCuts.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1531

[3965]-878

M.E. (Instrumentation & Control) (Process Instru. Biomedical Instru.)

MATHEMATICAL METHODS IN INSTRUMENTATION

(2008 Course) (5061102) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any 3 questions from each section.***
2) ***Use separate answer books for each section.***
3) ***Assume suitable data, if necessary.***
4) ***Use of Calculators, log tables, charts is allowed.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain basis vectors and their role in signal processing. **[4]**

b) Discuss one to one linear transformation with suitable example. **[4]**

c) Find Singular Value Decomposition of the following : **[10]**

$$A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$$

Q2) a) Compare Unitary and orthogonal transformation. **[6]**

b) Check the followings for Unitary or Orthogonal transformation : **[10]**

i) $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ ii) $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ iii) $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}$

Q3) a) Compare various numerical methods. **[6]**

b) With $h = 0.1$, find the numerical solution on $0 <= x <= 1$ by Runge-Kutta method for $y' = y^2 + 2x - x^4$ with $y(0) = 0$ and compare your result with exact solution $y = x^2$. **[10]**

Q4) a) Explain orthogonal operators. **[8]**

b) Represent vectors (1, 2, 3) as linear combination of vectors (4, 5, 6) and (2, 1, 0). **[8]**

P.T.O.

SECTION - II

Q5) a) Explain probability density functions. Discuss its application in signal processing/process instrumentation. **[6]**

b) The probability of defective bolt is 0.1. Find **[10]**

i) the mean,

ii) the standard deviation, for the no. of defective bolts in a total of 400 bolts.

Q6) a) Find the probability that in five tosses of a fair die, a 3 will appear. **[10]**

i) Twice.

ii) At most once.

iii) At least two time.

b) Define with suitable examples : **[8]**

i) Experiment.

ii) Sample space.

iii) Event.

iv) Event space.

Q7) a) Let X be the random variable that denotes the life in hours of certain electronic device. The following probability density function of this device is as follow : **[10]**

$$f(x) = \begin{cases} \dfrac{20{,}000}{x^3} & x > 100 \\ 0 & \text{elsewhere} \end{cases}$$

Calculate :

i) Mean.

ii) Standard deviation.

iii) Variance.

b) Define : **[6]**

i) Moment.

ii) Moment generating function.

iii) Skewness.

iv) Kurtosis.

Q8) a) Write the density functions for the following distribution : **[8]**

i) Gaussian distribution

ii) Poisson distribution.

iii) Binomial distribution.

iv) Uniform distribution.

b) Define : **[8]**

i) Conditional Probability.

ii) Vectors norms.

iii) Subjective Probability.

iv) Classical Probability.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1535

[3965] - 887

M.E. (Instrumentation & Control)

(Process Instru. and Biomedical Instru.)

ADVANCED SIGNAL PROCESSING

(2008 Course) (5061109) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the necessity of Time-Frequency analysis of the signal? Define STFT and explain the signal analysis using STFT. State the advantages of STFT over FT. **[8]**

b) Explain the AR model of stochastic process in detail. **[8]**

Q2) a) Consider the signal $x(n) = a^n u(n)$, $|a| < 1$, **[10]**

i) Determine the spectrum X(ω).

ii) The signal $x(n)$ is applied to a decimator that reduces the rate by a factor of 2. Determine the output spectrum.

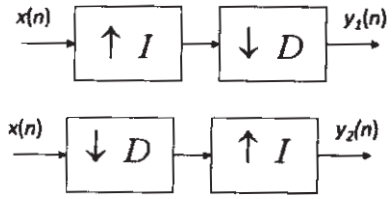
iii) Show that the spectrum in part (ii) is simply the Fourier Transform of $x(2n)$.

b) Explain in detail any one application of Homomorphic deconvolution. **[8]**

Q3) What do you mean by adaptive filtering? Describe the LMS algorithm for adaptive filtering. Explain one application of adaptive filtering. **[16]**

P.T.O.

Q4) a) Consider the two different ways of cascading a decimator with an interpolator as shown in following figure. **[10]**



i) If D = I, show that the output of the two configurations are different. Hence, in general, the two systems are not identical.

ii) Show that the two systems are identical if and only if D and I are relatively prime.

b) State the equations of Decimation and Interpolation process. Explain the different steps in sampling rate conversion by a rational factor I/D. **[6]**

SECTION - II

Q5) a) Consider an arbitrary digital filter with transfer function **[10]**

$$H(z) = \sum_{n=-\infty}^{\infty} h(n) z^{-n}$$

i) Perform a two-component polyphase decomposition of H(z) by grouping the even-numbered samples $h_0(n) = h(2n)$ and the odd-numbered samples $h_1(n) = h(2n + 1)$. Thus show that H(z) can be expressed as

$H(z) = H_0(z^2) + z^{-1}H_1(z^2)$

and determine $H_0(z)$ and $H_1(z)$.

ii) For the IIR filter with transfer function $H(z) = \dfrac{1}{1 - az^{-1}}$ determine $H_0(z)$ and $H_1(z)$ for the two-component decomposition.

b) List out the different Video Compression Standards. Explain any one of them. **[6]**

Q6) a) The autocorrelation sequence for an AR process $x(n)$ is $\gamma_{xx}(m) = \left(\frac{1}{4}\right)^{|m|}$

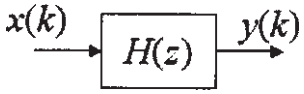
i) Determine the difference equation for x(n).

ii) Is your answer unique? If not, give any other possible solution. **[10]**

b) What is QMF filter bank? Explain the three level signal decomposition using Wavelet Transform. The input signal frequency is 16 kHz. State the frequency range of each band. **[8]**

Q7) Define the terms power spectrum and periodogram. What are the different power spectrum estimation methods? Explain any one Nonparametric methods of power spectrum estimation. **[16]**

Q8) a) In the given figure **[8]**



If $x(k)$ is a WSS process, Show that the output autocorrelation sequence is the convolution of filter's autocorrelation sequence and the input autocorrelation sequence.

b) What is Orthogonal transform? Explain Sine and Cosine Transform.**[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1536

[3965] - 889

M.E. (Instrumentation & Control)

MODERN CONTROL THEORY

(2008 Course) (5061111A) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Obtain the time response of the following system **[10]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1\\ 1\end{bmatrix}u$$

where $u(t)$ is a unit step occurring at $t = 0$ and $x^T(0) = [1 \;\; 0]$.

b) $$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 2\end{bmatrix}u$$ **[5]**

$x_1(0) = 0$, $x_2(0) = 1$, compute the State Transition Matrix.

Q2) a) $$\mathrm{A}=\begin{bmatrix}3 & 4\\ 2 & 1\end{bmatrix}$$ **[10]**

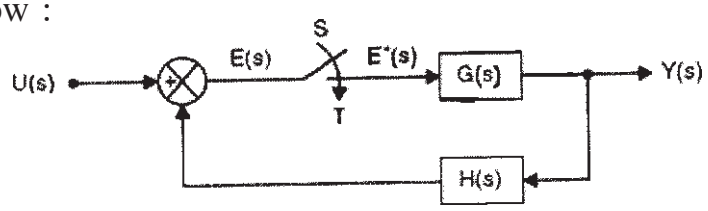
Determine the eigenvalues and eigenvectors of matrix A.

b) Determine the transfer matrix for the system given below **[5]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 3\\ -2 & -5\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}u(t) \text{ and } y=\begin{bmatrix}2 & 1\\ 1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

P.T.O.

Q3) a) Obtain the pulse transfer function for the error-sampled system given below : **[10]**



where

$G(s) = \dfrac{1}{s(s+1)}, H(s) = 1$, sampling time T = 1sec.

b) A discrete-time system is described by the difference equation **[10]**

$y(k + 2) + 5y(k + 1) + 6y(k) = u(k)$

$y(0) = y(1) = 0$; T = 1sec.

Determine the state-model in normal form also compute state transition matrix.

SECTION - II

Q4) a) $$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_1(t) \\ \dot{x}_1(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_1(t) \\ x_1(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} u(t)$$ **[10]**

Determine whether the system is completely state controllable or not.

b) A nonlinear system described by **[5]**

$\dot{x}_1 = x_2$

$\dot{x}_2 = -x_1 - x_2^3$

Investigate the system's stability using the direct method of Lyapunov.

Q5) a) Synthesize a PI controller for a plant having a nominal model given by $G_o(s) = \dfrac{1}{s^2 + 6s + 9}$ **[10]**

in such a way that Mg ≥ 10[dB] and Mf ≥ π/4.

b) Explain McMillan form with example. **[5]**

Q6) a) Explain affine parameterization for SISO and MIMO control system. **[10]**

b) Find pulse transfer function for PID controller. **[10]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1537

[3965] - 892

M.E. (Instrumentation and Control)

(Biomedical Instrumentation)

BIOSIGNAL PROCESSING

(2008 Course) (5061204A) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail the block diagram representation of discrete-time systems. **[8]**

b) Using basic building blocks, sketch the block diagram representation of discrete-time system described by the input-output relation $y(n) = 0.25\ y(n-1) + 0.5x(n) + 0.5x(n-1)$. **[4]**

c) Define linear system and causal system. **[4]**

Q2) a) The impulse response of a linear time-invariant system is **[8]**

$$h(n) = \{1, 2, 1, -1\}$$

Determine the response of the system to the input signal

$$x(n) = \{1, 2, 3, 1\}$$

b) Explain the properties of convolution of LTI systems. **[8]**

P.T.O.

Q3) a) Determine the pole-zero plot for the signal **[4]**

$x(n) = a^n u(n)\ a > 0$

b) Determine the unit sample response of the system characterized by the difference equation **[8]**

$y(n) = 2.5y(n-1) - y(n-2) + x(n) - 5x(n-1) + 6x(n-2)$

c) State any four properties of z-transform. **[4]**

Q4) a) Sketch the signal flow graph of DIT algorithm for 4-point. DFT calculation. **[6]**

b) State any four properties of DFT. **[4]**

c) Determine the impulse response of a low pass linear phase FIR filter of length M having desired frequency response **[8]**

$$H_d(e^{j\omega}) = \begin{cases} 1e^{-j\omega(M-1)/2}, & 0 \le |\omega| \le \omega_c \\ 0, & \text{otherwise} \end{cases}$$

using the window technique.

SECTION - II

Q5) a) Design a low pass digital filter with a 3-dB bandwidth of 0.2π, using bilinear transformation applied to the analog filter with transfer function,

$H_a(s) = \dfrac{\Omega_c}{s + \Omega_c}$ Also, determine the frequency response of digital filter and magnitude at ω = 0 and ω = 0.2π. **[8]**

b) Apply the bilinear transformation to **[8]**

$$H_a(s) = \frac{s + 0.1}{(s + 0.1)^2 + 16}$$

With T = 0.5 sec. Also, determine the poles and zeros of the digital filter.

Q6) a) Determine the order and the poles of a low pass Chebyshev type I filter that has 1-dB ripple in the passband frequency $\Omega_p = 1000\pi$, a stopband frequency of 2000π and an attenuation of 40 dB for $\Omega \ge \Omega_s$. **[12]**

b) Compare the FIR filters and IIR filters. **[4]**

Q7) a) Describe the advantages and disadvantages of modified Huffman coding. **[8]**

b) What are the various finite word length register effects? **[8]**

Q8) Write short notes on : **[18]**

a) Adaptive filters.

b) Integer filters.

c) Digital Signal Processors.

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Total No. of Questions : 10] **[Total No. of Pages : 5**

P1539

[3965]-911
M.E. (Polymer Engg.)
PROCESSING AND MECHANICS OF COMPOSITES
(2008 Course) (Sem. - II) (509124)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q.No. 1 from section-I and Q.No. 6 from section-II are compulsory. Attempt any other two from section-I and any other two from section-II.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections must be written in separate answer books.***
4) ***Assume suitable data, if required.***
5) ***Use of scientific calculator, log paper is allowed.***

SECTION - I

Q1) Answer any five : **[20]**

a) Write lower bound on young's modulus using mechanics of materials approach.

b) Write stiffness matrix for transversely isotropic lamina.

c) How will you calculate major Poisson's ratio, υ_{12} using mechanics of materials approach?

d) Explain the test set up for calculation of E_{11} and E_{22}.

e) Give merits and demerits of hand lay up process.

f) Write in short about any one thermoplastic matrix material commonly used in composites.

Q2) a) Obtain expression of strength of a composite for following cases. **[6]**

i) Fiber length less than load transfer length.
ii) Fiber length equal to load transfer length.
iii) Fiber length more than load transfer length.

P.T.O.

b) For a unidirectional lamina, engineering constants are :

E_{11} = 125 MN/m^2
E_{22} = 8 GN/m^2
G_{12} = 5 GN/m^2
υ_{12} = 0.4

The lamina is loaded as shown in fig.1. Find out global strains $\in_x$, $\in_y$ and γ_{xy} **[9]**

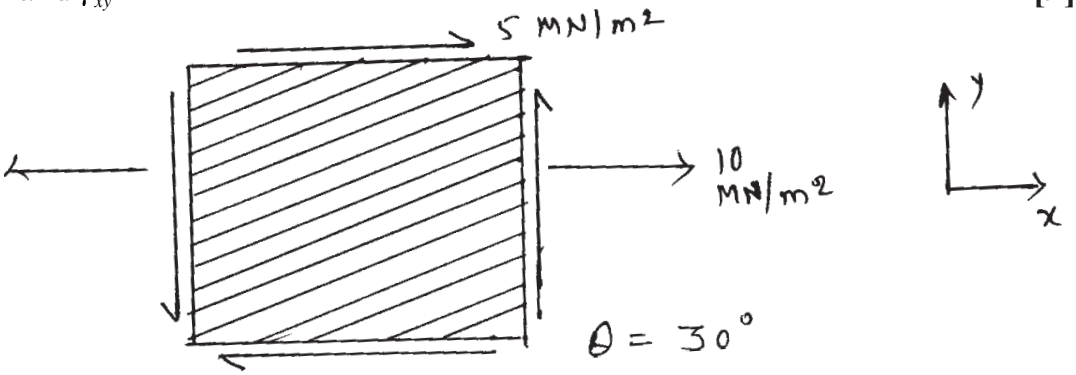


Fig.1

Q3) a) A unidirectional lamina is subjected to stress as shown in Fig.2. Engineering constants are :

E_{11} = 100 kN/m^2 E_{22} = 10 kN/m^2

G_{12} = 5 kN/m2 γ_{12} = 0.3

Failure strengths are :

F_{1T} = 1300 N/mm^2
F_{2T} = 80 N/mm^2
F_{1C} = 1000 N/mm^2
F_{2C} = 50 N/mm^2
shear strength = S = 50 N/mm^2
T - refers to tension
C - refers to compression

Find whether failure will take place as per maximum stress theory and by maximum strain theory. **[9]**

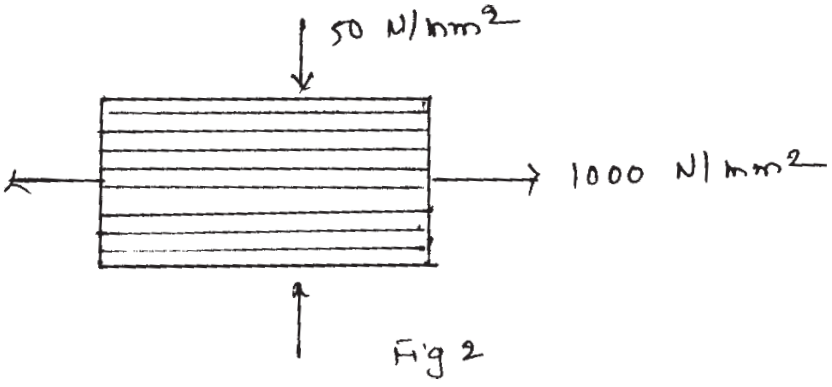


Fig 2

b) State maximum strain theory and reduce it to unidirectional lamina. **[6]**

Q4) a) Discuss processing steps, tooling, merits and demerits of resin transfer moulding. **[7]**

b) How will you calculate fiber content and void content of a composite? **[5]**

c) Give Griffith's formula to calculate strength of brittle fibers. **[3]**

Q5) a) Draw a neat sketch of pultrusion line. **[4]**

b) Give plane stress condition for orthotropic material. **[3]**

c) The reduced stiffnesses for plane stress condition for a lamina are given below : **[8]**

Q_{11} = 134 GPa
G_{22} = 8.8 GPa
Q_{12} = 2.29 GPa
G_{66} = 3.3 GPa

If angle of orientation is 30^{o}, calculate invariants and also transformed reduced stiffnesses.

SECTION - II

Q6) Attempt any four : **[20]**

a) Give a simple flow chart explaining laminate design procedure.

b) Write expressions for calculation of hygrothermal strains in global direction using coefficient of thermal expansion and coefficient of moisture expansion for a unidirectional lamina.

c) Give example of Quasi-Isotropic laminate and give in-plane force displacement relationship.

d) Give force and moment resultants for an unsymmetric laminate.

e) Give assumptions of classical lamination theory and show variation of strain and stress through the laminate thickness.

Q7) a) For a balanced symmetric laminate show that effective laminate young's modulus $\overline{E}_x$ is given by

$$\overline{E}_x = \frac{1}{d}\left[Axx - \frac{Ax^2y}{Ayy^2}\right]$$

where *d* is laminate thickness and A*xx*, A*yy* and A*xy* are elements of extensional stiffness matrix. **[8]**

b) For a symmetric angle ply laminate $[\pm 45]_s$, prove that effective laminate modulus $\overline{E}_x$, effective laminate Poisson's ratio $\overline{\upsilon}_{xy}$ and stiffness element Q_{66} are related by **[7]**

$$\frac{\overline{E}_x}{2\,(1+\overline{\upsilon}_{xy})} = Q_{66}$$

Q8) a) A steel beam has bending stiffness of 40 kN/m^2. It is to be replaced by hybrid beam made up of carbon-epoxy and glass-epoxy laminates as shown in Fig.4.

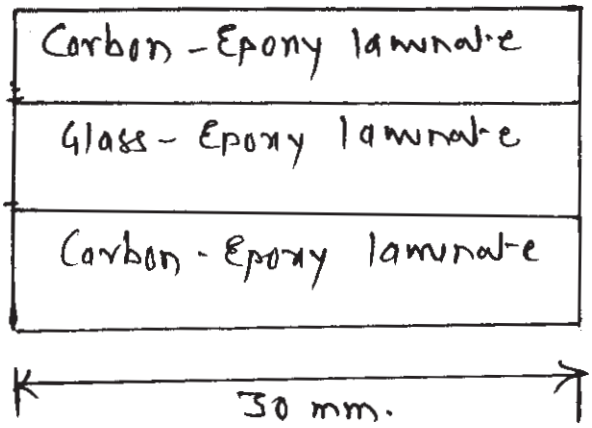


Fig 4

Fibers are laid unidirectionally along the beam axis. Determine the depth of hybrid beam. Also calculate the number of plies in each laminate if both plies have same thickness of 0.1 mm. Given :

$E_{\text{carbon-epoxy}} = 250$ GPa

$E_{\text{glass-epoxy}} = 55$ GPa **[8]**

b) Give example of a symmetric laminate with multiple specially orthotropic laminae. Write force and moment resultants. **[7]**

Q9) a) Given below are laminate codes. Mention type of laminate and for each laminate mention which of the elements of [A], [B] and [D] matrices are zero. **[12]**

i) $[\pm 45/\pm 45]$
ii) $[30/-45/-30/45]$
iii) $[\pm \theta]$
iv) [0/90/0/90]
v) $[0/45/90/-45]$
vi) [0/90]

b) Define antisymmetric laminates. **[3]**

Q10) a) Write expressions for : **[5]**

i) Deflection of a beam with uniform load and simply supported at both ends.

ii) Fundamental frequency for a simply supported beam incase of symmetric laminate.

b) For a symmetric laminate, show that : **[10]**

i) In plane logitudinal modulus $E_x = \frac{1}{h\ A_{11}^{xx}}$.

ii) In plane transverse modulus $E_y = \frac{1}{h\ A_{22}^{xx}}$.

iii) In plane shear modulus $G_{xy} = \frac{1}{h\ A_{66}^{xx}}$.

iv) In plane Poisson's ratio $\upsilon_{xy} = -\frac{A_{12}^{xx}}{A_{11}^{xx}}$.

h = thickness

A_{11}^{xx}, A_{22}^{xx}, A_{66}^{xx}, A_{12}^{xx} are elements of extensional compliance matrix.



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1561

[3965]-919

M.E. (Printing Engineering & Graphic Communication)

PRINTING TECHNOLOGY MANAGEMENT

(2008 Course) (508102) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Assume suitable data, wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer the following :

a) Explain the different production systems with the examples of printing industry. **[9]**

b) Explain the functions of production department in a gravure press. **[9]**

c) The past data regarding sales of magazine for the last five years is given. Using the least square method, fit a straight line, Estimate the sales for the year 2006 and 2007. **[7]**

Year	2001	2002	2003	2004	2005
Sales in 100s	35	56	79	80	40

Q2) Answer the following :

a) Explain the functional and operational aspects of product design. **[9]**

b) Write about product policy of an organization. **[9]**

c) Explain the phases in product life-cycle. **[7]**

Q3) Answer the following :

a) Explain the different forecasting methods in detail. **[13]**

b) There exists a relationship between expenditure on research and its annual profit. The details of expenditure for last 6 years is given below. Estimate the profit for the year 2010 when the expenditure is 6 units. **[12]**

P.T.O.

Year	2004	2005	2006	2007	2008	2009	2010
Expenditure in crores Rs.	2	3	5	4	11	5	6
Annual profit in Rs. crores.	20	25	34	30	40	31	?

SECTION - II

Q4) Answer the following :

a) Derive the economic order quantity for instantaneous stock replenishment model. **[9]**

b) Explain the selective control of inventory using ABC analysis. **[7]**

c) The annual demand for a machine component is 24,000 units. The carrying cost is Rs. 0.40/unit/year, the ordering cost is Rs. 20/order. And shortage cost is Rs. 1000/unit/year.
Find :

i) Economic order quantity.
ii) Maximum inventory.
iii) Maximum shortage quantity.
iv) Cycle time.
v) Inventory period (t_1).
vi) Shortage period (t_2) **[9]**

Q5) Answer the following :

a) Explain quality, quality cost and quality assurance. **[9]**

b) Explain six sigma with an example from printing industry. **[9]**

c) Explain process capability index and its importance in quality control. **[7]**

Q6) Answer the following :

a) Explain the tools used in statistical print process control. **[10]**

b) Six consecutive lots of books were inspected by sampling process. The number of defectives observed in different samples, each having 100 books, is given below. **[7]**

Sample No.	1	2	3	4	5	6
No. of defectives	7	6	6	1	5	2

Draw control chart for the fraction defectives.

c) An acceptance sampling plan is to take sample of size 50 and reject the batch if 3 or more non-conforming items are found. Draw the operating characteristics curve. Binomial distribution table can be used. **[8]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1562

[3965] - 920
M.E. (Printing)
MODERN TRENDS IN PRINTING
(2008 Course) (508103) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss substrate selection procedure for web offset printing. **[10]**

b) Discuss the automatic plate mounting system used for printing. **[8]**

c) Discuss basic principle of operation of digital printing. **[7]**

Q2) a) Describe the conventional and digital flexo plate making procedure followed in printing press. **[10]**

b) Describe the construction of auilox roller. Also explain the selection procedure for this roller. **[15]**

Q3) a) Explain detailed procedure followed for the selection of substrates for gravure printing applications. **[12]**

b) Discuss various types of substrates and inks used for gravure printing. **[13]**

SECTION - II

Q4) a) Discuss the basic principle of operation of elastomer? Why it is selected for impression rollers? **[10]**

b) How Nip width of impression rollers decides the printability of printer? **[8]**

c) Discuss the effect of rubber hardness on print quality. **[7]**

P.T.O.

Q5) a) Explain the function and utilities of electronic line shaft drive system. **[13]**

b) Explain and enumerate various areas of pneumatic system used in printing machine. **[12]**

Q6) a) Explain logistic and material handling systems used in press shop of printing industry. **[15]**

b) Write a note on maintenance of various systems used in printing press. **[10]**

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1566

[3965]-927
M.E. (Printing)
PRINT MEDIA COMMUNICATIONS
(2008 Course) (508108) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures on right indicates marks.***

SECTION - I

Q1) Explain in detail various methods used for surface design by using PDF/x file format. **[25]**

Q2) a) Explain advantages and disadvantages of human vision system. **[13]**

b) What are the skills used in creating design for substrates like textile, ceramics and plastic? **[12]**

Q3) a) Explain CIE system in graphic art industry. **[13]**

b) What is colour space calculations and conversions. **[12]**

SECTION - II

Q4) Design a book format for kinder garden students and mention legal requirements of the book. **[25]**

Q5) a) What are problems involved in designing inside pages. **[13]**

b) Design a sport page of News Paper. **[12]**

Q6) a) What are the standard formats for new paper design. **[13]**

b) Explain appropriate digital software for typographic make up. **[12]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1567

[3965] - 928

M.E. (Printing Engg. & Graphic Communication)

WEB HANDLING ON PRESS

(2008 Course) (508109) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is video viewing? Explain its basic principle of operation, purpose and applications. **[15]**

b) Discuss the operation of splicing mechanism on Gravure printing press. **[10]**

Q2) a) Explain principles of dyne level requirement. **[10]**

b) Discuss basic principles and applications of flame treatment. **[8]**

c) Explain the operating mechanism and application of antistatic eliminator. **[7]**

Q3) a) Why tension control is required in web handling? **[10]**

b) Discuss various tension control devices. **[15]**

SECTION - II

Q4) a) Explain basic principle of operation of circumferutial registration control on press. **[10]**

b) How lateral registration is controlled? **[8]**

c) Discuss various types of cylinder marks required on the cylinder for registration control. **[7]**

P.T.O.

Q5) a) Explain the operation of web guiding system and its correction mechanism. **[15]**

b) How web break can affect the balancing of rollers? **[10]**

Q6) a) Discuss the operation of wrap angle? How wrap angle helps for web control? **[10]**

b) Discuss the procedure followed to decide the diameter of transport roller. **[8]**

c) Explain lead in and lead out rollers. **[7]**

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1568

[3965]-929
M.E. (Printing Engg. & Graphic Communication)
SUBSTRATE AND INKS
(2008 Course) (508110) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two Sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is the importance of Recycling of substrates. **[10]**
b) What is Green printing. **[8]**
c) Give standard papers sizes in metric and English units. **[7]**

Q2) Explain in details ASTM and TAPPI standards required for printing packing and computer stationary. **[25]**

Q3) a) Explain, different resins selected for different substrates. **[10]**
b) What are the drying mechanisms used in printing. **[8]**
c) Give ink formulation for off set ink. **[7]**

SECTION - II

Q4) a) What are the requirements of security inks? **[10]**
b) Write notes on : **[15]**

i) Thermographic inks.
ii) Decorative product inks.
iii) Metallic inks.

Q5) a) How cost estimation is done for printing industry. **[13]**
b) Calculate working size of paper for 4 pages A5 size brochure trimmed with 4 colour printing on off set machine. **[12]**

Q6) Explain BIS and ISO quality controll standards for substrate and inks used in printing industry. **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1569

[3965] - 930
M.E. (Printing)
MULTIMEDIA SYSTEMS & COMMUNICATION
(2008 Course) (Elective - III) (508111)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures on right indicate full marks.***

SECTION - I

Q1) Explain concept of multimedia communication in printing industry. **[25]**

Q2) a) How images are created in multimedia communication? **[15]**

b) How object is created in Animation Process. **[10]**

Q3) a) What are formats of multimedia? **[13]**

b) What is Compression Technique? **[12]**

SECTION - II

Q4) How internet Radio works? Explain in steps. **[25]**

Q5) a) Explain in details programme language HTML for web page. **[15]**

b) Explain mobile communication system. **[10]**

Q6) a) What is meta data & Asset management? **[15]**

b) Explain working of digital camera. **[10]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1570

[3965]-931

M.E. (Printing Engineering and Graphic Communication)
TOTAL PRODUCTIVE MAINTENANCE IN PRINTING
(2008 Course) (508111 (b)) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate answer book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer the following :

a) Define TPM? Explain steps to be followed in implimenting TPM with reference to printing industry. **[10]**

b) Following data refers to the 3 different plate setter : **[15]**

i) Heidel berg platesetter.
ii) Kodak trend setter 400.
iii) Screen plate setter.

The output is expected to be 9000 plates per month company works for 48 hrs per week. Find out the plate setter which will satisfy the following required capacity.

Sr. No.	Particulars	Machine		
		A	B	C
1	Machine set up time in minute	9	4	6
2	Machine operation time in min (per piece)	1.2	2.0	1.5
3	Lot size	450	300	360

P.T.O.

Q2) Answer the following :

a) What is 5s? Explain how it can be achieved. **[10]**

b) The following data were obtained by work study man from a study conducted by him. **[15]**

Sr.No.	Maintenance particulars	Time
a	Get out and put away tools	120 min/day
b	Cleaning of machine	5.0 min/day
c	Oiling of machine	5.0 min/day
d	Replenish coolant supply	3.0 min/day

Sr.No.	Interruption	Time
a	Interruption by foreman	5.0 min/day
b	Interruption by porteretc	4.0 min/day
c	Delay time due to power failure	6.0 min/day
d	Personal time	20.0 min/day

Calculate the total allowance, total available cycle time, productive hour, considering a working day of 8 hours.

Q3) Answer the following :

a) Explain how data collection analysis is useful in focus improvements, in printing industry. **[10]**

b) The Vikram printer industry Pvt Ltd. is manufactures the printing journal the total quantity is 19, 271 and it is observed that 423 are found to be defective work in the shifts. Calculate the OEE of that company for that shift. The details regarding company is as follows : **[15]**

Item	Data
Shift length	8 hours = 480 min
Short Breaks	2 @ 15 min = 30 min
Meal Break	1 @ 30 min = 30 min
Down Time	47 minutes
Ideal Run Rate	60 pieces per minute
Total Pieces	19, 271 pieces
Rejectpieces	423 pieces

SECTION - II

Q4) Answer the following : **[25]**

ABC printers have an order for four colour poster measuring 18 × 24" finish size with a form size of 16 × 22" (1 inch white margine on all side) based on an evalution of the colour photo to be printed coverages are anticipated to be as follows : magenta 45%, cyan 65%, yellow 40% and black 15% add 3% per form for paper spoilage and 4% for ink waste and loss during production. Stock will be litho coated offset book, substance 70. The customer wants 7500 copies delievered. Inks cost are magenta and cyan $ 4.50 per pound yellow $ 4.15 per pound and black $ 3.80 per pound. Determine ink poundage and cost for the job.

Q5) Answer the following : **[25]**

Plot the control chart for $\overline{X}$ and R using the following sample data and sample size of five from the chart find out whether the process is in control also calculate the process capability.

Sample No.	1	2	3	4	5	6	7	8	9	10
$\overline{X}$	5.004	5.204	5.014	5.008	5.009	5.016	5.030	5.010	5.016	5.010
R	0.02	0.08	0.03	0.05	0.04	0.09	0.04	0.04	0.05	0.07

Given for n = 5, $d_2 = 2.326$, $D_4 = 2.11$, $D_3 = 0$

Q6) Answer the following :

a) Explain the role of training and education in TPM. **[10]**

b) Explain all supporting pillers used in TPM. **[15]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1571

[3965] - 932
M.E. (Printing)
PRESS FINGER PRINTING
(2008 Course) (508111C) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures on right indicates marks.***

SECTION - I

Q1) Explain in details requirements of pre-press conditions in finger printing. **[25]**

Q2) a) Explain press optimization procedures. **[13]**

b) Write notes on : **[12]**

i) Hue error.

ii) Grey balance.

iii) Color variation.

Q3) a) Evaluate fingerprinting with ECL 2002 chart. **[13]**

b) Explain importance of : **[12]**

i) Registration mark.

ii) Step wedge.

iii) Tracker line.

SECTION - II

Q4) Explain in details plan and run standardization test for capabilities and optimization and maintaining consistancy. **[25]**

P.T.O.

Q5) a) What is management of color reproduction system? **[13]**

b) Explain profile editing. **[12]**

Q6) a) Explain statistical technique by control chart. **[13]**

b) Explain process stability and process capability. **[12]**

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Total No. of Questions : 6] **[Total No. of Pages :2**

P1572

[3965] - 934

M.E. (Printing Engineering and Graphic Communication)

ADVANCES IN CONVERTING AND PACKAGING

(2008 Course) (508112 (b)) (Elective - IV)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections Should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain modern developments in converting style. **[10]**

b) What in Hologram? State its importance in packaging. **[8]**

c) Explain the layout of punching plate in cantons. **[7]**

Q2) a) Discuss basic differences between overprint varnishing and coating. **[10]**

b) Explain advance finishing techniques used in stationary and publication binding. **[15]**

Q3) a) What is extrusion lamination? Explain advantages of extrusion lamination over adhesive lamination. **[13]**

b) Discuss basic principle of operation of dry lamination? Compare dry lamination and wet lamination. **[12]**

P.T.O.

SECTION - II

Q4) a) What is co-extrusion? Explain production of five layer film by using three extruders. **[15]**

b) Discuss basic differences in principle of operation and applications of stretch wrap and shrink wrap. **[10]**

Q5) a) With reference to product design of pouch of size 100 mm × 150 mm show the layout for **[15]**

i) Three side sealed pouch.

ii) Centre sealed pouch.

iii) Stand up pouch.

b) Explain the function of pet bottle for food packaging. **[10]**

Q6) a) Explain various types of barrier properties required for packaging material. **[10]**

b) Write a shortnote on Retort Pouch. **[8]**

c) Discuss various types of sterlisation. **[7]**

Total No. of Questions : 6] **[Total No. of Pages :2**

P1573

[3965] - 935
M.E. (Printing)
ANALYSIS OF SPOT & PROCESS INKS
(2008 Course) (508112) (Elective - IV)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, wherever necessary.***
5) ***Figures on right indicates marks.***

SECTION - I

Q1) a) Explain purpose of spot & process inks for Gray Balance. **[13]**

b) What is heat set Inks? **[12]**

Q2) a) Explain types of vehicles and their properties used in fexography Inks. **[12]**

b) Explain types of Resins and their selection criteria for spot & process Inks. **[13]**

Q3) a) What is Ink Rheology? How it is controlled by using Ink Additives. **[13]**

b) Give composition of Gold Ink used in Gravure Printing and Procedure of making the Ink. **[12]**

P.T.O.

SECTION - II

Q4) Explain different types of offset Inks and differents between Inks for publishing, packing and product printing. **[25]**

Q5) a) Write Notes : **[12]**

i) Ink Adhesion Test.

ii) C.O.F of Ink.

iii) Rub Resistance

b) What are the tests carried out on Inks? **[13]**

Q6) a) Explain Analysis of colorometric values. **[13]**

b) Write Notes on. **[12]**

i) Print sharpness.

ii) Contrast.

iii) Trap.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1574

[3965]-909
M.E. (Polymer Engineering)
POLYMER PHYSICS AND CHARACTERIZATION
(2008 Course) (509122) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Predict the C-13 NMR spectrum for polycarbonate derived from bisphenol-A and phosgene. **[9]**

b) Define polymer degradation. Explain the polymer degradation process and its evaluation by any one method. **[9]**

Q2) a) Discuss in detail the gel permeation chromatographic technique with reference to its principle, working and characterization method involved. **[8]**

b) Write a note on size and shape of polymer chain in solution. Explain the term solubility parameter with suitable illustration. **[8]**

Q3) a) Write a note on crystallinity in polymers. Explain how you will utilize X-ray studies for the same. **[8]**

b) Discuss in detail principle, working and characterization method by using FTIR technique. Draw hypothetical spectrum for any one polymer. **[8]**

Q4) a) Compare and contrast optical and scanning electron microscopic method of evaluation to determine microstructure of polymers. **[8]**

b) Write a note on structure evaluation by ultraviolet spectroscopy. Explain the shift in the peak position with reference to functional groups. **[8]**

P.T.O.

SECTION - II

Q5) a) A polymer polyacrylamide was subjected to quantitative and qualitative elemental analysis. What are the expected results? Which tests will you conduct to ascertain the same. **[9]**

b) What is solubility parameter? Write in detail thermodynamics of polymer dissolution. **[9]**

Q6) a) Write a note on shear flow and shear less flow with suitable example. **[8]**

b) Define viscosity. Explain the various ways to study viscosity of polymer solutions. **[8]**

Q7) a) Discuss the 'membrane osmometry' method to determine molecular weight of polymers. **[8]**

b) A given polymer has its softening temperature in the range 130-140^{o}C. On further heating it shows melting between 280-290^{o}C. On cooling the same polymer gets partially crystallized between 240-250^{o}C. Based on these findings draw a DSC curve. **[8]**

Q8) a) Write a note on relationship between viscoelastic properties and viscometric functions. **[8]**

b) Explain the terms resistivity and conductivity. Give its relevance in polymer applications. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1575

[3965] - 910
M.E. (Polymer Engineering)
POLYMER STRUCTURE AND PROPERTIES
(2008 Course) (509123) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Enlist and explain the various factors that affect the electrical properties of the polymer. **[9]**

b) Discuss how the chemical composition of a polymer has its effect on barrier properties of the polymer. **[9]**

Q2) a) Explain in general the relation between the molecular structure and the processing techniques. How will you correlate the same considering blow moulding technique. **[8]**

b) The polymer A can be converted into a fiber while the polymer B can be converted into film. Which factors must be playing their role in this kind of a behavior? **[8]**

Q3) a) Some polymers can be used as adhesives while others as lubricants (non-stick). Discuss the difference in properties based on the factors affecting the same. **[8]**

b) A polymer having very high molecular weight shows higher transition temperatures while the same polymer with little low MW exhibits lower transition temperature. Explain the deciding factor (s). **[8]**

P.T.O.

Q4) a) Polymers are never 100% crystalline. Explain the statement. **[8]**

b) Explain how the presence of spherulites affects the polymer properties. Which property is most affected by the same? How? **[8]**

SECTION - II

Q5) a) Discuss the significance of MWD on thermal and mechanical properties of a polymer. How does broad MW affect the processing? **[9]**

b) Some polymers are flexible while some are rigid. Discuss the molecular requirements for the same. Does any kind of influencing forces have their contribution to the same? Explain. **[9]**

Q6) a) What are multiphase systems? Discuss the role of composite materials in enhancing the properties of the polymer. **[8]**

b) Explain the relation between processing parameters and its effect on morphology and properties of the polymer considering suitable example. **[8]**

Q7) a) Explain the different possible transitions in polymer. Discuss how various factors affect the transition in polymers. **[8]**

b) Discuss which kind of polymers are suitable for rotational moulding. **[8]**

Q8) a) Whether presence of fillers and additives affect the transitions in polymers? Explain the case of natural rubber. **[8]**

b) Write a note on thermodynamics and kinetic forces affecting polymer properties. **[8]**

❖ ❖ ❖ ❖

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1576

[3965]-111
M.E. (E & TC) (Instrumentation - Old)
OPTICAL COMMUNICATION
(2002 Course) (504102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the various factors that contribute to dispersion in optical fibers. **[25]**

Explain the concept of dispersion shifted and dispersion flattened fibers. Draw the graphical representation of the same.

Consider a G.653 dispersion-shifted single mode optical fiber that has a zero dispersion wavelength at 1550 nm with a dispersion slope of S_0 = 0.07 ps/(nm^2.km). Plot the dispersion in the wavelength region $1500\,\text{nm} \le \lambda \le 1600\,\text{nm}$.

Comment on the effect of source spectral width on dispersion in the single mode fiber.

Q2) State and explain the various noises in a photodetector. **[25]**

What is Response time of a photodetector? Explain the factors on which the response time depends.

A photodiode circuit has dark current I_d = 2 nA, a load resistance of 1 MΩ, responsivity R = 0.5A/W, incident optical power of 10μW, T = 300 K and bandwidth B = 1 MHz. Find the thermal and the shot noise currents and SNR.

Q3) Explain the concepts of modulation of Laser diodes. **[25]**

A GaAs laser with a cavity length of 500 μm and 32% reflectivity at each end facet has an effective absorption coefficient of 10 cm^{-1}. What should be the gain for lasing to occur?

What are the frequency and wavelength spacings? If, at the half power point, $\lambda - \lambda_0 = 2\,\text{nm}$, what is the spectral width σ of the gain? Assume n = 3.7 for GaAs.

P.T.O.

SECTION - II

Q4) Explain the Rise Time Budget and Link Power Budget carried out in Digital links. **[25]**

State the various power penalties that exist in digital links.

Consider a 2.5 Gb/s link that may be used for SONET OC-48 or SDH STM-16. A 1550 nm laser diode launches 2mW of optical power level into a fiber flylead and a 60 km long optical cable with 0.3dB/km attenuation.
Assume that a 5 m optical jumper cable is needed at each end between the end of the transmission cable and the SONET equipment rack.
Each jumper introduces a loss of 3 dB. Assume 1 dB connector loss occurs at each fiber joint.
For the system to be viable, what is the sensitivity required from the photo detector?

Q5) What is Grating? Explain the concept of Fiber Bragg Grating and its role in WDM systems. **[25]**

Explain the concept of Optical Couplers in detail.

A 2 × 2 biconical tapered fiber coupler has an input power level of $P_0 = 200$ μW and output powers at the other three ports are $P_1 = 90$ μW, $P_2 = 85$ μW and $P_3 = 6.3$ nW. Calculate the various performance parameters for the FBT Coupler.

Q6) Explain (Any 4) : **[25]**

a) Eye Diagrams.

b) MAN optical communication for Power Sector.

c) Photonic Switching.

d) Modulation Techniques for Digital Transmission.

e) DWDM.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1582

[3965]-5

M.E. (Civil) (Construction and Management)

CONSTRUCTION MATERIALS AND MATERIALS MANAGEMENT

(2002 Course) (501103)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss primary and secondary objectives of materials management. With examples explain how the materials manager has to balance the objectives. **[8 + 2]**

b) Derive the formula for EOQ. What are limitations of EOQ? **[4 + 4]**

Q2) a) 1 lakh cement bags are required per year. Cost of bag is Rs.265/-. Inventory carrying cost is at 25%. Cost per order is Rs.3000/-. Supplier offers the following discounts in price. **[12]**

Order Qty	Discount %
$\geq$ 60,000 bags,	10%
$\geq$ 50,000 bags, < 60,000 bags	8%
$\geq$ 40,000 bags, < 50,000 bags	6%
$\geq$ 30,000 bags, < 40,000 bags	4%
$\geq$ 15,000 bags, < 30,000 bags	3%
< 15,000 bags	No discount

Decide suitable order quantity.

b) Explain HML and VED with an example each. **[4]**

P.T.O.

Q3) You are the stores incharge of materials on a construction site. By assuming suitable data, work out any 8 materials indices which will help you in effective materials management. **[16]**

Q4) a) Explain with sketches, the Re-order level system of ordering stock. Show all necessary mathematical calculations required to operate the system.**[8]**

b) What is safety stock? How is the level of safety stock decided? **[4]**

c) Explain elements of lead time with an example from construction work.**[4]**

SECTION - II

Q5) What is SCC? What are its advantages? What is its limitation? Explain in brief any 4 tests conducted on SCC. **[2 + 3 + 1 + 12]**

Q6) What are problems with fly-ash? Discuss properties of flyash which make it a useful construction material? How is flyash characterized? Explain. **[4 + 10 + 2]**

Q7) Explain the production process of manufacturing silica fume concrete, mentioning the necessary chemical reaction. What are its advantages? Explain any 2 applications of SFC in detail. **[6 + 4 + 6]**

Q8) What are the basic requirements of concrete used for shielding nuclear radiations? Which special materials are used for radiation shielding. Describe the experi.mental programme with sketches for testing baryte aggregate as an option to conventional aggregate, in detail. **[4 + 2 + 10]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1583

[3965]-35

M.E. (Civil) (Structures)

REINFORCED CONCRETE AND PRESTRESSED CONCRETE STRUCTURES

(2002 Course) (501502)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data, if necessary.***

SECTION - I

Q1) a) Design a slab for a hall of size 5m × 5m c/c fixed at all supports using yield line theory. Use M20 Fe500 take live load = 4.5kN/m^2 and floor finish load = 0.75kN/m^2. Draw reinforcement details. **[10]**

b) Design a grid slab for a floor of hall 12m × 13.5m c/c having square grid of 1.5m. Use M20 Fe415 take live load = 4.2kN/m^2 and floor finish load = 1kN/m^2. Apply the required check and draw reinforcement details. **[15]**

Q2) Design a bell type RCC shear wall for length 4m, thickness 230mm for the following : **[25]**

Axial forces of 1800kN and 300kN due to dead and live load and due to seismic load respectively bending moment of 500kNm and 4000kNm due to dead and live load and due to seismic load respectively use M20 Fe500, draw reinforcement details.

Q3) Design a Intze type ESR for 9 lakh liters with staging height 15m using M25, Fe500 design must include analysis and design calculations of Top dome, top ring beam, cylindrical wall, Middle level ring beam, conical and bottom dome of the tank draw the reinf details. **[25]**

P.T.O.

SECTION - II

Q4) Design intermediate post tensioned prestressed concrete unsymmetrical 'T' or 'I' section floor beam of a hall for flexure and shear for the following :

Clear span = 16m, width of support = 450mm, spacing of beams 3.2m c/c, RCC slab thickness 130mm, live load on slab 2.5kN/m^2, floor finish load on slab = 1.5kN/m^2, concrete grade M45 HT steel is Multi-strand cables with fy = 1750N/mm^2, stressed up to 75% of 'fy 'do not consider the composite action design must include detail load, bending moment calculation, check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

Q5) a) Explain in detail with proper sketches, the stress pattern at support section in balanced cantilever beam. **[10]**

b) The cross section a composite beam of a T section having a pre-tensioned rib of 200mm wide and 500mm depth with M40 and cast in situ slab (flange) 1200mm wide and 100mm thick with M20. The rib is prestressed with 20 wires of 7mm dia. with ultimate tensile stress of 1500N/mm^2. Calculate the moment of resistance of the composite section assuming that there is sufficient vertical reinforcement at the junction to avoid the shear failure of the beam. **[15]**

Q6) a) Design post tensioned prestressed concrete slab for a roof of parking for the following :

Isolated clear span of 8.5 × 8.5m width of supporting beam on all sides 450mm, live load on slab 1.5kN/m^2, water proofing load on slab = 2kN/m^2 concrete grade M50 HT steel is cables of cross sectional area 100mm^2 with fy = 1750N/mm^2.

Design must include check fiber stresses in concrete and deflection design of end block. Draw sketches showing cable profiles. **[18]**

b) Explain in detail with proper sketches, manufacturing process of prestressing of pre tensioned poles. **[7]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1584

[3965]-38
M.E. (Civil) (Structures)
BRIDGE ENGINEERING
(Elective - I) (2002 Course) (501509)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC codes, IS 1343, IS 456 - 2000 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Compare box section PSC girder with I section PSC girder. **[9]**

b) Write detail note on afflux and its importance in bridge design. **[8]**

c) Write short note on segmental construction bridge super structure. **[8]**

Q2) Design slab, longitudinal and cross girder for the Bridge for the following Effective span = 12m, width of carriageway = 7.5m, No. of beams 3, equally spaced along the carriageway width, Spacing of cross girders = 4 m c/c, 1.2 wide footpath on either side of the outer vertical face of the outer girders loading class = IRC class AA, kerb size = 200 X 500mm, concrete grade M25 Design should include detail load, bending moment calculation, Check fiber stresses in concrete Draw sketches showing details of reinforcement. **[25]**

Q3) a) Design the slab bridge with the data: **[18]**

Clear span of the culvert = 5 m.
Clear carriage way width = 7.5 m.
Size of kerb = 200 mm x 600 mm.
Average thickness of wearing coat 80 mm.
Use material M25, Fe 500
Loading class A
Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

b) Compare PSC girder with RCC girder. **[7]**

P.T.O.

SECTION - II

Q4) Design wall type RCC abutment for the following: **[25]**

Solid slab Bridge of 10 m clear span.
Height of soffit of slab above bed level of stream = 5.6 m.
Safe bearing capacity = 240 kN/m^2 below 1.5 m from bed level.
Class A loading.
Thickness of deck slab = 600 mm.
Width of bridge = 7.5 m.
Concrete grade M25.
Backfill, cohesion less, angle of friction = 30°, dry density = 18 kN/m^3.

Q5) a) Design well foundation for an pier for the following: **[20]**

Base dimensions = 9m x 4m.
Type of strata = sandy soil.
Height of pier = 8m.
Depth of bearing strata below max scour level = 20 m.
Total vertical load including self wt of pier & well = 12000kN.
Total Lateral load at scour level = 400kN.
Material of pier and footing = M30 & Fe 500.

b) List merits and demerits of roller & rocker bearing for bridges. **[5]**

Q6) a) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data. **[20]**

Maximum vertical load = 800 kN.
Dynamic vertical load = 80 kN.
Transverse lateral load = 60 kN.
Longitudinal load = 50 kN.
Longitudinal total translation 10 mm.
Rotation at support 0.002°.
Shear modulus of elastomeric bearing = 1.1 N/mm^2.
Allowable comp. stress for concrete = 8 N/mm^2.
Allowable comp. stress for elastomer = 10 N/mm^2.

b) Write a short note measures to maintain the verticality during well sinking. **[5]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1586

[3965]-143
M.E. (Electronics) (Digital Systems)
ADVANCED DIGITAL SYSTEM DESIGN
(2002 Course) (504306)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) Design a sequential circuit that computes the product of two four bit binary numbers. **[8]**

b) What is clock skew? What are the possible problems caused by clock skew? What is the remedy? **[8]**

Q2) a) Draw the detail CPU architecture of RISC. Compare it with CISC in detail. **[8]**

b) What do you mean by self starting and self correcting sequence generator? Design a self correcting sequence generator in which output Y is '1' if the input sequence of 11001 occurs at consecutive clock pulses, otherwise 'Y' = '0'. **[8]**

Q3) a) Draw the Built in Self Test (BIST) arrangement. Explain BIST for sequential circuit. Draw necessary block diagram. **[8]**

b) Explain significance of the term 'Finite' in FSM. Explain with example how FSM based design simplify the large design problem. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Signature analysis.

b) System integrity.

c) CAD Tools.

d) Built in Logic Block Observer. (BILBO).

P.T.O.

SECTION - II

Q5) a) Find the Hazard free minimum cost of implementation of the function. **[8]**

$F(X1, X2, X3, X4) = \Sigma m(0, 4, 11, 13, 15) + D(2, 3, 5, 8)$

b) What will happen for a finite transmission line, if it is not terminated in Z_O. **[8]**

Q6) Explain following terms in context to large digital system design : **[16]**

Reliability estimation, reliability function, Failure rate, bathtub curve, MTBF. How you will define reliability in a system with 'n' components having different individual failure rate?

Q7) a) What is pipelined processor architecture? Discuss considerations in design of parallel processing hardware units. **[8]**

b) What is the need of network design tool? Explain its structure. **[8]**

Q8) Write short notes (any three) : **[18]**

a) Boundary scan.

b) IEEE 486 Bus.

c) Static Hazards.

d) Scan path technique.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1587

[3965]-294
M.E. (Chemical)
ADVANCED PROCESS DYNAMICS AND CONTROL
(2002 Course) (109108)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What is process identification? Explain process identification using : **[16]**

a) Step response.
b) Impulse response.
c) Frequency response.

Q2) For a liquid tank process shown in figure.1 derive differential equation and transfer function model assuming. **[16]**

a) Linear relation $F_0 = kh$
b) Non-linear relation $F_0 = c\sqrt{h}$. In this case, linearize the model equation around steady-state value hs.
c) Compare the parameters of a linear model (in (a)) and linearized model (in (b)).

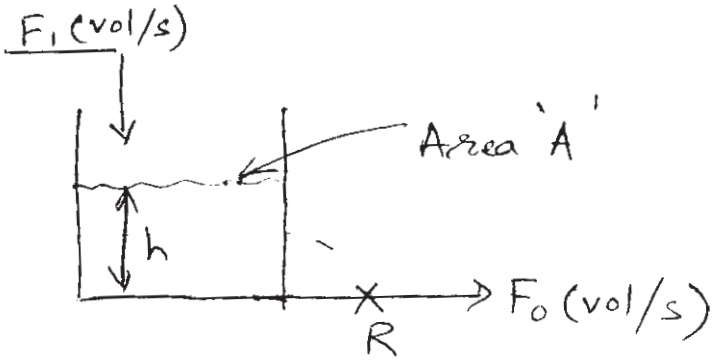


Figure 1

P.T.O.

Q3) a) Derive the mathematical model for isothermal CSTR used for carrying out second-order reaction whose rate equation is given by -

$-r_A = K, C_A^2$

where $K = 0.5$ (moles $- m^{-3} - min^{-1})^{-1}$.

b) Linearize this model around initial concentration of A, $C_{A0} = 0.925$ moles/m^3.

c) Derive the expression for change in concentration of A inside the reactor if initial concentration is changed by 0.925 mol/m^3. The molar flow rate is $F = 0.085$ m^3/min and volume of reactor is 2.1m^3.

[16]

Q4) a) Find the poles of a 2 × 2 system modeled as : **[9]**

$\dot{x}_1 = x_2$

$\dot{x}_2 = -5x_1 - 2x_2$

find the transient behavior of state variables x_1 and x_2.
(Hint : use eigen value approach)

b) Derive the expression for eigen value analysis of a 2 × 2 system modeled as :

$X = AX + B$

$Y = CX$

Explain node, saddle and focus point behavior. **[9]**

SECTION - II

Q5) a) Draw block diagram of a 2 × 2 process having 2 inputs m_1, m_2 and 2 outputs y_1, y_2. Derive transfer function model for this process. If single-loop controllers having transfer functions Gc_1 and Gc_2 are installed between the input-output pairs $m_1 - y_1$ and $m_2 - y_2$ respectively, derive the expression for response of y_1 and y_2 when

i) Control loop between $m_1 - y_1$ is closed and that between $m_2 - y_2$ is opened.

ii) Both control loops are closed. **[8]**

b) In Q.3 (a), define the RGA and state its properties. **[8]**

Q6) For a process having input-output relationship

$$\bar{y}_1 = \frac{0.5 \exp(-1.5s)}{s+1} \bar{m}_1 + \frac{\exp(-0.5s)}{2s+1} \bar{m}_2$$

$$\bar{y}_2 = \frac{2 \exp(-1s)}{0.5s+1} \bar{m}_1 + \frac{1}{s+1} \bar{m}_2$$

Form the two control loops by coupling $\bar{m}_1 - \bar{y}_1$ and $\bar{m}_2 - \bar{y}_2$. Design decouplers D_1 and D_2 for both the control loops and draw block diagram. State whether these decouplers are physically realizable. **[16]**

Q7) a) With neat block diagram explain working of digital control system. **[8]**

b) Explain construction of FOH and ZOH elements. **[8]**

Q8) Write short notes on : **[18]**

a) Pulse transfer function.

b) Dynamic matrix control.

c) Model algorithmic control.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1588

[3965] - 295
M.E. (Chemical)
NOVEL SEPARATION TECHNIQUES
(2002 Course) (109104)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Classify membrane filtration processes based on rated pore size and molecular weight cut-off. **[6]**

b) Define the following terms : **[6]**

i) Solute rejection. ii) Water flux.

iii) Solvent recovery. iv) Reflection coefficient.

c) Explain concentration polarization in UF membranes using resistances-in-series model. **[6]**

Q2) Explain reverse osmosis (Ro) process of separation with the following points.

a) Membranes used (materials and modules). **[16]**

b) Feed pretreatment methods.

Q3) Explain ultrafiltration (UF) process of separation with the following points:**[16]**

a) The basic models (Ferry, surface force pore flow, Hindered transport).

b) Concentration polarization using osmotic pressure model.

c) Inorganic and organic membrane materials.

P.T.O.

Q4) Explain microfiltration (MF) process with the following points : **[16]**

a) Dead end filtration (Darcy's law).

b) Crossflow filtration.

c) Operational configurations (total recycle, dialysis, batch concentration, feed and bleed).

SECTION - II

Q5) Explain pervaporation process of separation with the following points :**[16]**

a) Thermopervaporation.

b) Temperature gradient driven process.

c) Carrier gas pervaporation.

d) Pervaporation with condensable, permeate miscible carrier.

Q6) a) Explain Emulsion Liquid Membranes (ELM) used for separation of phenol from waste water. **[8]**

b) Explain type 1 & type 2 facilitation mechanisms for ELM process.**[8]**

Q7) Explain the following steps involved in an ELM process : **[16]**

a) Emulsification (membrane formulation, emulsion preparation).

b) Dispersion / extraction settling.

c) Demulsification.

Q8) Write short notes on the following : **[18]**

a) Structural and compartmentation methods of organization of membrane reactors.

b) Temperature Swing Adsorption (TSA).

c) Supercritical Fluid extraction (SCFE).

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1589

[3965] - 404

M.E. (Civil) (Construction and Management)

NEW CONSTRUCTION MATERIALS

(2008 Course) (Elective - I) (501104)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What is high performance concrete? Where is it used? What are its advantages? Which special materials are used to prepare HPC? **[18]**

Q2) What is SFC? How is it produced? What are its applications? What special properties does it possess? **[16]**

Q3) What is flyash? How is it generated? What are its problems? In which projects flyash can be effectively used as a construction material? What precautions need to be taken before using flyash in construction? **[16]**

Q4) Explain in detail : **[16]**

a) Use of nano-technology in construction materials.

b) Retarders, accelarators, Vma's.

SECTION - II

Q5) Define smart materials. Classify the smart materials by explaining each material. Discuss one application involving each smart material. **[18]**

P.T.O.

Q6) a) What is SCC? How is the mix design constituted? What are its advantages. **[8]**

b) Explain with sketches any 2 tests conducted on SCC. **[8]**

Q7) a) What are the properties required of concrete to be used as a radiation shield? Which materials are specially added for the above purpose? Why? **[8]**

b) Explain tremie pipe under water concreting with a neat sketch. **[8]**

Q8) Explain in brief : **[16]**

a) GFRC applications in Civil Engg.

b) FRP applications in Civil Engg.

c) Aluminium as a construction material.

d) Aerated Concrete.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1590

[3965] - 407

M.E. (Civil) (Construction and Management)

CONSTRUCTION SAFETY

(2008 Course) (Elective - I) (501104)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question 1 and 5 are compulsory. Out of remaining solve any two questions from each section.***
2) ***Numbers to the right indicates full marks.***
3) ***Neat figures are drawn wherever required.***
4) ***Answers to each section must be written in separate answer books.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Frame safety policy for under water construction using pneumatic caisson. **[10]**

b) Write a note on importance of safety management in construction industry. **[8]**

Q2) An ISO certified construction company has bought a Tunnel Boring Machine for tunneling work. A safety programme is to be executed and the related labours are to be trained for it. Draw the flowchart which will show the procedure of training. Also, give the checklist for safety alongwith the detailed safety programme. **[16]**

Q3) a) Safety engineer will look after the safety of workers on site. Write his duties and responsibilities. In case of accidents, give the formats of reports that he will prepare from insurance point of view. **[8]**

b) Write a detailed note on Personal Protective equipments. **[8]**

Q4) What are the cots of accidents? Explain in detail. **[16]**

P.T.O.

SECTION - II

Q5) Discuss various steps to be followed on site to avoid accidents at following stages. **[18]**

a) Structural steel welding.

b) RCC work using shotcreting.

c) Erecting formwork.

d) Road work on busy streets.

e) Launching of girders of bridge.

f) Drilling near buildings.

Q6) Write short notes on : **[16]**

a) Operational Health Hazard.

b) RAMP Handbook.

Q7) a) List down the common hazards while using tower crane. **[8]**

b) Discuss the importance of first aid for various major / minor accidents. **[8]**

Q8) a) Write a safety manual a major site you have visited. Include at least 4 major activities for which more attention is needed. **[8]**

b) What are various clauses included in workman's compensation act? Explain in brief. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1591

[3965] - 409
M.E. (Civil Construction and Management)
TQM IN CONSTRUCTION
(2008 Course) (Elective - II) (501105)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss the various barriers which exist in the implementation of TQM programs in the construction industry. As a manager, how would you overcome these barriers? Explain. **[18]**

Q2) Explain the following with examples : **[4+4+4+4]**

a) PDCA cycle.

b) QIT.

c) Quality Control & Quality Assurance.

d) Six sigma technique.

Q3) What are the various defects in construction? How each defect can be quantified? Explain with examples. **[16]**

Q4) Explain how to determine the cost of poor quality through different approaches. Which approach is better? Why? How the costs are classified? **[16]**

P.T.O.

SECTION - II

Q5) Explain the 8 principles of ISO 9001 with examples from the construction sector. What is the basic difference between ISO 9001 and ISO 9004? Explain. **[18]**

Q6) What are the types of audits conducted in ISO certification? How are these audits conducted? How non-conformities are to be taken care off, before the next audit? **[16]**

Q7) Draft a checklist for checking the quality of : **[16]**

a) Cement bags.

b) Fine aggregate.

c) Coarse aggregate.

d) Water used for mixing.

Q8) Explain in brief : **[4+4+4+4]**

a) Quality circles.

b) Components of TQM programs.

c) Graphical representation of 6 sigma based on probability.

d) Quality Manual.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1592

[3965] - 412

M.E. (Civil) (Construction & Management)

CONSTRUCTION CONTRACTS ADMINISTRATION & MANAGEMENT

(2008 Course) (501108) (Theory) (Sem. - II)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) With reference to the MOS & PI contract conditions explain the following :

a) Various advances and their recovery. **[18]**

b) Extras, substituted items, variations.

c) Dispute resolution mechanism.

d) Bonus, penalty.

e) Escalation.

Q2) a) Explain the pre-qualifications which you would insist for enecution of a nuclear power plant of Rs. 400 crores to be completed in 36 months. **[4]**

b) Prepare on a 5 point scale, a weighted. System for evaluating the pre-qualification bid for the following capacities **[12]**

i) Past experience.

ii) Present organisational capacity. The work consists of construction of a thermal power plant to generate 500 MW electricity, to be completed in 2 years.

P.T.O.

Q3) a) Following facts exist in the relationship between the tenderer and the client. **[10]**

i) Without signing the contract document, based on the letter of acceptance, the tenderer (A) was asked to mobilize the resources which he subsequently performed within stipulated time.

ii) Subsequently the tenderer (A) completed the excavation items of the project and raised his first bill.

iii) Due to some legal complications the contract document was not signed with tenderer (A), but it was signed with tenderer (B).

iv) Tenderer (A) alleged that

1) Contract with tenderer (B) is illegal.

2) He should get all the money spent on mobilisation and the construction of excavation items.

3) Adequate compensation for not continuing the contract with him, for the further work, must be paid.

v) The client refused all the above allegations and asked tenderer (A) to vacate the site within a stipulated period. Based on the Indian contract Act (1872) Comment on

1) Whether all the 3 allegations of tenderer (A) are justified.

2) Whether clients decision of not paying tenderer (A) is justified.

3) Whether clients decision of asking tenderer (A) to vacate the site is justified.

b) Explain with examples the valid excuses for non-performance permitted in the Indian Contract Act. **[6]**

Q4) a) Explain importance of (EBP) and (2AN-B) with an example each. **[6]**

b) Discuss advantages of DRB **[4]**

c) With different examples, explain the statement : "Arbitration is a semi-judicial process". What are duties of Arbitrator? **[6]**

SECTION - II

Q5) Explain the provisions made in FIDIC (Red Book) with respect to :

a) Value engineering and its procedural requirement to be followed by the contractor. **[4]**

b) Circumstances under which the contractor shall be entitled to terminate the contract. **[4]**

c) For which items details are given in the Appendix to Tender (excluding references to names and addresses of Employer, Engineer and Contractor). **[5]**

d) Detailed descriptions of which aspects / items the contractor shall include in monthly progress report of a project. **[5]**

Q6) a) Define in detail what is a "FORCE MAJEURE" event/circumstance. Enumerate the different events / circumstances, which are manmade or natural situations. What are their short term and long term implications. **[8]**

b) Write in detail regarding obligations, responsibilities and duties of the Employer for contracts under Red Book. **[8]**

Q7) a) Differentiate the main contractual provisions between Building and Engineering works designed by the Employer (Red Book) and the EPC Turnkey Contracts (Yellow Book). **[8]**

b) Cost of which items is covered under mobilization or site Preliminaries of a project? If the Contractor gets Extension of Time to the Contract Completion Date, how is he compensated for the cost of mobilization. **[8]**

Q8) a) Explain 2 bid system of tender submission in brief. **[4]**

b) What are conditions of particular application (COPA)? Draft any 2 conditions making suitable assumptions. **[4]**

c) Explain advantages of lump-sum contracts over item rate contracts. **[4]**

d) Explain differences in the Arbitration Act of 1940 and the revised act of 1996. **[4]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1593

[3965] - 417

M.E. (Civil) (Construction and Management)

TRUST AREAS IN PROJECT MANAGEMENT

(2008 Course) (Elective - IV) (501112)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is pre-project planning? What are advantages of pre-project planning? What is PDRI and how does it help in effective pre-project planning? Explain. **[2+4+4]**

b) Discuss the merits of project partnering with a case study. **[8]**

Q2) a) Explain SWOT analysis and SWOT matrix with an example. Perform SWOT analysis for the Indian Construction sector. **[2+2+6]**

b) Discuss the entreprenual qualities required in : **[6]**

i) business and

ii) in an organisation.

Q3) a) Perform SCM for the process of tendering, with an example. **[8]**

b) Discuss 3 leadership styles and types of motivation with examples. **[8]**

Q4) a) Explain how the 7 covey habbits of principle centered leadership are very useful to a project manager of the construction project. **[8]**

b) Draft a charter for project partnering between the client and the contractor for the execution of a multi-storeyed building project being constructed on expansive soils. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain competency mapping as an effective tool in the development of the human resources at managerial levels in the construction industry, with an example. **[8]**

b) Explain fast track construction with a diagram. Discuss merits and demerits of the same. **[2+8]**

Q6) Explain the various sub-scales used in the bar on-emotional quotient. Why is there, a necessity of defining the spiritual quotient (SQ) for the project managers in construction industry? Explain the sub-scales of the (SQ) which will help the project managers in better execution and control. **[16]**

Q7) Explain how you would conduct the training needs assessment for the managerial level staff working on nuclear power projects. Explain, how the data generated from the needs analysis will enable you to develop a detailed training program for the above staff. You may make suitable, relevant, realistic assumptions. **[16]**

Q8) a) What are GMP contracts? How is the GMP arrived at and then negotiated with the contractor? What risks exist? Explain. **[8]**

b) Explain how multiple linear regression analysis can be useful in assessing the various skills necessary for the project leaders. Do these skills vary, based on the role played by the project leader? How? **[8]**

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1600

[3965]-584
M.E. (Electrical) (Control Systems)
ADVANCED DIGITAL CONTROL TECHNIQUE
(2008 Course) (503110) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Obtain the pulse transfer function of the system shown in figure No.1 **[8]**

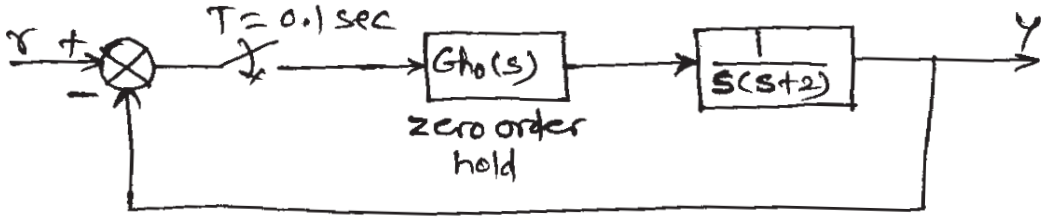


Figure No. 1

b) Explain the concept of warping and prewarping. **[8]**

Q2) Draw the block diagrams to realize following $G(z)$ in direct form, cascade form and parallel form and obtain corresponding state models. **[18]**

$$G(z) = \frac{z + 0.5}{(z + 0.2)(z + 0.8)(z + 1)}$$

Q3) a) List the steps required to design a digital phase lead compensator using root locus. **[8]**

b) Explain the following digital controller algorithms of digital PID controller.

i) Position algorithm.
ii) Velocity algorithm. **[8]**

P.T.O.

Q4) Obtain the state feedback gain matrix K for the system with state model.

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$$

such that the closed loop poles are placed at $z = -0.5 \pm j\,0.5$ by

a) Transformation matrix method.
b) Ackermann formula. **[16]**

Q5) a) List the steps in the design of digital state observer. **[8]**
b) Explain the concept of adaptive control with suitable block schematic. **[8]**

SECTION - II

Q6) Design the FIR filter with desired frequency response **[16]**

$H_d(e^{jw}) = e^{-3jw}$ for $|w| \leq \pi/4$

$= 0$ for $|w| > \pi/4$

using Hamming window (N = 7).

Q7) a) Explain the interpolation process with the help of a neat block diagram and spectral analysis. **[10]**
b) Explain the sampling rate conversion by factor I/D in detail. **[8]**

Q8) Write short notes on any two : **[16]**

a) Finite word length effect in digital filters.
b) Harward architectures in DSP processors.
c) Instruction pipelining in TMS 320C54XX DSP processors.

Q9) Draw and explain architecture of TMS 320C5X DSP processors. **[16]**

Q10) Explain the function of ALU and multiplier-accumulator (MAC) of TMS 320C54XX DSP processor with help of neat diagrams. **[16]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1604

[3965]-714
M.E. (Production)
SURFACE TREATMENT PROCESSES
(2008 Course) (Elective - III) (511111)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***

SECTION - I

Q1) a) Explain the scope of surface engineering in advanced metal and alloys. **[8]**
b) Explain how the common surfaces will help for initiating engineering failures? **[8]**

Q2) a) Explain need for surface cleaning and explain ultrasonic process in detail with its application. **[8]**
b) Explain the different criteria for various surface cleaning processes. **[8]**

Q3) a) Explain the different conventional methods for surface modification. **[8]**
b) Compare hot dipping, galvanizing, anodizing coating process with respective to principle of operation, process parameter, application, advantages, limitations. **[8]**

Q4) Write short notes on any three : **[18]**

a) Online automatic part inspection.
b) Surface degradation of surface.
c) Electroless deposition.
d) Pickling and descaling.

SECTION - II

Q5) a) Explain principle of physical vapor coating and give its application and limitation. **[8]**
b) Discuss the various factors affecting on proper selection of coating processes. **[8]**

P.T.O.

Q6) a) Explain how is the surface geometry of a coated surface is achieved? **[8]**

b) What are the methods for accurate routine measurement of coated surface? **[8]**

Q7) a) Explain salient features of surface machined at macro, micro, nanolevel. **[8]**

b) Explain evaluation of tribological characteristics of surface in nano scale. **[8]**

Q8) Write short notes on any three : **[18]**

a) Use of laser in surface engineering.

b) Thermal spray coating.

c) Recent development for surface properties evolution.

d) Tribological characteristic of engineered surface.



Total No. of Questions : 10] **[Total No. of Pages : 2**

P1605

[3965]-722
M.E. (Production Engineering) (CAD/CAM)
ADVANCED STRESS ANALYSIS
(2010 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Square bracketed figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain plane stress and plane strain conditions and their significance in stress analysis. **[8]**

b) Write and Explain the expression of generalized Hook's law. **[8]**

OR

Q2) a) Given the stress components. **[8]**

$\sigma_x = 500 N/m^2$ $\tau_{xy} = -1500 N/m^2$

$\sigma_y = 500 N/m^2$ $\tau_{xz} = 500\sqrt{2}\ N/m^2$

$\sigma_z = 2000 N/m^2$ $\tau_{yz} = -500\sqrt{2}\ N/m^2$

Find the principal stresses and principal axes.

b) Derive the expression for Octahedral shear stress. **[8]**

Q3) Prove that Airy stress function can be formulated in terms of two functions of a complex variable. **[16]**

OR

Q4) Describe any two methods of experimental stress analysis in detail. **[16]**

P.T.O.

Q5) Write short notes on : **[18]**

a) Fatigue data representation.

b) Factors influencing fatigue strength.

c) Corrosion fatigue.

SECTION - II

Q6) a) Explain Mechanism of fatigue crack initiation and Propagation. **[8]**

b) What is stress life and strain life approach for fatigue life estimation? **[8]**

OR

Q7) a) Explain importance of prevention of fatigue failures. **[8]**

b) Consider an unnotched specimen with an endurance limit of 300MPa. If the specimen was notched such that $Kf = 1.3$, What would be the factor of safety against failure for $N > 10^6$ cycles at a reversing stress of 125 MPa?

i) Solve by reducing $S'e$.

ii) Solve by increasing the applied stress. **[8]**

Q8) A semicircular surface crack in a pressure vessel is 3 mm deep. The crack is on the inner wall of the pressure vessel and is oriented such that the hoop stress is perpendicular to the crack plane. Calculate K_I if the local hoop stress = 127 MPa and the internal pressure = 11 MPa . Assume that the wall thickness >> 3mm. **[16]**

OR

Q9) Explain in detail following two fracture toughness parameters and tests to determine their values. **[16]**

a) J-Integral.

b) CTOD.

Q10) Write short notes on : **[18]**

a) Fatigue and fracture safe design.

b) Stages in crack growth.

c) Paris equation.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1606

[3965]-744

M.E. (Computer Engineering)

INFORMATION AND NETWORK SECURITY

(2008 Course) (510105A) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain four basic tasks in designing a particular security service. **[4]**

b) What is security policy? Explain steps necessary for developing security policy. **[7]**

c) Enlist and discuss the principles of data security architecture. **[7]**

Q2) a) What requirements must a public-key cryptosystem fulfill to be a secure algorithm? **[6]**

b) Explain RSA algorithm with suitable example. **[8]**

c) What is a trap-door one-way function? **[2]**

Q3) a) What is the difference between a message authentication code and a one - way hash function? **[8]**

b) Explain different components of DMZ networks with suitable diagram. **[8]**

Q4) Write Short Notes on (Any Three): **[16]**

a) Applications of Public key Cryptosystems.

b) ARP explosions.

c) Fragmentation vulnerabilities.

d) Issues in multi-level secure systems.

P.T.O.

SECTION - II

Q5) a) What is SRTP? Explain how it provides means to secure integrity of data and safety from replay. **[8]**

b) What is Blind key cryptosystem? Explain with suitable example. **[8]**

Q6) a) List three design goals for a firewall, and explain different firewall configurations. **[8]**

b) Explain rules that a reference monitor enforces and properties of a reference monitor. **[8]**

Q7) a) List and explain different vulnerabilities in wireless networks with possible solutions. **[8]**

b) Explain how Diffie-Hellman based Key Agreement protocol is beneficial for providing security in group communication issues, and how can this protocol be used for secured cash transfer in a bank? **[8]**

Q8) Write Short Notes on (Any Three): **[18]**

a) Secure binding of multimedia streams.

b) Session key management.

c) Secure routing.

d) PKI components and applications.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1607

[3965]-748
M.E. (Computer Engineering)
DISTRIBUTED SYSTEMS
(2008 Course) (510108) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In a large network connected to multiple resources, when a resource fails, discuss how the failure can be identified and tolerated. **[6]**

b) The Network Time Protocol service can be used to synchronize computer clocks. Explain why, even with this service, no guaranteed bound is given for the difference between two cocks. **[6]**

c) What factors affect the responsiveness of an application that accesses shared data managed by a server? Describe remedies that are available and discuss their usefulness. **[6]**

Q2) a) List out the various communication failures in handling remote objects. Why do these failures happen and give your suggestions to overcome such failures? **[8]**

b) Discuss in detail, the different events to be handled when a remote object reference interface is not available during execution or compilation time. List out the events generated. **[8]**

Q3) a) List out the pitfalls of Cristian algorithm and explain how Berkley's algorithm tries to resolve the issue. **[8]**

b) Is two-phase locking restricted only to centralized methods of transactions? How does two-phase locking help in recovery of crashed objects in distributed transaction. **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[16]**

a) Reliable multicast.

b) Communication between distributed objects.

c) Design requirements for distributed architectures.

d) Transaction recovery.

SECTION - II

Q5) a) Which features of the AFS design make it more scalable than NFS? What are the limits on its scalability, assuming that servers can be added as required? **[8]**

b) Why might a DNS client choose recursive navigation rather than iterative navigation? **[6]**

c) Why an additional application-level routing mechanism is required in peer-to-peer systems? **[4]**

Q6) a) What is causal consistency? Give an example of an application for which causal consistency is the most suitable consistency models. **[8]**

b) What are the main causes of thrashing in a DSM system? What are the commonly used methods to solve the thrashing problem in a DSM system? **[8]**

Q7) a) What is a key distribution problem? How does it differ for symmetric and asymmetric cryptosystems? **[8]**

b) Explain why UDDI can be described as being both a name service and a directory service, mentioning the types of enquiries that can be made. **[8]**

Q8) Write short notes on (any three) : **[16]**

a) Global Name Service.

b) XML Security.

c) Directory service for the Grid.

d) Release consistency.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1608

[3965]-774
M.E. (Chemical)
APPLIED STATISTICS FOR CHEMICAL ENGINEERS
(2008 Course) (Sem. - I) (509101)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The percentage yield of desired product for 11 runs on a pilot plant reactor are : 32, 55, 58, 59, 60, 63, 63, 63, 63, 67.

a) Find mean, mode, median values of yield. **[6]**

b) Find SD, variance, QD and COV. **[4]**

c) Find Karl Pearson and Bowley's coefficient of skewness and comment on symmetry of distribution. **[4]**

d) Calculate excess Kurtosis and comment on nature of Kurtosis. **[4]**

Q2) a) For the reactor data given in Q.1, determine an interval estimate of yield, presuming that the population variance is $\sigma_x^2 = 81$ and for $\alpha = 0.05$, $Z_{\frac{\alpha}{2}} = -1.96$ and $Z_{1-\frac{\alpha}{2}} = +1.96$. **[8]**

b) For the reactor data test whether sample mean is $\mu = 57$. **[8]**

Q3) a) What are the point estimates of population parameter? Define the properties of the best estimate - consistency, bias, efficiency. **[8]**

b) A reaction A $\rightarrow$ B is carried out at atmospheric pressure, and the temperature varies from 20 to 30°C. The pilot plant studies provided the following data for temperature (X) and conversion of A (Y) as :

X :	20	21	22	23	24	25	26	27	28	29	30
Y :	3	5	7	10	11	14	15	17	20	21	22

Find the relation between X and Y in the form : $Y = \beta_0 + \beta_1 X$. **[8]**

P.T.O.

Q4) a) The past experience shows that 20% of a manufactured product is of top quality. In one day's production of 400 articles, only 50 are of top quality. Show that either the production of the day chosen was not a representative sample or the hypothesis of 20% is wrong. Find also the 95% confidence limits for the percentage of top quality product. (Take Los = 5% with $Z_\alpha = 1.96$). **[4]**

b) In a large city A, 20% of a random sample of 900 school boys had a slight physical defect, while in another large city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? (Take Los = 5%, with $Z_\alpha = 1.96$). **[4]**

c) A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160cm. Can it reasonably regarded that, in the population, the mean height is 165cm and the SD is 10cm. (Take $\alpha = 1\%$ with $Z_\alpha = 2.58$). **[4]**

d) Test the significance of the difference between the means of the samples drawn from two normal populations with the same SD using the following data : **[4]**

Sample No.	Size	Mean	SD
1	100	61	4
2	200	63	6

(Take Los = 5% with $Z_\alpha = 1.96$).

SECTION - II

Q5) Describe the following tests of significance for small samples. **[18]**

a) Student's t-distribution.

b) Snedecor's F-distribution.

c) Chi-square distribution.

Q6) a) The mean life of a sample of 25 bulbs is found to be 1550hrs, with SD of 120hrs. The company claims that the average life of bulbs in 1600hrs. Is the claim acceptable at 5% Los? (Use Left-tailed test with 5% Los having $t_{0.05}\ (\upsilon = 24) = 1.71$). **[4]**

b) Show that the average values of the following sets of observations differ significantly : **[6]**

Set 1 :	1.82	2.02	1.88	1.61	1.81	1.54
Set 2 :	2.00	1.83	1.86	2.03	2.19	1.88

(Use t-test with $t_{0.05}\ (\upsilon = 10) = 2.23$ for two-tailed test).

c) Two samples of sizes 9 and 8 gave the sums of squares of deviations from their respective means equal to 160 and 91 respectively. Can they be regarded as drawn from the same normal population. (Use F-test with $F_{0.05}(\upsilon_1 = 8, \upsilon_2 = 7) = 3.73$). **[6]**

Q7) a) Explain the aim of the design of experiments. Also explain the basic principles of experimental design-randomization, replication, local control. **[8]**

b) A completely randomised design of experiment with 10 plots and 3 treatments gave the following results : **[8]**

Plot no :	1	2	3	4	5	6	7	8	9	10
Treatment :	A	B	C	A	C	C	A	B	A	B
Yield :	5	4	3	7	5	1	3	4	1	7

Analyze the result for treatment effect.

(Take $F_{5\%}(\upsilon_1 = \upsilon_2 = 2) = 19.35$).

Q8) a) Explain R.B.D. of experiments. Construct ANOVA table for two factors of classification. **[6]**

b) Three varieties of a crop A, B, C, D are tested in a R.B.D. with four replications; having the yield values : **[10]**

	Treatments		
Blocks	A	B	C
1	47	49	48
2	51	49	53
3	49	52	52
4	49	50	51

Analyze the data for significance with $F_{5\%}(3, 6) = 4.76$,

$F_{5\%}(2, 6) = 5.14$.



Total No. of Questions : 6] **[Total No. of Pages :2**

P1616

[3965]-34
M.E. (Civil/Structures)
PLATES AND SHELLS
(2002 Course) (501506)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive from the first principles the moment curvature relations in case of thin plate bending. **[10]**

b) A square plate is subjected to uniform bending moments 'M' along all the four edges. What is the resultant deflection at the center? Show that the plate is bent to a spherical surface. **[10]**

c) State the assumptions for small deflection theory of thin plates. **[5]**

Q2) a) A simply supported RCC slab panel of 3m × 4.2 m and thickness 120 mm carries a live load of 3 kN/m^2 in addition to its dead load. Take density of slab material as 25 kN/m^3 and poisson's ratio as 0.15. Find the maximum deflection and principal moments in the slab using Navier's method. **[13]**

b) Obtain the maximum value of deflection and moments for the problem 2.a above using Levy's method. **[12]**

Q3) A circular plate carries axisymmetric triangular loading with zero intensity at the center and 'q' at the edges. The plate is simply supported over its edge. Derive from the first principles the expression for lateral displacement, radial and tangential moments. **[25]**

P.T.O.

SECTION - II

Q4) a) A conical thin shell tank is supported at the top edge. It carries a liquid of density 'q' up to a height 'd' from the vertex. Obtain expressions for the stress resultants N_θ and N_Φ in the shell. Find the locations of maximum values of stress resultants, with their magnitude. **[20]**

b) State the assumptions in the general theory of thin elastic shells, stating the implications of each. **[5]**

Q5) a) Draw the neat sketch of cylindrical shell element subjected to general loading showing all the stress resultants possible. Derive the equation of equilibrium for the cylindrical shell element using membrane analysis. **[20]**

b) State the merits and demerits of a shell structure against a plate structure. **[5]**

Q6) a) Derive the equilibrium equation and hence the 4^{th} order differential equation for deflection using general cylindrical shell theory for the axisymmetric load. **[20]**

b) Describe the principles of Lundgren's beam theory for thin shells. Discuss the advantages and limitations of the theory. **[5]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1619

[3965]-152
M.E. (Electronics) (Digital System)
NETWORK SECURITY SYSTEMS
(2002 Course) (504308)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that inverse of DES encryption is DES decryption. Also explain DES encryption algorithm. **[8]**

b) Describe four general categories of security attacks. **[6]**

c) What are two basic functions used in encryption algorithm. **[4]**

Q2) a) Explain the principle of public key cryptosystems. **[6]**

b) Compare conventional and public key encryption. **[4]**

c) Explain RSA public key encryption algorithm. **[6]**

Q3) a) Explain the different ways in which HASH code can be used to provide the message quthentication with diagram. **[8]**

b) In what ways can the HASH value be secure so as to provide message authentication. **[8]**

Q4) a) Explain X.509 authentication service. **[8]**

b) Explain the architecture model of public key infrastructure (PKIX). **[8]**

SECTION - II

Q5) a) What are the requirement of Kerberos? Explain Kerberos message exchange. **[8]**

b) Explain the five principle services provided by PGP. **[8]**

P.T.O.

Q6) a) Explain the IP sec ESP format. What purpose is served by padding field. **[8]**

b) What are the roles of Oakley key determination protocol and ISAKMP in IPSEC? **[8]**

Q7) a) Describe secure socket layer (SSL) architecture and protocol stack. **[8]**

b) What are the characteristics of firewall? Describe various types of firewall. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Diffie-Hellman algorithm.

b) Password protection.

c) S/MIME.

d) Secure Electronic Transaction (SET).



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1620

[3965]-401
M.E. (Civil) (Const. & Management)
MATHEMATICS
Probabilistic Methods, Statistical Methods, Simulation Applications in Construction
(2008 Course) (501101) (Sem. - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain any three types of probability distributions with proper examples applicable to construction sector. **[18]**

Q2) Explain concept of equipment sizing-matching. Explain application of Griffi's mathematical model with an example. State assumptions made in the formulation of the model. **[16]**

Q3) a) In 100 bricks, 10 bricks are of poor quality. Find the probability of :**[10]**

i) All bricks of good quality.
ii) No brick of good quality.
iii) 15 bricks of good quality.
iv) 15 bricks of poor quality.

b) Explain 3 point cost estimates with an example. **[6]**

Q4) With an example, explain the Monte-Carlo method of simulation in detail. Why simulation becomes necessary? **[16]**

P.T.O.

SECTION - II

Q5) Following is a data set of observations.

Sr No.	Project Worth (x) (Rs.)	Amount involved in disputes (y) (Rs.)
1	10,00,000	2,00,000
2	15,00,000	3,50,000
3	20,00,000	5,00,000
4	25,00,000	8,00,000
5	32,00,000	17,00,000
6	23,00,000	4,00,000
7	17,00,000	4,25,000
8	22,00,000	5,50,000
9	8,00,000	1,50,000
10	35,00,000	22,00,000

a) Determine mean, standard deviation, coefficient of variance, range and co-relation coefficient. **[12]**

b) Suggest measures to reduce disputes. **[6]**

Q6) For the data set given in Q5, for a regression equation relating the project worth, with the disputed amount. How much reliable is the equation? **[16]**

Q7) Explain utility of any 8 materials indices in management, with examples. **[16]**

Q8) A material supplier gives following discounts for purchase of reinforcement steel. **[16]**

Order qty	Discount %
$\leq$ 1 tonne	No Discount
> 1 tonne $\leq$ 2 tonnes	3%
> 2 tonnes $\leq$ 4 tonnes	5%
> 4 tonnes $\leq$ 8 tonnes	8%
> 8 tonnes $\leq$ 10 tonnes	9%
> 10 tonnes $\leq$ 15 tonnes	10%

Annual order quantity is 14 tonnes. Price per tonne is Rs.35,00,000/-. Ordering cost is Rs. 2000 per order and Inventory carrying cost is 20%. Cost of understocking is 2% of the material ordered and cost of overstocking is 1% of the material ordered. The monthly consumption of steel is as follows.

Month	Quantity
Jan.	½ tonne
Feb.	1 tonne
March	1½ tonne
April	2 tonnes
May	2½ tonnes
June	½ tonne
July	1 tonne
August	1½ tonne
Sept.	1½ tonne
Oct.	½ tonne
Nov.	¾ tonne
Dec.	¾ tonne

Determine EOQ

☒☒☒☒

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1622

[3965]-452
M.E. (Civil/Structures)
STRUCTURAL MATHEMATICS
(2008 Course) (501401) (Sem. - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the forces in the members AE and CE of the truss shown in the Fig.1.a by taking these member forces as redundant. The axial rigidity for the vertical and horizontal members is EA and for the diagonal members is 2EA. Use flexibility method. **[12]**

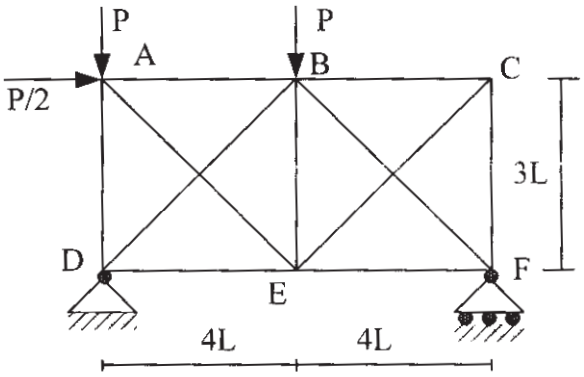


Fig.1.a

b) Compare member stiffness approach with structure stiffness approach. Explain merits and demerits of each approach. **[4]**

P.T.O.

Q2) a) Analyze the grid shown in the Fig.2.a by concept of symmetry and calculate reactions at supports. EI = GJ = Constant. The member AB is subjected to uniformly distributed load of 'q' per unit length. **[12]**

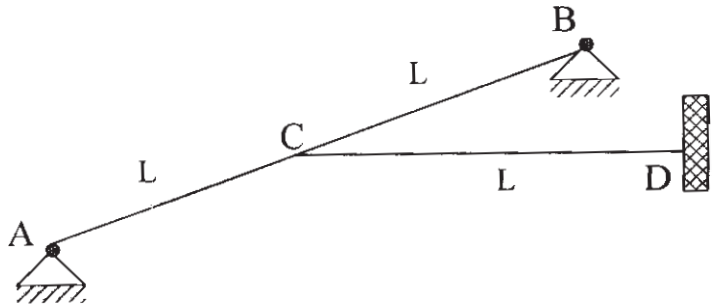


Fig. 2.a

b) Derive the member stiffness matrix for a space frame member. **[5]**

Q3) a) Find the nodal displacements for the given portal frame in Fig.3.a using stiffness matrix method. **[8]**

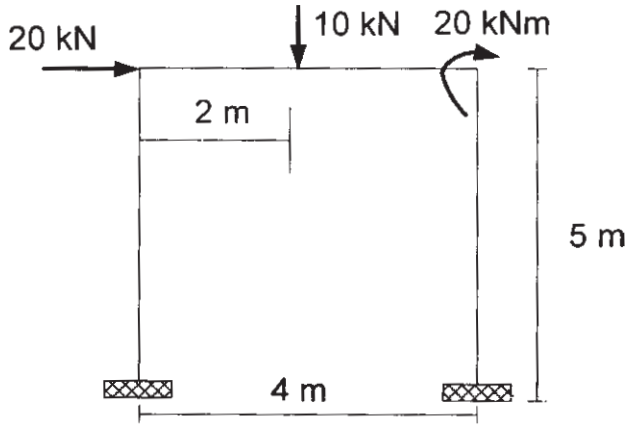


Fig. 3.a

b) A simply supported beam-column of length 1 as shown in Fig.3.b is subjected to uniformly distributed transverse loading of intensity w per unit length over the entire span along with the compressive force P. Assume constant flexural rigidity and obtain the expression for maximum bending moment. **[8]**

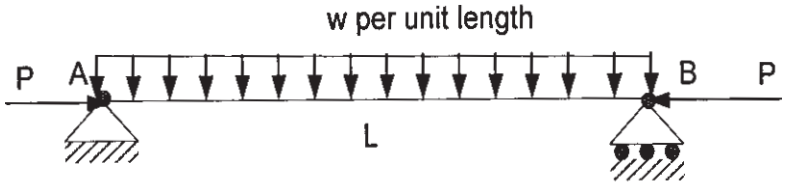


Fig. 3.b

Q4) a) Given y" + xy' + y = 0, y (0) = 1, y' (0) = 0, find the value of y (0.1) by using Runge-Kutta method of fourth order. **[8]**

b) Solve the transcendental equation x = cos x by any numerical method. **[4]**

c) Estimate the lowest buckling load of a uniform pin ended column of length L and flexural rigidity EI using Eigen value technique. Divide the column in three equal parts. **[5]**

SECTION - II

Q5) a) Write a short note comparing backward difference, forward difference and central difference techniques as defined in finite difference methods. **[5]**

b) A beam 12m long is fixed at both ends. 4m long portions near the end have a cross-section with second moment of area 2I. Cross section of the central 4m portion is I. The beam supports a uniformly distributed load of 6kN/m over the entire length. Calculate the deflection and bending moment at the center using finite difference Technique. Use 2m interval. **[12]**

Q6) a) A beam of span 'L' simply supported at its ends supports a concentrated load W at distance 'a' from left support. Develop a fourier series to represent the load. **[12]**

b) Write a short note on spline interpolation technique. **[5]**

Q7) a) For the data given below, develop an equation fitting the data points using least square technique. Hence calculate value at x = 14. **[11]**

x	7	8	9	10	11
y	20.2760	24.7652	30.2482	36.9453	45.1251

b) Compare Numerical Integration Techniques using Trapezoidal rule, Simpson's rule and Gauss Quadrature rule. **[5]**

Q8) a) From the data shown below, obtain the value of y at x = 7.7 using Lagrange Polynomial Technique. **[10]**

x	5	7	8	11
y	8.91	12.21	10.16	7.12

b) Write a short note on Fourier Integral, Fourier Transform and Fast Fourier Transform. **[6]**



Total No. of Questions : 06] **[Total No. of Pages :3**

P1623

[3965]-453
M.E. (Civil) (Structures)
ADVANCED SOLID MECHANICS
(Sem. - I) (2008 Course) (501402)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A plane passing through point (x, y, z) in a stressed elastic body has its normal 'n' with direction cosines cos (n, x), cos(n, y) cos (n, z). Obtain expressions for the stress resultants (Tn) and its direction in terms of six independent components at that point. **[8]**

b) What are principal stress and principal planes. Derive governing cubic equation to obtain the principal stresses in six independent stress components. How will you decide their directions? **[7]**

c) Define strain compatibility. In a general state of stress, assuming the strain displacement relations, obtain the necessary strain compatibility equation. **[5]**

d) Given the following strain field – **[5]**

$$\varepsilon_{xx} = x^4 + y^4 + x^2 + y^2 + 5$$

$$\varepsilon_{yy} = x^4 + y^4 + 3x^2 + 3y^2 + 6$$

$$\gamma_{xy} = 4xy(x^2 + y^2 + 2) + 10$$

$$\varepsilon_{zz} = \gamma_{yz} = \gamma_{zx} = 0$$

i) Check whether this strain field is compatible.

ii) Compute the values of strain variables at the origin for this strain field.

Q2) a) State and explain the Generalized Hook's law. Hence obtain the Lame's constants and engineering constants for an elastic isotropic body. **[6]**

b) Define Airy's stress function 'Φ'. Prove that the stress function satisfies the Biharmonic Governing Equation in absence of body forces. **[10]**

c) If $\Phi = a.X^4/12 + b.X^3Y/6 + c.X^2.Y^2 + d.X.Y^3/6 + e.Y^4/12$, obtain the stress distribution on the sides of rectangular plate of size L × 2C. Neglect body forces. Also check for static equilibrium of the plate under this stress distribution. **[9]**

Q3) a) In a plane elasticity problem, Obtain the equations of equilibrium in polar coordinates. **[8]**

b) Using Polar Coordinates, show that for an axial symmetric distribution, the stress function $\Phi(r, \theta)$ is of the form **[10]**

$$\Phi = A.\log(r) + B.r^2.\log(r) + C.r^2 + D$$

c) Obtain the solution for stress distribution σ_r and $\sigma\theta$ in a hollow cylinder subjected to uniform internal and external pressure. **[7]**

SECTION - II

Q4) a) Define an axi - symmetric problem in elasticity giving two examples. Write the basic equations for stress equilibrium, compatibility and stress components in an axi- symmetric problem. **[5]**

b) A curved bar with constant narrow c/s and circular axis is bent in the plane of curvature by a moment "M" applied at the ends. Obtain the necessary equation to find stress distribution σ_r and $\sigma\theta$. **[10]**

c) Show that $(\sigma_r + \sigma\theta)$ is constant for a thick cylinder. If a thick cylindrical pressure vessel with inner and outer radii 250 mm and 300 mm respectively, is subjected to internal pressure of 50 N/mm^2, find σ_r and $\sigma\theta$ at inner and outer surface. **[10]**

Q5) a) Derive Poisson's equation for torsion of prismatic bars of non - circular section in terms of stress function Φ using St. Venants theory. Neglect body forces. **[15]**

b) A shaft of elliptical c/s having semi major axis 50 mm and semi minor axis 25 mm is subjected to a torque of 1000 N-m. Determine maximum and minimum shear stress developed in shaft. **[10]**

Q6) a) What are different types of Elastic foundations? Give examples. **[5]**

b) Derive differential equation for the elastic line of a beam resting on an elastic foundation. **[10]**

c) An infinitely long steel beam of unit width and 200 mm thick is resting on an elastic foundation whose modulus of foundation is 10 N/mm^2. A concentrated load of 8 kN is applied at appoint on the beam. Determine the maximum deflection and maximum bending stress. Take $E = 2 \times 10^5 N/mm^2$. **[10]**



Total No. of Questions : 6] **[Total No. of Pages : 3**

P1624

[3965]-454

M.E. (Civil) Structures

STRUCTURAL DYNAMICS

(2008 Course) (501403) (Sem. - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare between Static and Dynamic Loading. Explain in brief the types of vibrations. **[6]**

b) Determine the weight of the system shown in Fig. 1.1 whose cyclic linear frequency is 4.21 Hz. Assume $K_1 = K_2 = 2000$ N/m, $K_3 = 3000$ N/m. **[9]**

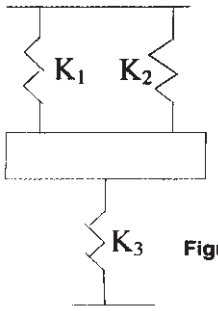


Figure1.1

c) A weight of the building is 200 kN and it is set to free vibrations by releasing it (t = 0) from a displacement of 0.12 m. If the maximum displacement of the return swing is 0.08 m at time t = 0.64 s, determine

i) Spring Stiffness.

ii) Damping Ratio.

iii) Damping Coefficient.

iv) Damped Frequency. **[10]**

P.T.O.

Q2) a) Derive the formula for dampening ratio using logarithmic decrement principle. **[6]**

b) Obtain steady state and transient response of SDOF undamped system subjected to harmonic excitations. **[9]**

c) A machine of 200 kg is placed on roof supported by four columns of stiffness 185 N/m each, creates an unbalanced disturbing force 350 kN at a frequency of 2121 rpm. If damping ratio is 0.2, determine

i) Amplitude of motion due to unbalance.

ii) Transmissibility.

iii) Transmitted Force. **[10]**

Q3) a) Write notes on: **[10]**

i) SDOF system subjected to short duration Impulse.

ii) Damping Effects and Types of Dampers.

iii) Linear Acceleration Method for Non-linear Analysis.

b) Derive expression for the response of SDOF system for loading function using Fourier Seriese. (Refer Fig. 3.1) **[15]**

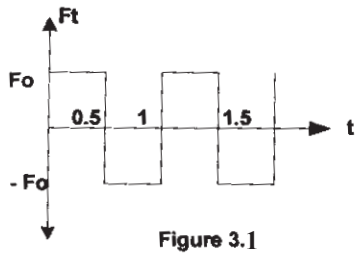


Figure 3.1

SECTION - II

Q4) a) What are normal modes of vibrations in MDOF? Prove that normal modes of vibrations are orthogonal. **[10]**

b) Calculate normal frequency and mode shapes of a three storeyed building having mass of first two floors equal and mass of roof floor equal to half of the first two floors. The building consists of one bay only and uniform stiffness of all columns. **[15]**

Q5) a) In a continuous system, derive the equation of free vibrations of uniform shear beam. **[10]**

b) Explain two DOF system as MDOF and write in matrix form the equation of motion. Hence determine the natural frequencies and mode shapes assuming mass and stiffness of ground storey equal to twice that of first storey. **[15]**

Q6) Write notes on: **[25]**

a) Stodola Method of Analysis.

b) Wilson Theta Method.

c) Finite Element Techniques in Vibration Problems.

d) Rayleigh Method for Frequency in Fundamental Mode.

e) Coupled and Un-coupled MDOF system.



Total No. of Questions : 06] **[Total No. of Pages :2**

P1626

[3965]-464
M.E. (CIVIL) Structures
FINITE ELEMENT METHOD
(2008 Course) (501409) (Sem. - II)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the write indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the various stages involved in Finite Element Analysis? Compare it with Classical methods of analysis? **[10]**

b) Explain the terms CST, LST and QST? Obtain natural co-ordinates for any point lying on sides opposite of each node of CST element? **[15]**

Q2) a) Describe the 'Pascal Triangle' ant its uses? State and explain the convergence of a polynomial shape Function? **[6]**

b) Determine Shape Function for four noded rectangular element using natural co-ordinate system? **[9]**

c) Using Principle of Minimum Potential Energy, derive general expressions for elemental stiffness matrix, consistent load vector with usual notations? **[10]**

Q3) a) What are different types of discontinuity generally observed while descritization? Define element aspect ratio and its effect on accuracy of analysis? **[6]**

b) Derive element stiffness matrix for Beam Element using variational approach? **[9]**

c) What is Lagrange Polynomial? Using this, find and plot the shape functions of five noded bar element? **[10]**

P.T.O.

SECTION - II

Q4) a) Establish relation between strain at any point with nodal displacement in a two noded bar element using shape functions in terms of natural co-ordinates. **[6]**

b) For the CST element with nodes 1(100, 100), 2(400, 100) and 3(200, 400), find the element stiffness matrix by FEA. Assume t = 20 mm and $E = 2 \times 10^5$ N/mm^2. **[9]**

c) Explain the Isoparametric concept in FEM. State the basic laws on which it is developed? For the isoparametric element shown in figure 4.1, determine Cartesian co-ordinates of the point 'p' which has local coordinates $\zeta = 0.57735$ and $\eta = 0.57735$. **[10]**

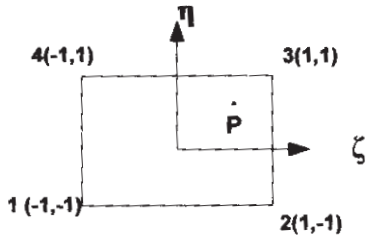


Figure 4.1

Q5) a) What is displacement function for ACM plate bending element? Examine nodal as well as inter element compatibility of the element. **[7]**

b) Derive all matrices to formulate [K] of ACM plate bending element. **[8]**

c) Explain BFS plate bending element and its displacement function. **[10]**

Q6) a) Explain with neat sketches the various 3D elements used in analysis of shells. What are the factors to be considered in the development of shell elements? **[10]**

b) What is 'degenerated solid element'? Explain how a 3D brick element can be reduced to shell element. **[15]**

♦♦♦♦

Total No. of Questions : 08] **[Total No. of Pages :3**

P1632

[3965]-490
M.E. (Mech - Heat Power)
ADV. THERMODYNAMICS
(Sem. - I) (2008 Course) (502102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) 5 Kg of air at 27°C is stored in a vessel of 150 litres capacity. Determine the pressure of air :- **[9]**

i) By using Vander Waal's equation.

ii) Ideal gas equation.

iii) Reduced pressure and temperature

b) Explain the followings:- **[7]**

i) Helmholtz and Gibb's function.

ii) Law of corresponding states.

Q2) a) Define :- **[4]**

i) Critical point & triple point.

ii) Law of degradation of energy.

b) 8 Kg of iron ingot at 800°C is dropped into an oil bath of at 60°C, containing 40 Kg of oil. Determine the change in entropy when the system reaches a common temperature. Take specific heats of iron & oil as 0.4 kJ/kg K and 1.95 kJ/kg K, respectively. Also find loss of energy. When the surroundings are 30°C. **[8]**

c) Explain availability function for closed & open systems. **[4]**

P.T.O.

Q3) a) Draw P - T diagram for the substance:- **[4]**

i) Which expands on freezing.

ii) Which contracts on freezing.

b) Derive the relation, $(c_p - c_v) = -T\left(\frac{\partial \upsilon}{\partial T}\right)_p^2 . \left(\frac{\partial p}{\partial \upsilon}\right)_T$ where the notations carry usual meanings. Hence show that:- **[12]**

i) c_p is always greater than c_v

ii) At absolute zero, $c_p = c_v$.

Q4) Write short notes (any three): **[18]**

a) Vander waal's equation of state.

b) Energy destruction & its principle.

c) Generalised compressibility chart.

d) Max well - Relations

SECTION - II

Q5) a) Benzene (C_6H_6) is burnt with stoichiometric air during a combustion process. Assuming complete combustion, determine:- **[11]**

i) Air - fuel ratio on mass and molar basis.

ii) The above, for 50% excess air.

iii) Volumetric & gravimetric analysis of products for 50% excess air.

b) Explain fugacity & activity. **[5]**

Q6) a) Write notes on :- **[10]**

i) Gibb's phase rule.

ii) Concept of heat of reaction.

b) Discuss Amagat's law and kay's rule. **[6]**

Q7) a) What is adiabatic flame temperature? List the factors influencing the same. **[8]**

b) Discuss the criteria for chemical equilibrium derive the relation between Gibb's function & equilibrium constant. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Fermi - dirac statistics.

b) Bose - Einstein statistics.

c) Joule - Thompson coefficient and inversion curve.

d) Dalton's law of partial pressure.

e) Third law of thermodynamics.



Total No. of Questions : 12] **[Total No. of Pages : 4**

P1633

[3965]-491
M.E. (Mechanical Engineering)
(Common to Design, Heat Power, Mechatronics and Automotive Engg.)
TECHNOLOGY AND FINANCIAL MANAGEMENT
(2008 Course) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I
Unit - I

Q1) a) Distinguish between 'Flexible Budget' and 'Fixed Budget'? What are the main features of a budgetary control system? **[8]**

b) A factory engaged in manufacturing plastic toys is working at 40% capacity and produce 10000 toys per month. The present cost breakup for one toy is as under:

Material	Rs. 10
Labour	Rs. 3
Overhead	Rs. 5 (fixed)

The selling price is Rs. 20 per toy. If it is decided to work the factory at 50% capacity, the selling price falls by 3%. At 90% capacity the selling price falls by 5% accompanied by a similar fall in the price of material. Prepare a flexible budget statement showing profit at 50% and 90% capacities. **[8]**

OR

Q2) Write short notes on the following: **[16]**

a) Limitations of financial accounting.

b) Forces driving global economy.

c) Sources of short term finance.

d) Preparation of sales budget.

P.T.O.

Unit - II

Q3) a) What is cost accounting? What are its objectives? How do cost accounting records help in the planning and control of operations of business enterprise? **[12]**

b) The profit-volume ratio of X Ltd. is 50% and the margin of safety is 40%. Calculate the net profit if the sales volume is Rs. 1,00,000. **[6]**

OR

Q4) a) What is Activity-Based Costing? Why is it needed? **[5]**

b) What do you mean by marginal costing? Discuss its usefulness and limitations. **[6]**

c) Prepare a process accounts statement from the following figures indicating the cost of process and the total cost. The production was 480 articles per week.

	Process - I	Process - II	Process - III
Materials	Rs.3,000	Rs.1,000	Rs.400
Labour	1,600	4,000	1,200
Factory overheads	520	1,440	500

Office overheads amounting to Rs. 1,700 should be apportioned on the basis of wages, Ignore stock in hand and work-in-progress at the beginning and end of the week.

[7]

Unit - III

Q5) a) Distinguish between micro economics and macro economics. **[6]**

b) Explain the theory of consumer's demand with the help of indifference curve analysis. Also explain Income effect and substitution effect. **[10]**

OR

Q6) Explain the following in brief: **[16]**

a) Monopolistic competition.

b) Fixed and flexible exchange rates.

c) Balance of payment.

d) Types of unemployment.

SECTION - II
Unit - IV

Q7) a) Explain the following related to quality management: **[12]**
- i) Quality planning.
- ii) Quality control.
- iii) Quality improvement.

b) Explain in brief the concept of Kaizen. **[4]**

OR

Q8) a) Explain the Deming's 14 point approach to Quality Management. **[8]**

b) Discuss the ISO 9000 system standards in brief. **[8]**

Unit - V

Q9) A small engineering project consists of set of activities whose three time estimates in *days* are given below:

Activity	A	B	C	D	E	F	G	H	I
Optimistic time	2	2	4	2	2	3	2	5	3
Most likely time	2	5	4	2	5	6	5	8	6
Pessimistic time	8	8	10	2	14	15	8	11	15

Activities A, B and C can start simultaneously. Activity D follows activity A while E follows B. Activity D and E are followed by activity G while F is dependent on C. H depends on D and E, while I depends on F and G.

a) Construct the network. **[4]**

b) Find the expected duration and variance of each activity. **[2]**

c) Calculate the slack for each event. **[3]**

d) What is the critical path and expected project duration. **[3]**

e) If the project due date is 28 days, what is the probability of not meeting the due date. **[3]**

f) What should be the project duration for the probability of completion of 95 % (For 95% probability $Z = 1.65$) **[3]**

OR

Q10) a) CPM uses a deterministic time estimate and PERT uses probabilistic time estimate. Explain. **[6]**

b) Explain the concept of BOT in brief. **[6]**

c) What are the objectives and applications of network analysis. **[6]**

Unit - VI

Q11) a) Define personnel management. State the objectives and principles of personnel management. **[10]**

b) Distinguish between autocratic and supportive models of organizational behavior? **[6]**

OR

Q12) a) Define merit rating. State and describe any three methods of merit rating. **[10]**

b) Explain the process of Management by Objectives. **[6]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1634

[3965]-498
M.E. (Mechanical) (Heat Power)
CONVENTIONAL POWER PLANTS
(2008 Course) (Elective - II) (502105)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How does erosion of steam turbine blades occur? State the methods of preventing erosion of the blades. **[6]**

b) In a 15MW steam power plant operating on ideal reheat cycle, steam enters the H.P. turbine at 150 bar and 600°C. The condenser is maintained at a pressure of 0.1 bar. If the moisture content at the exit of L.P. turbine is 10%, determine : **[10]**

i) Reheat pressure.
ii) Thermal efficiency.
iii) Specific steam consumption.

Q2) a) Explain various methods of steam turbine governing. **[9]**

b) Draw a modern steam power plant and explain the fuel circuit. **[7]**

Q3) a) Explain CANDU-type nuclear reactor, with a neat sketch. **[6]**

b) Write notes on : **[10]**

i) Nuclear waste disposal.
ii) Shielding against nuclear radiation.
iii) Future of Nuclear Power.

Q4) Write short notes on (any three) : **[18]**

a) Gas turbine power plants.
b) Fluidized bed combustion.
c) Cooling towers.
d) Losses in steam turbines.

P.T.O.

SECTION - II

Q5) In context of a hydroelectric power plant discuss : **[16]**

a) Selection of site.

b) Environmental impacts.

c) Selection of components.

d) Social impact.

Q6) a) What is the need of energy storage system? Explain the different types of energy storage systems used. **[10]**

b) Explain the principle of working of a H_2 - O_2 fuel cell. **[6]**

Q7) a) Discuss in detail the projection of energy demand and planning of different power plants. **[10]**

b) Examine the choice of Nuclear Power for India. **[6]**

Q8) Write notes on (any three) : **[18]**

a) Instrumentation systems for thermal power plants.

b) Clean energy technologies.

c) Safety in power plants.

d) Role of NHPC and NTPC.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1636

[3965]-509

M.E. (Mech.) (Design Engg. & Automotive Engg.)

MATHEMATICAL MODELING AND ANALYSIS

(2008 Course) (502201) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from section-I and any three questions from section-II.***
2) ***Answers to each section should be written in separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Describe static system with suitable example, mathematical model, and response to step input. **[8]**

b) Write a short note on Lumped and Distributed parameter systems. **[8]**

Q2) a) Figure Q.2 (a) shows a block diagram. Apply block diagram algebra to evaluate C/R. **[8]**

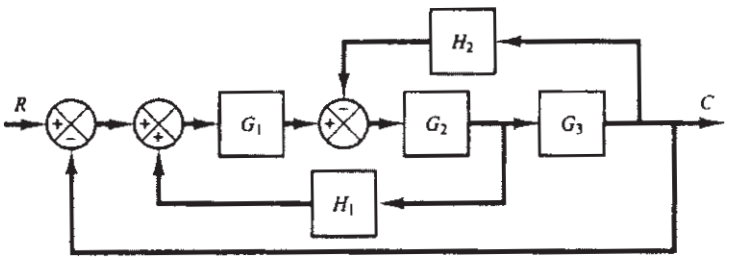


Figure Q 2 (a)

b) Construct signal flow graph for Figure Q.2 (a) and obtain expression for C/R using Masson's Gain Formula. **[8]**

P.T.O.

Q3) For state space representation given by **[16]**

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -6 & 5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} f\ (t)$$

$$y = \begin{bmatrix} 6 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Write the equations for x_1 and x_2 from above representation obtain $[sI - A]$ matrix. Evaluate inverse matrix $[sI - A]^{-1}$ i.e. $\phi(s)$. Assume initial conditions as zero and $f(t)$ as unit step, obtain $x_1(t)$ and $x_2(t)$, and thus $y(t)$.

Q4) a) Figure Q.4 (a) shows an massless cart with mass, spring and damper. Obtain mathematical model for this system. **[10]**

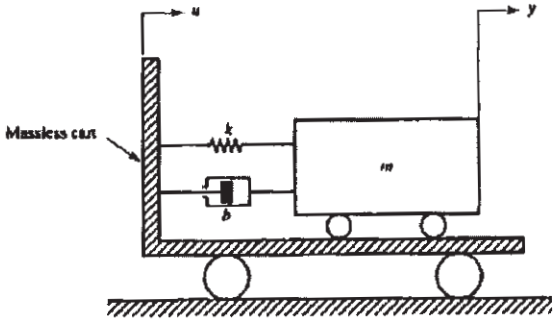


Figure Q 4(a)

b) Define System, Environment and Variables. **[6]**

Q5) a) Define Masson's Gain formula with suitable block diagram and corresponding signal flow graph. **[10]**

b) Discuss Linear Graph Models. **[8]**

SECTION - II

Q6) For the transformed equation. **[18]**

$$C\ (s) = \frac{10\,F\,(s) - 10\ (s + 2)\ U\ (s)}{s^2 + 8s + 15}$$

Determine the response when

a) $F(s)$ is unit step and $U(s) = 0$.

b) $F(s) = 0$ and U (s) is unit step.

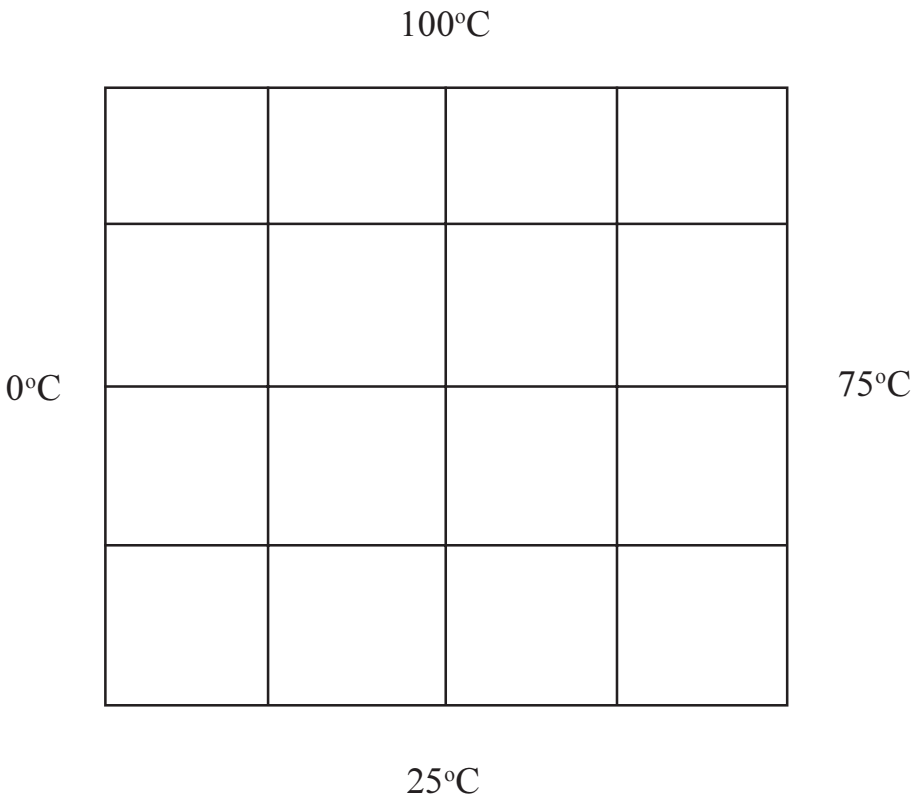
Q7) a) Determine the z transform of $F\ (s) = \frac{s}{s^2 + \omega^2}$ using Residue method. **[8]**

b) The z transform of a digital control system is **[8]**

$$C(z) = z \frac{z + 2}{(z - 1.5)(z + 0.5)(z - 1.2)}$$

Determine the inverse z transform.

Q8) Figure shows a square plate. The temperature of the edges is as shown in Figure Q 7 (a). Using Laplace Equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$ and Libmann's method obtain the temperatures of inside nodes. Compute four iterations and tabulate the result. **[16]**



Q9) a) Applications of Fourier Transforms in Design Engineering. **[8]**

b) Relation between Z transforms and Laplace Transforms. **[8]**

Q10) a) Successive relaxation in solution of Elliptic Differential Equations. **[6]**

b) Determine solution of the differential equation using Laplace Transform Method. **[10]**

$(D^3 + 4D^2 + 5D + 2)\, y(t) = f(t)$

Where $f(t) = \sin(\omega t)$ and all initial conditions are zero.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1637

[3965]-516
M.E. (Mechanical) (Design Engg.)
PROCESS EQUIPMENT DESIGN
(2008 Course) (Elective - II) (Theory) (502205)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of logarithmic tables, slide rules, Mollier chart, electronic steam table and electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary giving reasons.***

SECTION - I

Q1) a) Explain self supporting roof design of a storage tank. **[5]**

b) Suggest a suitable material with justification for Handling of any two of following i) Acetic acid ii) Chlorine iii) Milk and milk products iv) Acetic anhydride. **[3]**

c) Suggest a suitable design for a storage tank to store 400000kg of benzene required in the production of alkyl benzene sulphonate. The storage tank will be filled to 90% of its capacity. Due to space limitations, maximum tank diameter can be used is 3.6m. plates in 90cm × 240cm in different thickness ranging from 5 to 16mm are available for fabrication.
Density of benzene is 800kg/m^3. Permissible stress of the material = 960kg/sq cm, welded joint efficiency = 0.85. **[6]**

d) What is stress corrosion? **[2]**

Q2) a) Explain shell design for high pressure vessel based on tangential stress and maximum energy distortion criteria. **[4]**

b) A flanged torispherical head having thickness 20mm is to be used for a vessel having internal diameter 3.5m. the crown radius of the head is 3.5m and knuckle radius is 21cm. The permissible stress of the material is 1020kg/sq cm. Welded joint efficiency 85%. If the vessel is to operated at 5kg/sq cm, will the thickness be sufficient? **[8]**

c) Explain considerations in shell design, wind girders and roof curb angles for storage vessel. **[4]**

P.T.O.

Q3) a) Explain with neat sketches design of saddle support. **[6]**

b) A storage tank 25m in diameter is to be fabricated for storage of oil having density 800kg/m^3. The tank is to be filled to 85% capacity. The plates of 1.8m × 3.6m size in varying thickness are available for fabrication. Permissible stress material is 820kg/cm^2. Weld joint efficiency is 85%. Corrosion allowance is 2mm. **[10]**

Estimate :

i) Maximum and minimum thickness that can be used in fabrication of storage tank.

ii) Thickness required at various heights of storage tank.

iii) Number of layers (courses) required for fabrication and number of plates.

Q4) a) A high pressure vessel is to be operated at 120MN/m^2. The inside diameter of vessel is 35cm. The steel plate with yield strength of 400MN/m^2 is to be used for fabrication. Estimate wall thickness by maximum shear stress theory with factor of safety of 1.5. **[5]**

b) What is dilation of pressure vessel? How it is taken care in design of pressure vessel. **[3]**

c) Determine the optimum proportion of a storage tank of capacity to store 800m^3 liquid having density 1200kg/m^3. The tank will be filled to 90% of it's capacity. The annual cost of fabrication of cylindrical shell C_1 is two times the annual cost of bottom C_2. The annual cost of roof is 1.5 times the annual cost of bottom. The annual cost of land, preparation and install considered as equal to annual cost of bottom. Also calculate maximum plate thickness required for fabrication of storage tank. Permissible stress of the material is 1000kg/cm^2. **[8]**

Q5) Write short notes on any three : **[18]**

a) Protective coatings and their applications.

b) Design of skirt support.

c) Design considerations for process equipment design.

d) Various types of roofs for storage vessel.

SECTION - II

Q6) a) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ratio of outer radius to inner radius fro all shells is 1.4. The vessel is subjected to an internal pressure of 150kg/cm^2. Pressure outside vessel is atmospheric. Estimate :

i) Maximum combined stress at interface of concentric shells.

ii) Interface pressure resulting internal pressure and shrinkage stresses.

Data - Modulus of elasticity. E = 2 × 10^{6}kg/cm^2. Internal diameter of vessel is 400mm. **[6]**

b) Explain testing and inspection of pressure vessels. **[6]**

c) Explain either contacting devices in plate columns or types of packing in packed columns. **[4]**

Q7) a) Explain the following aspects of design of shell and tube heat exchanger-shell diameter, shell thicknes, nozzle thickness, baffles, flanged joint, thickness of tube, tube sheet thickness, channel and channel cover. **[8]**

b) What are agitators? Explain design consideration of an agitator. **[8]**

Q8) a) Explain classification pumps and following aspects cavitation, virtual head, design head, volumetric efficiency, pump selection. **[8]**

b) A tall column 2.5m in diameter and 28m in height is subjected to bending moment of 302058kg-m at base. The weight to use with this moment for anchor bolt size is 66000kg. Bolt circle diameter is 2.7m. The permissible stress in bolt material is 1200kg/cm^2. Anchor bolt diameter is 40mm. Estimate number of anchor bolts. **[8]**

Q9) a) What are tall vessels? Give example of tall vessels and explain design considerations of any one tall vessel. **[8]**

b) What are integral, fabricated and formed nozzles? **[4]**

c) Explain thermal stresses and its determination. **[4]**

Q10) Write short note on any three of following : **[18]**

a) Vacuum Crystallizer.

b) Protective linings for process equipments.

c) Process flow diagrams.

d) Various theories of failure.

e) Optimization techniques in equipment design.

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Total No. of Questions : 10] **[Total No. of Pages :3**

P1638

[3965]-517
M.E. (Mech.) (Design Engineering)
ROBOTICS
(2008 Course) (Elective - II) (502205)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the questions should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss some common characteristics of the robot. **[8]**

b) In one degree of freedom robot, it has one sliding joint with full range of 1.5 meter. The robots control memory has a 8 bit storage capacity. Determine the control resolution for this axis of motion. **[5]**

c) Compare relative merits and demerits of drive systems used in robotics. **[5]**

Q2) a) A point P(7, 3, 2), is attached to a frame (u, v, w), is subjected to the transformations, but all relative to the current moving frame as follows **[8]**

i) A rotation of 90 degree about the u - axis.

ii) Then a translation of (4, -3, 7) along uvw.

iii) Followed by a rotation of 90 degree about the w - axis.

Find the coordinates of point relative to the transformations are complicated.

b) Explain the steps to implement D-H representation to the joint - link combination of robot manipulator. **[8]**

Q3) a) Find the differential motions of a robot frame **[8]**

i) Total differentials caused by small rotations of about 0.1, 0.05 and 0.02 radians in x, y and z axes respectively.

ii) Total differential operator matrix for the following differential transformations, rotation of 0.1, 0.05 and 0.02 radians and translations 0.5, 0.3 and 0.1 about x y and z axes respectively.

b) In a Stanford arm manipulator, the second arm is to move from a initial position of 20 degree to a final position of 68 degrees in 4 seconds. Assume that the joint starts and finishes at zero velocity and find the cubic polynomial that satisfies this motion. Calculate the position, velocity and acceleration of this joint at intervals of one second and show their plots against time. **[8]**

P.T.O.

Q4) a) Compare Algebraic and Geometric approach to the solution of a simple planar three - link manipulator. **[8]**

b) Sketch and explain the terms "Path points", "via points" and "pseudo via points" with suitable example. **[8]**

Q5) Short notes on

a) Inverse manipulator kinematics. **[5]**

b) Mechanical end effectors **[5]**

c) SCARA Robot **[6]**

SECTION - II

Q6) a) Derive the joint angles for given end arm position of two degree of freedom arm in world space coordinates. **[8]**

b) Explain static force analysis of robots. **[8]**

Q7) a) Compare different types of actuators used in robotics. **[8]**

b) Determine the time required to complete the move and the velocity of each joint for the three axis RRR manipulator to travel the following distance under joint interpolated motion: Joint 1, 40°, Joint 2, 30° and Joint 3, 70°. All joints travel at a maximum rotational velocity of 30°/s, neglecting the effect of acceleration and deceleration and no joint may travel at grater than 80% of maximum velocity. **[8]**

Q8) a) A two degree of freedom planar robot is to follow a straight line between the start (3, 10) and end (8, 14) points of the motion segment. Find the joint variables for the robot if the path is divided into 10 segments. Each link is 9 inches long. **[8]**

b) Explain joint space scheme and Cartesian space scheme for trajectory planning. **[8]**

Q9) a) Differentiate between contact and non contact type sensors. **[4]**

b) Explain types of force and pressure sensors. **[4]**

c) Consider a schematic image as shown in Figure Q9(c). Determine the area, minimum aspect ratio, centroid, compactness and thickness measures of the image. **[8]**

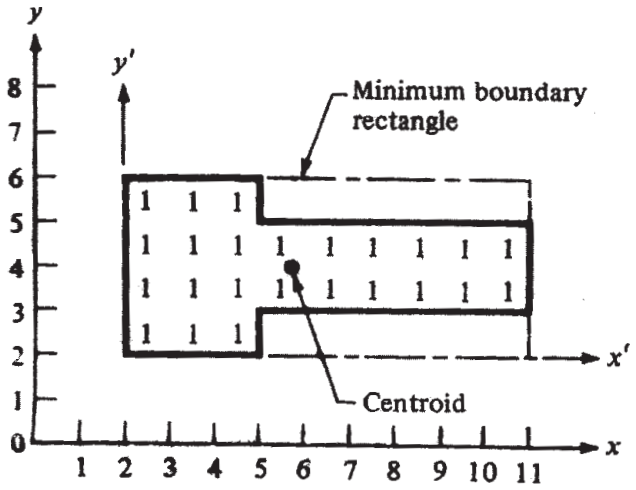


Figure Q9 (c)

Q10) Write short notes on

a) Teach through robot programming method. **[6]**

b) Remote centre compliance. **[6]**

c) Acquisition of images. **[6]**



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1643

[3965]-572

M.E. (Mechanical) (Automotive Engg.)

AUTOMOTIVE CHASSIS DESIGN

(2008 Course) (502310 B) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt three questions from Section - I and Section - II.***
2) ***Answers to each section should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table, scientific calculator is allowed.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) What are the general characteristics of a vehicle suspension system? What conditions must be satisfied in suspension system of a modern day car. Explain with the help of neat sketches. **[8]**

b) A motor cycle is fitted with a mono shock suspension system i.e. only one shock absorber is mounted in front of rear wheel. The laden weight of the bike is 240kgs. Selecting a suitable material and assuming appropriate deflection during rough ride, design the spring specifying no. of active/ inactive coils, mean coil dia, wire dia, solid length, free length and type of ends. Draw a sketch showing its mounting. **[8]**

Q2) a) Describe with the help of sketches, working of an independent wheel suspension system of a modern car dealing with high acceleration, peak speeds and high cornering speeds. **[10]**

b) What do you understand by double wish bone suspension system? Give its advantages during different kinematic conditions of the vehicle. **[6]**

Q3) a) With the help of neat sketches describe working of a Rack and pinion type and also re circulating ball steering mechanisms. **[8]**

b) What is steering linkage mechanism? Explain the difference between Ackerman and Davis steering mechanism geometries with advantages/ disadvantages of one over the other. **[8]**

P.T.O.

Q4) Describe in detail, with the help of a well labelled diagram, working of a hydraulic power steering system. List the major components of the mechanism and draw a hydraulic circuit showing high pressure and return lines. **[16]**

Q5) Write short notes on the following (any three): **[18]**

a) Mc Pherson struts.

b) Electrical power steering system.

c) Types of springs used in suspension systems of passenger cars, LCVs and HCVs.

d) Anti roll bars.

e) Ride comfort in a car.

f) Curb weight, vehicle mass, gross vehicle weight, pay load and axle load.

SECTION - II

Q6) a) Write a detailed note on Tubeless Tyres. What are the advantages/ disadvantages with respect to conventional tyres. **[8]**

b) Draw cross section of a tyre explaining the role of various components in that. What are the factors improving road grip? **[8]**

Q7) What are various forces acting on rear/front tyres during different driving conditions? With the help of neat sketches, indicate the way these forces are transferred to various components of a car chassis. How are these forces affected by tyre pressures and road surface condition? **[16]**

Q8) a) Write a detailed note on ABS giving its advantages over normal braking systems. **[8]**

b) A motor cycle develops 10.5 kW at 7500 rpm. Calculate the braking torque at wheels if primary reduction is 3.4 and secondary reduction is 2.87. If pressure in the fluid line is 10 bars and diameter of piston is 52 mm, calculate the force applied for full braking. **[8]**

Q9) With the help of a neat labelled diagram explain working of a six wheeled vehicle. Discuss its applications and the method of calculating wheel torque on different wheels. **[16]**

Q10) Write short notes on the following (any three): **[18]**

a) Caster and camber.

b) Roll centre and roll axis.

c) Specifications of tyres with respect to sizes, dimensions, ply ratings and markings.

d) Application of composites in various car components.

e) Types of car wheels.

f) Types of tracks used for vehicle evaluation.



Total No. of Questions : 12] **[Total No. of Pages : 2**

P1644

[3965]-574

M.E. (Electrical) (Control System)

ADVANCED MATHEMATICAL TECHNIQUE FOR CONTROL SYSTEM

(2008 Course) (503101) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write the concept of local and global extrema. **[9]**

b) Define and explain the concept of convex function, vector space and vectors. **[9]**

OR

Q2) a) Explain the method of lagrange multiplier. **[9]**

b) Write the limitations of method of differential calculus. **[9]**

Q3) Maximise the function and also find the maximum value of function.

$f(x) = 20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$ **[16]**

OR

Q4) Write and explain the method of obtaining extremum point of multivariable optimization with equality constraints. **[16]**

Q5) a) Write and explain the conjugate gradient method of obtaining the extremumist. **[8]**

b) Write the steepest descent method of optimization of a problem. **[8]**

OR

Q6) By using dual simplex method, minimize function $f = 20x_1 + 16x_2$ subject to $x_1 \geq 2.5$, $x_2 \geq 6$, $2x_1 + x_2 \geq 17$, $x_1 + x_2 \geq 12$, $x_1 \geq 0$, $x_2 \geq 0$. **[16]**

P.T.O.

SECTION - II

Q7) Find the maximum of $f = x\,(1.5 - x)$ by starting from 0.0 with an initial step size of 0.05 from accelerated step size. **[16]**

OR

Q8) Find the maximum of $f = x\,(1.5 - x)$ in the interval (0, 1) to within 10% of the value by using exhaustic method. **[16]**

Q9) Explain the method of conversion of non serial system to a serial system problem. **[16]**

OR

Q10) Explain the computational procedure in dynamic programming. **[16]**

Q11) a) Explain the Gomory's cutting plain method. **[9]**

b) Explain the graphical representation integer linear programming. **[9]**

OR

Q12) Explain the basic concept of stochastic linear and non linear programming. **[18]**



Total No. of Questions : 12] **[Total No. of Pages :3**

P1645

[3965]-580
M.E. (Electrical) (Control Systems)
COMPUTER AIDED CONTROL SYSTEM DESIGN
(2008 Cource) (Elective - II) (503105)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain the conditions for compensation. **[4]**

b) Derive the transfer function of the following compensating networks and draw the corresponding bode diagrams. **[8]**

i) Phase - lag network

ii) Phase - lead network

c) Explain clearly the term 'Relative Stability' and discuss the measures of relative stability. **[4]**

OR

Q2) a) What are the advantages of feedback compensation? Explain with neat diagram the tachometer feedback compensation. **[6]**

b) For a unity feedback control system with **[10]**

$$G(s) = \frac{k}{s(s+1)}$$

Design a phase - lag compensator to meet the following design specifications.

i) Phase margin $\phi_m \geq 50°$

ii) Velocity error constant $K_\upsilon \geq 10$

Draw the Bode diagrams for compensated and uncompensated systems.

P.T.O.

Q3) a) Give algorithm and flow chart of the computer method for obtaining the transient response of a second order control system to a unit step input. **[12]**

b) Explain how to reshape this transient response plot to obtain the desired performance. **[6]**

OR

Q4) a) Explain briefly the importance of computer as an aid in the analysis and design of control system. **[6]**

b) Give algorithm and flow chart for obtaining frequency response by Bode plots from the given open - loop transfer function G(s) H(s) using a computer. Compare the computer method with classical approach for obtaining Bode plots. **[12]**

Q5) a) Define Critical point and discuss the different critical points in phase plane method. **[6]**

b) Explain with illustration the phase - plane technique for Simulating non - linear control system with 'Saturation as non - linearity'. How to obtain the time response from the phase - plane trajectory. **[10]**

OR

Q6) a) Define 'Describing Function' and state the important assumptions made in describing function method. **[6]**

b) Explain with algorithm the computer method for Simulating the control system Containing 'ON - OFF' (Ideal Relay) non - linearity using describing function method. How to determine the stability of non-linear control system using Describing Function Method? **[10]**

SECTION - II

Q7) a) Out line the procedure to determine the controllability and observability using computer method. Give its algorithm. **[8]**

b) Explain the computer method for obtaining the solution of state and output equations of a linear time-invariant closed - loop control system represented by:

$$\dot{x}(t) = Ax(t) + Bu(t)$$

$$y(t) = Cx(t)$$

With usual notations. Give its algorithm. **[8]**

OR

Q8) a) Explain the method of pole placement using linear - state variable feedback. Draw the appropriate block diagram. **[6]**

b) A linear control system is represented in state space form:

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 8 & -4 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design the linear state variable feedback to place the poles at desired locations; s = –2 and (–3 ± j1). **[10]**

Q9) a) What is the necessity of an observer? Explain the nature of the state estimation problem using full order observer. Draw neatly the block diagram showing the structure of an observer system. **[12]**

b) What is a linear regulator problem. State and explain the infinite - time state regulator problem based on quadratic performance index. **[6]**

OR

Q10) a) Draw block diagram and explain with suitable example the working of P, PI and PID controllers. **[6]**

b) Out line the design procedure of tunable PID controller using Ziegler-Nichols method. Give its algorithm. **[12]**

Q11) a) Explain the discrete linear regulator problem and outline the procedure for solving discrete-time matrix Riccati Equation. **[8]**

b) A discrete - time control system is represented by the difference equation,

$$x(k + 1) = Fx(k) + Gu(k)$$

With usual notations. Give algorithm and discuss the procedure for computer solution of closed-loop time response. **[8]**

OR

Q12) a) Explain with neat block diagram, the working of a typical digital computer controller scheme. **[8]**

b) Explain the following design specifications for digital control system. **[8]**

i) Disturbance rejection.
ii) Control effort constraints.
iii) Sensitivity to parameter variations, and
iv) Transient and steady state accuracy.

♦♦♦♦

Total No. of Questions : 8] [Total No. of Pages :2

P1648

[3965]-607
M.E. (E & TC/ Electronics)
Microwave / VLSI Embeded Systems / Communication Network/ Signal Processing / Digital Systems
PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(Sem. - I) (2008 Course) (504182)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss the prerequisities for planning of an IT project. **[8]**

b) Explain the importance of controlling as a function of process of management. **[8]**

Q2) a) Explain role & importance of business policy. **[8]**

b) Explain situations for revision of project plan & role of project manager. **[8]**

Q3) a) Explain theories of group formation? **[8]**

b) State the strategies for resolving destructive conflict. **[8]**

Q4) Write short notes on any three **[18]**

a) Business ethics & social responsibility.

b) Team management.

c) Six sigma.

d) PCMM

SECTION - II

Q5) a) Explain applications of IT in insurance & banking. **[8]**

b) Discuss concept of supply chain management (SCM) as modern approach to management. **[8]**

Q6) a) Enlist various project constraints, Explain any one of them in detail. **[8]**

b) Explain the process of tracking project progress. **[8]**

P.T.O.

Q7) a) Explain the concept of knowledge management. **[8]**

b) Explain the process of creating budget in details. **[8]**

Q8) Write short notes on any three **[18]**

a) Application of IT in product design & development.

b) Stress management.

c) Work breakdown structure.

d) IPR & cyber laws.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1650

[3965]-645

M.E. (E & TC) (Signal Processing)

SIGNAL PROCESSING TECHNIQUES

(2008 Course) (504502) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Linear and Circular Convolution. How Linear Convolution is calculated using circular convolution? Obtain the linear convolution using circular convolution for following sequence.

$x_1(n) = \{1, 2, 3\}$

$x_2(n) = \{2, 2, 2\}$ **[8]**

b) Find 4-point DFT $X(k)$, magnitude $|X(k)|$, and phase $\angle|X(k)|$ for a discrete time sequence $x(n) = \{1, 2, 3, 4\}$ **[6]**

c) Define ROC. State and explain any three properties of ROC. **[4]**

Q2) a) For a given difference **[8]**

$$y(n) = -\tfrac{3}{4}\,y(n-1) - \tfrac{1}{8}\,y(n-2) + x(n) + x(n-1)$$

Find:

i) Impulse response.

ii) Step response.

iii) Location of poles and zeros.

P.T.O.

b) Find N = 8 point DFT using Radix - 2 FFT DIT algorithm for given sequence.

$x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ **[8]**

Q3) a) Define DTFS and DFT. Obtain relation between DTFS and DFT. **[6]**

b) Consider the following DT system

$y(n) = 0.5\,x(n-2) + 0.25\,x(n-1) + 0.25\,x(n-3)$

Find DTFT, magnitude and phase spectra and sketch both. **[6]**

c) Explain how Z-Transform can be used to find Causality and Stability of system. Is it possible to design non Causal and Stable System? If yes or no then give proper justification. **[6]**

Q4) a) Give the comparison between Butterworth, Chebyshev- I, Chebyshev - II, and Elliptical filter. **[4]**

b) Explain in place computation and bit reversal in FFT algorithms. Explain number of computations for 16 point DFT and 16 point FFT. **[8]**

c) For a given $X(k) = \{6, -2 + j2, -2, -2 - j2\}$, find $x(n)$ using IFFT radix –2 Algorithm. **[4]**

SECTION - II

Q5) a) What are the advantages of Kaiser Window over other window? **[4]**

b) For the analog transfer function $H(s) = \dfrac{10}{s^2 + 7s + 10}$ determine $H(z)$ using impulse invariance method. Assume $T = 1$ sec. **[6]**

c) Obtain the Direct Form –II and Parallel Form realization for the given difference equation. **[8]**

$$y(n) = 0.5\,y(n-1) + 0.25\,y(n-2) + x(n) + x(n-1).$$

Q6) a) Design a Butterworth low pass filter using Bilinear Transform method for the following specification.

$0.9 \le \left| H(e^{j\omega}) \right| \le 1 \qquad 0 \le \omega \le 0.5\pi$

$\left| H(e^{j\omega}) \right| \le 0.2 \qquad 0.75\pi \le \omega \le \pi$. **[8]**

b) Explain the Impulse invariant method in detail. Derive the relation between S-Domain and Z-Domain, and relation between analog frequency Ω and digital frequency ω. Why it is not possible to design High Pass Filter and Band Pass Filter using impulse invariant Method? **[8]**

Q7) a) Design a FIR low Pass filter for M = 9 and $\omega_c = 3\pi/4$ using Hanning window. **[8]**

b) Why FIR Filter is Linear in Phase but IIR is Non Linear in phase. **[4]**

c) Write frequency - domain characteristics of any four window functions. **[4]**

Q8) a) Obtain direct form and cascade from realization for the transfer function of an FIR System given by

$H(z) = (1 + 0.5z^{-1} + z^{-2})(1 + 0.25z^{-1} + z^{-2})$

Is the FIR filter is linear in phase. **[8]**

b) Determine the impulse response and output response of the system.

$y(n) = \frac{5}{6} y(n-1) - \frac{1}{6} y(n-2) + x(n)$

to the input signal $x(n) = \delta(n) - \frac{1}{3}\delta(n-1)$

Show that because of the input signal pole-zero cancellation occurred. **[8]**



Total No. of Questions : 08] **[Total No. of Pages :2**

P1653

[3965]-688
M.E. (E & TC) Communication Networks
WIRED & WIRELESS NETWORKS
(2010 Course) (504607) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give the IEEE standards for LAN: Ethernet, Token Bus and Token Ring. Also explain in brief all standards. **[8]**

b) Describe the CSMA/CD protocol. **[8]**

Q2) a) Explain working of SONET in brief. **[8]**

b) Discuss ALOHA system with its two versions. **[8]**

Q3) a) Explain class full addressing and class less addressing schemes. **[8]**

b) Compare IPv4 and IPv6. **[9]**

Q4) a) Explain following internet control protocols. **[8]**

i) ICMP
ii) ARP
iii) RARP
iv) DHCP

b) What is the need of multiple protocols in communication? Discuss. **[9]**

SECTION - II

Q5) a) Discuss in brief: **[8]**

i) Internet trends.
ii) Internet applications.
iii) Network programming.

b) Explain the design issues for the protocol layers. **[8]**

P.T.O.

Q6) a) Explain fixed routing algorithm by giving one example. **[8]**

b) What is VPN? Discuss. **[8]**

Q7) a) Discuss VLAN in brief. **[8]**

b) What is VLSM? How does VLSM work? **[9]**

Q8) a) An organization is granted a block of addresses with the beginning address 14.24. 74 .0/24. The organization needs to have three subblocks of addresses to use in its three subnets as shown below: **[8]**

i) One sub block of 120 addresses.

ii) One sub block of 60 addresses.

iii) One sub block of 10 addresses.

Give its structure.

b) Discuss in brief about flooding Routing algorithm by giving one example. **[9]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1654 **[3965]-696**

M.E. (Electronics & Telecommunication) Communication Networks
NEURAL NETWORKS IN COMMUNICATION
(Elective - IV) (504611) (2010 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the desirable characteristics of artificial neural networks? Describe in detail the basic building blocks of artificial neural networks. **[8]**

b) Describe the importance of delta learning rule. Derive the extended delta rule. **[8]**

Q2) a) Describe the concept of the linear separability. Explain in detail how is boundary region (decision boundary) determined using linear separability concept. **[8]**

b) Draw and explain the McCulloch-Pitts neuron architecture. Generate the output of AND logic function using McCulloch-Pitts neuron. **[8]**

Q3) a) Explain the architecture of perceptron network used for the pattern classification. Describe the algorithm used for training of the perceptron net for several outputs. **[8]**

b) Using the perceptron learning rule, find the weights required to perform the following classifications. Vectors (1 1 1 1), (–1 1 1 –1) and (1 –1 1 –1) are members of class (having target value 1); vectors (1 1 1 –1) and (1 –1 –1 1) are not members of class (having target value –1). Use learning rate of 1 and starting weights of 0. Using each of the training vectors as input, test the response of the net. **[10]**

Q4) a) Describe in detail the problem of congestion control in packet switching networks. How this problem can be solved using the neural networks. **[8]**

b) Explain in detail how the static and dynamic channel assignment can be done using simulated annealing. **[8]**

P.T.O.

SECTION - II

Q5) a) What is auto associative memory? With an architecture explain the training algorithm used in auto associative networks. **[8]**

b) A hetero associative net is trained by Hebb outer product rule for input row vectors S = (X_1, X_2, X_3, X_4) to output row vectors t = (p1, p2). Find the weight matrix.

S1 = (1 1 0 0)	t1 = (1 0)
S2 = (1 1 1 0)	t2 = (0 1)
S3 = (0 0 1 1)	t3 = (1 0)
S4 = (0 1 0 0)	t4 = (1 0)

[8]

Q6) a) What is discrete Hofield network? Draw and explain the architecture of discrete Hopfield net. Compare and contrast discrete Hopfield net with Continuous Hopfield net. **[8]**

b) What is back propagation network? Describe in detail the training algorithm used in the back propagation network. Comment on the selection of parameters used in training. **[8]**

Q7) a) Why self organizing neural net is called the topology preserving maps? With architecture, explain the training algorithm used in Kohonen self organizing feature map. **[8]**

b) What is the basic concept of switching theory? Describe the different neural approaches to switching. **[8]**

Q8) Write short notes on (ANY THREE): **[18]**

a) Learning Vector quantization.

b) Neural Network channel equalization.

c) Automatic language identification using telephone speech.

d) Adaptive resonance theory.

e) Support vector machines.



Total No. of Questions : 10] **[Total No. of Pages :3**

P1655

[3965]-726
M.E. (Production) (CAD/CAM)
MECHATRONICS
(2010 Course) (511205) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in brief the evolution, scope and components of mechatronics systems? **[10]**

b) Distinguish between traditional design and mechatronics design. **[6]**

Q2) a) Examine the truth table below and design the simplest ladder logic using a Karnaugh map. **[8]**

D	E	F	G	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

P.T.O.

b) Explain the principle of working of the following: **[8]**

i) Ultrasonic sensors.

ii) Piezo - electric sensors.

Q3) a) Explain the following with examples: **[8]**

i) Resolution.

ii) Dynamic response.

iii) Calibration.

iv) Repeatability.

b) Discuss the following with reference to an accelerometer: **[8]**

i) Principle of working.

ii) Sensitivity.

iii) Mounting an accelerometer.

Q4) a) Explain the operation of a DC and AC signal conditioning system with neat block diagrams? **[10]**

b) Explain with a neat block diagram an operational amplifier? **[6]**

Q5) Write a short note on any three of the following: **[18]**

a) Force sensors.

b) Modes of control.

c) System modeling of sensors.

d) Number systems in Mechatronics.

SECTION - II

Q6) a) A PLC can effectively replace a number of components. Give examples and discuss some good and bad applications of PLC? **[8]**

b) A robot will be loading parts into a box until the box reaches a prescribed weight. A PLC will feed parts into a pickup fixture when it is empty. ThePLC will tell the robot when to pick up a part and load it into the box by passing it an ASCII string "pickup". Draw the line diagram and ladder logic diagram of box loading system. **[8]**

Q7) a) For the following Boolean equation,

$$X = A + B(A + C\bar{B} + D\bar{A}C) + ABCD$$

i) Write out the logic for the un - simplified equation. **[4]**

ii) Simplify the equation. **[3]**

iii) Write out the ladder logic for the simplified equation. **[2]**

b) What is the difference between a PLC and a desktop computer? Why do PLCs do a self check every scan? **[7]**

Q8) a) Distinguish between microprocessor and microcontrollers? Discuss the organization of microcontroller system? **[8]**

b) Explain the following with reference to analog inputs: **[8]**

i) Multiplexing.

ii) Single and double ended inputs.

Q9) a) What are the general components of data acquisition systems? Explain it with an engineering application? **[8]**

b) Find products that include fuzzy logic controllers in their designs? Suggest five control problems that might be suitable for fuzzy logic control? **[8]**

Q10) Write short note on any three of the following: **[18]**

a) Factors affecting the selection of the size of PLC.

b) Role of Artificial Intelligence in Mechatronics.

c) Interfacing of A/D converters.

d) Micro - sensors.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1657

[3965]-735

M.E. (Production) (CAD/CAM)

COMPUTER AIDED PRODUCTION PLANNING

(2010 Course) (511212) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in two separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the types of demand patterns? Explain them with suitable sketches. **[8]**

b) What are the different computerized methods for design of facility layout? Explain CRAFT. **[8]**

Q2) a) Explain the bond energy algorithm used for Group Technology. **[8]**

b) What are the benefits of Group Technology? **[8]**

Q3) a) What is the need for computer aided process planning? Describe the structure of process plan. **[8]**

b) Explain the methods part inspection using CMM. **[8]**

Q4) Write notes on: **[18]**

a) Measurement of forecast accuracy.

b) Design and manufacturing attributes in GT.

c) Non-contact type inspection methods.

P.T.O.

SECTION - II

Q5) a) What are the objectives of MRP? What is the input for MRP? **[8]**

b) Describe various approaches of ERP to Manufacturing. **[8]**

Q6) a) Briefly discuss different measures of performances in single machine scheduling problem with independent jobs. **[8]**

b) Describe which type of information/data is collected from shop floor. **[8]**

Q7) a) What is the purpose of simulation? Describe the steps involved in simulating a manufacturing system. **[8]**

b) Describe the types of simulations. **[8]**

Q8) Write short notes on: **[18]**

a) Implementation of ERP.

b) Shop floor control.

c) Applications of simulation of manufacturing system.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1659

[3965]-751
M.E. (Computer)
SOFTWARE DESIGN AND ARCHITECTURE
(2008 Course) (Elective - III) (510111)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section-I and three questions from Section-II.***
2) ***Question No. 4 and 8 are compulsory. Out of the remaining attempt two questions from Section-I and two questions from Section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain any four architectural styles with their quality attributes. **[8]**

b) How will you perform assessment of software architectures using different approaches. **[8]**

Q2) a) Describe and differentiate structured design and object oriented design. **[8]**

b) Explain different aspects of component based design. **[8]**

Q3) a) What are the dimensions of software product lines? Explain decomposition of software product lines as per these dimensions. **[9]**

b) Explain the process of architecture transformation. **[7]**

Q4) a) Differentiate between architecture and design. **[2]**

b) Write short notes on :

i) Profile specification. **[2]**
ii) Levels of component reuse. **[3]**
iii) Adaptation techniques. **[3]**
iv) Framework component models. **[4]**
v) Conflict resolution. **[4]**

SECTION - II

Q5) a) Explain with suitable example the design tasks for execution architecture view. **[8]**

b) Explain the role of software architects in software development. **[8]**

P.T.O.

Q6) a) Explain the notations for documenting behavior of a system. **[8]**
b) Explain the standard organization of interface documentation. **[8]**

Q7) a) Explain rule archetype pattern. **[8]**
b) Explain model driven architecture along with its key concepts. **[8]**

Q8) a) Explain pleomorphism. **[2]**
b) List out the uses of architecture documentation. **[3]**
c) Give standard organization for documenting a style. **[3]**
d) Write about translation and mapping with respect to archetype patterns. **[4]**
e) Write on extreme programming and literate programming. **[6]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1661

[3965]-755

M.E. (Computer)

SOFTWARE PROJECT MANAGEMENT

(2008 Course) (Elective - IV) (510112A)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With respect to project risks state the following:
   i) What are the key elements associated with project risks?
   ii) What are the stages of risk assessment?
   iii) What are the different aspects of risk control?
   iv) What are the activities of risk management?

b) List out typical FIVE risks associated with a software project and their mitigation steps.

[16]

Q2) a) State what is meant by issues in a project. Why is it important to track and manage issues? Give example of a typical issues-log used in a project.

b) What is the main mechanism for regularly communicating the state of the project to senior management and customer? What are the typical contents of a status report?

[16]

Q3) Write short notes on: **[18]**

a) Peer reviews.
b) Sub contract management.
c) Scope Management.

Q4) Explain with suitable examples the "scrum" methodology of software Project development. Elucidate the salient points of agile development. **[16]**

P.T.O.

SECTION - II

Q5) a) State what are the typical sections which are included in a project management plan.

b) Using an example project, chart out the details of the following sections:

i) Project Summary.

ii) Project Process.

[16]

Q6) Explain the significance of each of the following six quality characteristics detailing their sub characteristics. Bring out the essential aspects of quality factors which developers should be aware of.

a) Functionality.

b) Reliability.

c) Usability.

d) Maintainability.

e) Portability.

[16]

Q7) Assuming suitable data, state what are the deliverables of the design phase of a software project. Answer should include both the high level design as well as the detailed design stages. **[18]**

Q8) a) State what are the various types of company organizations and illustrate each with a suitable diagram. State advantages and disadvantages of each type of organization.

b) State how the work of a project manager/coordinator is affected by the type of organizational structure.

[16]



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1663

[3965]-776

M.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(2008 Course) (509103) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following: **[10]**

i) Particle polarization.

ii) Radial migration.

b) What are the two types of Cross Flow Filtration Equipment? **[8]**

Q2) a) Briefly explain Thermal Diffusion. **[8]**

b) Explain the regimes in cross flow electrofiltration. **[8]**

Q3) a) What is enriching and stripping in foam separations? **[8]**

b) Explain the principle of working in electrodialysis. **[8]**

Q4) a) Explain the process design considerations for adsorption compound size beds & compound type beds. **[8]**

b) Explain the non-isothermal effects in adsorption. **[8]**

P.T.O.

SECTION - II

Q5) a) What is Ion exchange chromatography? Explain its principle of working and describe what are counterions, coions and swelling of resines. **[10]**

b) Discuss the five steps in the kinetics of ion-exchange. **[8]**

Q6) a) Give the equation for solute movement in large scale chromatography explaining each term. **[6]**

b) What is zone broadening. **[4]**

c) What is plate height? Give the Van Deemter equation. Explain each term. **[6]**

Q7) a) Describe microfiltration and ultrafiltration. Give flux equations and applications for each. **[8]**

b) Explain flow coupling and thermodynamic interactions. **[8]**

Q8) a) Explain the gel layer resistance model. **[8]**

b) How can fouling be reduced? **[4]**

c) Explain coated and uncoated membranes. **[4]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1664

[3965]-792

M.E. (Chemical)

CATALYSIS & SURFACE PHENOMENON

(2008 Course) (Elective - IV) (509112)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the information obtained from an adsorption isotherm. Explain with examples. **[8]**

b) What are the L-H & L-H-H-W models? **[8]**

Q2) a) Describe the random pore model. **[8]**

b) What is the mercury porosimetry method? **[8]**

Q3) a) Describe the steps involved in preparation of a catalyst by precipitation method & describe the effect of each step. **[10]**

b) Derive the equation of Thiele modulus for spherical particle. **[8]**

Q4) a) How does external transport affect feasibility of reaction? Explain all cases. **[10]**

b) Describe the condition of surface reaction control. **[6]**

P.T.O.

SECTION - II

Q5) a) What is effective diffusivity? **[6]**

b) Derive an equation for maximum temperature difference across a catalyst pellet. **[6]**

c) What is the importance of pore size & pore size distribution in catalysis? **[6]**

Q6) a) What is catalyst deactivation? What are the causes for deactivation? **[8]**

b) Describe a shrinking core model for deactivation. **[8]**

Q7) Write in detail about Fischer-Tropsch reactions and the various proposed mechanisms. **[16]**

Q8) Write the process of Methanol Synthesis giving the role of catalyst & mechanism involved. **[16]**



Total No. of Questions : 7] **[Total No. of Pages :4**

P1665

[3965]-815
M.E. (Petroleum Engg.)
PETROLEUM RESERVOIR MANAGEMENT
(Sem. - I) (2008 Course) (512102)

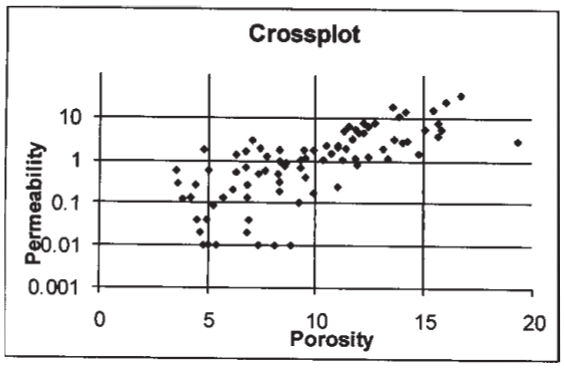
Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Assume additional data if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Solve any two questions each from section I and section II.***

SECTION - I

Q1) a) Following figure shows a poro-perm (k against Φ) cross plot for a carbonate reservoir (N = 87). Assume that all samples represent identical volumes. **[15]**



Treating them as the sample space, calculate the probabilities of each outcome of the following from figure along with appropriate explanation. (Assume criterion of cutoff is $K \geq 1$ and porosity 10%)

i) Probability of $K > 1$

ii) Probability of $\Phi > 10\%$

iii) Probability of $(K > 1) \cap (\Phi > 10\%)$

iv) Probability of $(K > 1/\Phi < 10\%)$

v) Probability of $(0.1 < K < 1) \cap (5 < \Phi < 10)$

b) Answer **any two** of the following **[10]**

i) Why do rock properties vary from at different locations within the reservoir?

ii) Why is the knowledge of reservoir heterogeneity important in the evaluation process?

iii) Why two rock samples of same porosity can have significantly different permeability?

P.T.O.

OR

Q2) a) An oil water capillary pressure experiment on a core sample has given following results. **[10]**

$P_{c,o/W}$[psi]	0	4.4	5.3	5.6	10.5	15.7	35.0
S_W[%]	100	100	90.1	82.4	43.7	32.2	29.8

Given that the sample was taken from a point 100 ft above the oil - water contact, what is the expected water saturation at that elevation? If the hydrocarbon bearing thickness from the crest (top) of the structure to the oil - water contact in 175 ft, what is the average water saturation over this interval? **(ρ*w* = 64*lb* / *ft*3 and ρo = 45*lb* / *ft*3)**

b) Illustrate with the help of a representative diagram standard rock porosity model for shaly sandstone. Why is it necessary to use different tools and measurement techniques to understand different portions of pore system? **[15]**

Q3) a) Define recovery factor for an oil reservoir. Describe (with the aid of diagrams) three different reservoir drive mechanisms. (Your description must include the production characteristics e.g., how pressure; GOR and WOR behave with time, as well as some indication of their relative efficiencies.) **[10]**

b) Explain following terms. **[15]**

i) Net thickness and gross thickness of a formation.

ii) Effective permeability and relative permeability.

iii) Dynamic reservoir model and earth model.

OR

Q4) a) Explain the differences between a **drainage** flood and an **imbibition** flood at the pore scale, paying particular attention to the roles played by **pore size, film - flow** and **accessibility to the inlet.** **[10]**

b) Following fine scale models generated below are prepared on 1 × 1m block, which needs up scaling to 5 × 5m block size. **[15]**

Calculate the effective properties for a coarse block representative of all five blocks

Porosity (Ø)					permeability (K)					Water Saturation (Sw)				
20	25	14	07	22	99	91	81	50	85	09	31	13	25	26
10	15	06	09	07	02	93	29	71	28	10	37	26	15	18
13	21	23	10	12	06	01	09	04	10	22	37	39	37	28
06	24	15	08	19	28	95	83	82	22	12	10	25	10	29
22	22	09	08	09	76	60	98	91	62	15	22	15	37	10

SECTION - II

Q5) a) Consider the following stratified reservoirs as waterflood candidates. Held a comparison between them. Thickness of them is almost same. Assume partial communication between them **[10]**

i) Permeability of upper layer is 1 Darcy and lower layer is 50 MD.

ii) Permeability of upper layer is 50 MD and lower layer is 50 1 Darcy.

b) At 70% water saturation and 30% oil saturation, water and oil were flowed at rates of 2.86×10^{-2} m^3 / d and 1.9×10^{-3} m^3/ d respectively through a 30 mm × 15 mm diameter core plug at a pressure difference of 207 kPa. **[15]**

Use $Q_w = -k_w(\gamma / \mu)_w.A.dh_w/dl$ or $k_w = -(Q_w/A)(\mu/\gamma)_w/(dh/dl)_w$

Use $Q_o = -k_o(\gamma / \mu)_o.A.dh_o/dl$ or $k_o = -(Q_o/A)(\mu/\gamma)_o(dh/dl)_o$

Calculate Relative permeability to oil and Relative permeability to water.

OR

Q6) a) Describe in brief effectiveness of Waterflooding in **any three** of following reservoirs. **[15]**

i) Reservoir with large gas cap.

ii) Reservoir with thin high permeability channels.

iii) Reservoir with strong bottom water drive.

iv) Highly faulted reservoir (sealing fault)

v) Shallow viscous oil reservoir.

b) Test runs on three core samples form three wells in the procured field yielded the following three sets of values for water saturation (Sw), porosity (φ), and permeability (k).
It is believed that these three properties can be used to determine the recovery fraction (RF). **[10]**

	Core 1	Core 2	Core 3
ϕ	.185	.157	.484
S_w	0.476	.527	.637
k	.614	.138	.799
Recovery factor	.283	.212	.141

The recovery factor can be expressed by the following equation:

$RF = a_0\varphi + a_1Sw + a_2k$, where a_0, a_1, and a_2 are constants.

Calculate Recovery factor if: Sw = .75, φ = .20, and k = .85.

Q7) a) Use following production data (million barrels) for calculation. **[15]**

Year	Annual production MM bbl
1	0.38325
2	0.42705
3	0.47633
4	0.53108
5	0.64277
6	0.64277
7	0.64277
8	0.56283

Year	Annual production MM bbl
9	0.493115
10	0.431795
11	0.378505
12	0.331420
13	0.290175
14	0.254405
15	0.222650

Following are the assumptions for the analysis:

i) Oil price is $ 65 and is constant through out the project tenure.

ii) Initial Investment is $ 70 MM and production cost is $ 4.00 / bbl. Initial investment is to be considered only in the beginning of project.

iii) Royalty is 10% on gross revenue.

iv) Rate of return is 10%.

v) Cost recovery is 100% and is allowed to deduct with the commencement of commercial production. The unrecovered cost is allowed to carry forward to next year.

vi) Profit petroleum is to be shared between government and operator @ 60% and 40% respectively.

vii) Operator is entitled to pay 30% income tax on profit.

Prepare a tabular form giving details of cumulative production, gross cash flow, royalty, net cash flow, cost recovery, recovered cost, profit petroleum, government share, and operator share, tax for operator, profit for operator, NPV for operator BFIT and AFIT. How one barrel or equivalent $ 65 is distributed amongst Government and operator?

b) Write a note on Production Sharing contract in India? **[10]**



Total No. of Questions : 7] **[Total No. of Pages : 4**

P1666

[3965]-825

M.E. (Petroleum Engg.)

GIS and Computer Applications in Petroleum Industry

(Sem. - II) (2008 Course) (512108)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any two questions each from Section - I and from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume additional data if required.***
4) ***Use of graph paper is allowed.***

SECTION - I

Q1) a) What are spatial objects? Classify natural and artificial spatial objects giving suitable examples of each. **[15]**

b) Draw and define following CAD operations.
Reselect, dissolve, eliminate, update and split. **[10]**

OR

Q2) a) What are the advantages and disadvantages of Raster structures as opposed to Vector structures? **[10]**

b) What is Relational Database System (RDBMS)? How it is compared with Object based Management System (ODBMS)? **[10]**

c) You are given data in a matrix of 8 x 8. This needs to be encoded to understand spatial autocorrelation. **Compress the information as run length code and rewrite the same**.

	1	2	3	4	5	6	7	8
1	0	1	1	1	0	0	0	0
2	1	1	0	0	0	1	1	0
3	0	0	1	1	0	0	1	1
4	0	0	0	1	1	0	1	1
5	0	0	1	1	1	1	0	0
6	0	1	1	0	0	0	1	1
7	0	0	0	1	1	1	0	0
8	0	0	0	1	1	0	0	0

[5]

P.T.O.

Q3) a) Answer any two of the following question: **[10]**

i) Spurious polygons.

ii) Three important characteristics of projections.

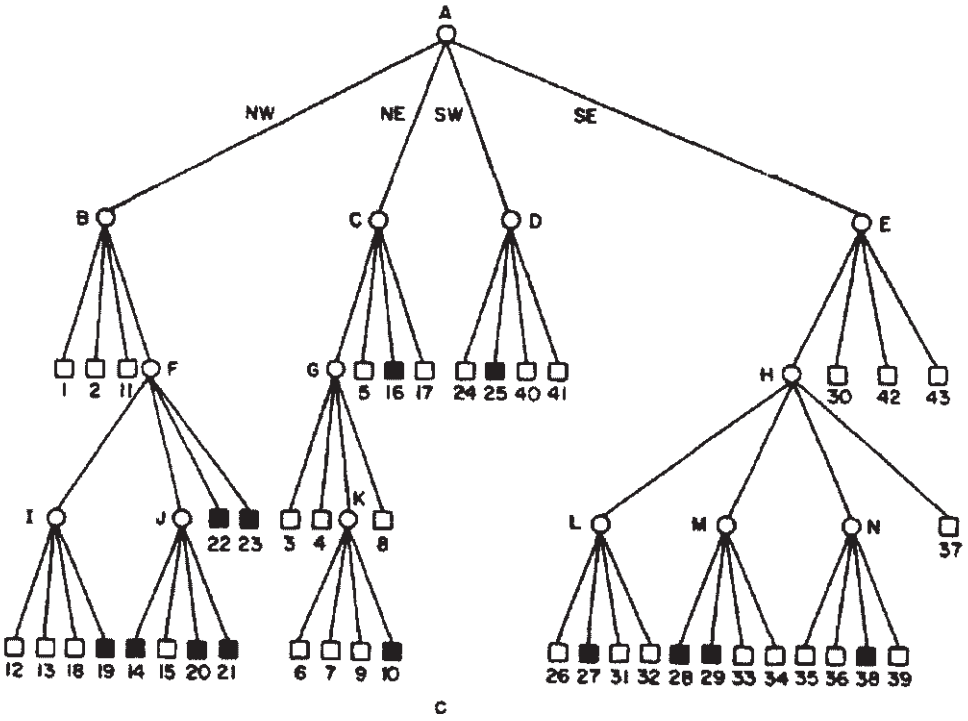
iii) Georeferencing.

iv) Autocorrelation.

b) How does Structured Query Language help in the creation of maps based on selective attribute data? What are the major types of SQL? **[15]**

OR

Q4) a) You are given a quadtree organized as per Morton order. Square node in the figure shows non continuation of object, while circle node indicates continuation of object for next order.



The object under consideration is shown by black squares. Convert this into a map representation following Morton order arrangement. **[10]**

b) What is Spatio-temporal data model in GIS? Explain in brief main concepts defined for a space-time path. Discuss an application where spatiotemporal analysis is useful to understand short and long term changes. **[15]**

SECTION - II

Q5) a) Explain the utility of Digital Elevation Model (DEM) in computing primary subsurface attributes useful in understanding geometry of different formations. **[15]**

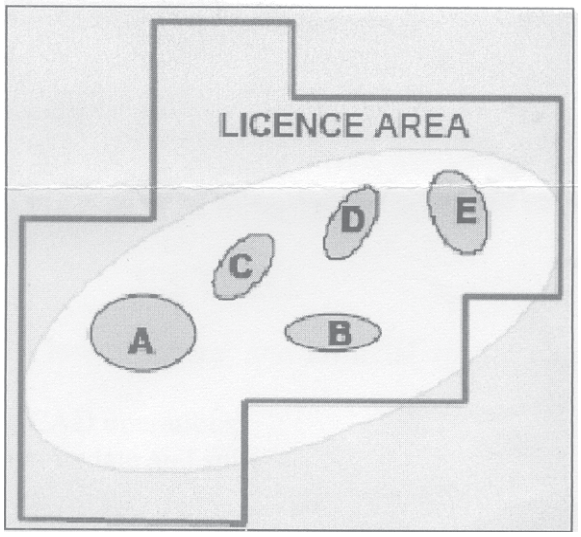
b) Explain the difference between static maps and dynamic maps with supporting examples. How is anisotropy taken into consideration. **[10]**

OR

Q6) a) Figure given below shows presence of many plays in a license area controlled by dependent and independent parameters to decide the value of reservoir.

Design a template for the creation of a 3D Reservoir model taking into consideration the foresaid dependent and independent parameters.

Also list out information on attributes to be included in the DBMS, which would allow a means to review the reservoir model and update the same.



How this database is useful in the creation of different maps? **[10]**

b) What is the difference between deterministic and probabilistic approach in the mapping of oil spill hazard and contingency planning using GIS and Remote Sensing techniques? **[15]**

Q7) a) Answer any two of the following: **[20]**

i) What are the five basic steps required in the design of any GIS project to avoid unnecessary work and duplication of database.

ii) Buffer zone creation around a point, line and area with suitable examples.

iii) Site selection using different Boolean operations.

iv) Utility of GIS in integrating the information in the life span of typical oil and gas field development project.

v) Implementation of environmental management model in the oil and gas operations by means of Remote Sensing and GIS.

vi) Multivariate maps.

b) You are designing a database for a subsurface with an accuracy of 10 m and 100 m. for an area of 100 km x 100 km. What is the difference in the maps created from this database? **[5]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1667

[3965]-826

M.E. (Petroleum Engineering)

ENVIRONMENTAL MANAGEMENT TECHNOLOGY AND SAFETY MEASURES

(2008 Course) (512109) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Attempt any two questions from section I and section II.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Assume additional data, if necessary.***

SECTION - I

Q1) a) Write in brief on air pollution due to activities of oil and gas industry. **[10]**

b) Discuss various forms of radioactive wastes by incorporating the concept of radioactivity decay. Apply this concept to short term against long term contaminants. **[15]**

OR

Q2) a) An example of industrial waste has an average flow of 1,230,000 gpd (4656 m^3/d) with BOD5 of 9850 1b/d (4468 kg/d). Calculate BOD concentration and the equivalent populations of hydraulic and BOD loadings. **[15]**

b) An activated - sludge process has a tank influent BOD concentration of 140 mg/L influent flow of 5.0 Mgal/d (18,900 m^3/d) and 35,500 1b (16,100 kg) of suspended solids under aeration. Calculate the F/M ratio. **[10]**

Q3) a) Describe various pathways through which waste produced during drilling and production can migrate. **[15]**

b) Write in brief about petroleum site evaluation for environmental impact assessment. **[10]**

OR

Q4) a) Two rectangular settling tanks are each 6 m (20 ft) wide, 24 m (80 ft) long, and 2.7 m (9 ft) deep. Each is used alternately to treat 1900 m^3 (0.50 Mgal) in a 12 h period. Compute the surface overflow (settling) rate, detention time, horizontal velocity, and outlet weir loading rate using H - shaped weir with three times the width. **[15]**

b) Explain the conceptual flow path of environmentally controlled process. **[10]**

P.T.O.

SECTION - II

Q5) a) Answer any two of the following: **[20]**

i) Detection of H_2S at a drill site and operations in such environment.

ii) Different ways of decommissioning of wells and structures.

iii) Thermal treatment of hazardous waste.

b) What is BOD and COD? **[5]**

OR

Q6) a) Write a detailed note on " Decommissioning of offshore oil and gas installations using following points.
Legal framework, abandonment phases, structure removal, disposal and site clearance. **[20]**

b) What are environmental related operational problems with oil separation equipment? How are they solved in field? **[5]**

Q7) a) Discuss the protocol for field investigation of a contaminated site, assuming the contaminations due to spilled petroleum products.
Support your discussion by considering the following: **[20]**

i) Levels of protection,

ii) Work zone control, and

iii) Knowledge of safety procedures.

b) What is environmental audit? **[5]**

OR

Q8) a) Give an overview of environmental regulations applicable to oil industry in India. **[15]**

b) What are the environmental consequences of wide spread use of **[10]**

i) Biofuels and

ii) LPG/CNG.

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1668

[3965]-2

M.E. (Civil) (Construction and Management)

CONSTRUCTION EQUIPMENT AND MATERIAL MANAGEMENT

(2002 Course) (501102)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question 1 and 5 are compulsory. Out of remaining solve any two questions from each section.***
2) ***Numbers to the right indicates full marks.***
3) ***Neat figures are drawn wherever required.***
4) ***Answers to each section must be written in separate answer books.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) For a National highway site, the subgrade preparation is in progress. Total length of road is 50km with total excavated quantity 50,000 cu.m (aaprx.). The complete excavated soil is to be used for filling. Excavation and compaction are to be done simultaneously. The excavated soil is a combination of murum and soft rock. Carry out complete planning related to sub grade preparation considering following points : **[18]**

- Drainage arrangement.
- Excavating equipments.
- Compacting equipment.
- Site layout.

Q2) a) Differential between dragline, backhoe, shovel and clamshell w.r.t. **[10]**

- Types of soil in which used.
- Advantages.
- Limitations.
- Depth of excavation.
- Applications.

b) What are different methods of compaction used for different types of soils? Name the compactors which are used for the same. **[6]**

P.T.O.

Q3) a) What are various types of cranes? Give applications of each. **[8]**

b) Draw a labeled sketch of screw conveyor and belt conveyor. Also differentiate between the two. **[8]**

Q4) a) Draw a neat and labeled sketch of scraper. Also write it's advantaged and disadvantages. **[8]**

b) What are different types of hammers used for pile driving? State its applications and advantages. **[8]**

SECTION - II

Q5) Design an aggregate crushing plant to produce aggregates of 40mm, 20mm, 10mm and sand. Rocks and boulders are to be brought from nearby quarry site. Give list of equipments needed for the complete operation with reasons. Assume suitable data if required. **[18]**

Q6) Write short notes on any two of following : **[16]**

- Rock bolting.
- Shotcreting.
- Drilling jumbo.

Q7) a) Write detailed note on slip form pavers. **[8]**

b) Compare between following : **[8]**

i) Hire and purchase of equipment.

ii) Small size and large size equipments.

Q8) a) Write sequence of operations for precast siporex building blocks. **[8]**

b) What are the factors that decide the replacement of equipment? **[8]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1670

[3965]-32
M.E. (Civil) (Structures)
EARTHQUAKE RESISTANT DESIGN OF STRUCTURE
(2002 Course) (501507)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1893-2002 (Part-1) is permitted.***

SECTION - I

Q1) a) What is an earthquake? Classify earthquakes based on different parameters? **[6]**

b) Classify and describe with suitable sketches different types of waves generated by an earthquake and their effects on structure? **[9]**

c) Define liquefaction and describe the factors affecting on it? **[10]**

Q2) a) Describe using diagrams how the irregulatories of mass, stiffness, strength are not desirable in a building located in earthquake prone area. **[10]**

b) Discuss various approaches to deal with the problems of non-structures. Which approach you recommend for a flexural structure. **[15]**

Q3) A plan of five storey SMRF building for T.V. Centre is as shown in figure 3.1. The Dead Load including self weight of slab etc. is 5 kN/m^2 and Live Load 4 kN/m^2 on each floor and 1.5 kN/m^2 on the roof. The building is situated in Zone IV. Assuming soil type II and storey height 3.5m, determine lateral forces and shears at different storey levels. **[25]**

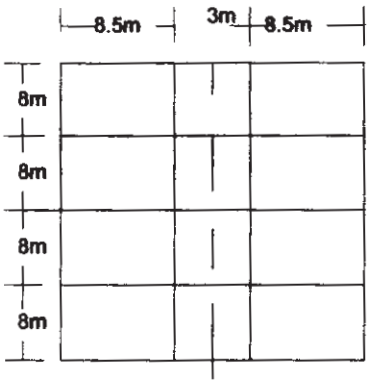


Figure 3.1

P.T.O.

SECTION - II

Q4) a) What is the necessity of ductile detailing? What are the variables affecting ductility? **[10]**

b) What is Seismic Evaluation? Classify different retrofitting techniques. Explain conventional techniques of retrofitting for RC buildings. **[15]**

Q5) a) What is Seismic Isolation? Discuss the in details the concepts of Isolators and Dampers? **[10]**

b) A Cantilever Slab 1m × 1m and 100mm thickness projects from a 225mm thick wall to the outside of the building. The slab is located 1m above the roof of the building. Assuming that the weight of the roof slab is 8 kN per meter length of the wall, examine the stability of cantilever if it is situated in Zone III. Assume wall above cantilever supports the slab. **[15]**

Q6) Write short notes on : **[25]**

a) Strengthening of Steel Buildings.

b) Behavior of Shear Wall.

c) Effects of Non-Structures.

d) Ductile Detailing of Slabs.

e) Learning from past earthquakes in India.



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1671 **[3965]-45**

M.E. (Civil/Structures)

ADVANCES IN CONCRETE COMPOSITES

(Elective - II) (2002 Course) (501510)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What are composites? Explain stress-strain behaviour of concrete composites with less than 2% fiber content by volume. Compare stress-strain response w.r.t. plane concrete and fiber reinforced concrete. **[10]**

b) Classify and discuss various fibers used in concrete composites. **[15]**

Q2) a) Write about an empirical approach on the prediction of composite strength. **[10]**

b) Explain the concept of strong brittle fibers in ductile matrix and strong fibers in brittle matrix. **[15]**

Q3) a) Explain the influence of fiber volume fraction, fiber length, specimen size, matrix composition on flexural behaviour of FRC using steel and polymer fibers. **[10]**

b) What is toughness? Write on flexural toughness with techniques of it's measurement. How the deflection can affect the toughness index of concrete composites. **[15]**

P.T.O.

SECTION - II

Q4) a) Explain the flexural behavior, Elastic modulus, shear strength, creep and shrinkage properties of GFRC. **[10]**

b) What is impact? Discuss instrumented. **[15]**

Q5) a) Write a note on compliance approach in fracture mechanics. **[10]**

b) Explain the methodology of attaching a GFRC panel to steel plate. Briefly explain the applications of GFRC. **[8]**

c) Compare the properties of sheet made using the premixing process with dewatering process. **[7]**

Q6) a) Explain two basic process used for fabricating GFRCs. **[10]**

b) Enlist and explain various quality control test on GFRC. **[8]**

c) Enlist and explain each quality control test on GFRCs. **[7]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1673

[3965]-47
M.E. (Mechanical Engg.) (Heat Power)
ADVANCED FLUID MECHANICS
(2002 Course) (502106)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Assume suitable data, if required.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.***
4) ***Answer any three questions from each section.***

SECTION - I

Q1) Consider the fully developed flow between two parallel plates, separated by a distance h. The bottom plate is stationary and the top plate is moving with a velocity V. Determine :

a) The velocity profile. **[10]**
b) Wall Shear Stress. **[3]**
c) Pressure Gradient which will produce zero wall shear stress. **[4]**

Q2) a) List any two assumptions of the boundary layer theory. **[2]**
b) Assuming a linear velocity profile within the boundary layer, determine the boundary layer thickness δ as a function of x. **[10]**
c) Derive the expression for the skin friction coefficient C_f for the same linear velocity profile. **[5]**

Q3) For compressible flows :

a) Derive expressions for $\frac{T_0}{T}$ and $\frac{p_0}{p}$, where T_0 and p_0 are the stagnation temperature and pressure respectively. **[4]**
b) Derive Bernoulli's equation for compressible flows. **[12]**

P.T.O.

Q4) a) What are the first order Forward and Backward difference expressions for $\frac{\partial u}{\partial x}$? **[2]**

b) List the steps in solving $u_t + au_x = 0$. using the McCormack method, where 'a' is a constant. What is the stability criterion? **[5]**

c) Apply the McCormack method to the continuity equation for two dimensional compressible flow. Show how the density is updated. **[9]**

SECTION - II

Q5) a) Derive the continuity equation in cartesian coordinates for two dimensional compressible flow. **[15]**

b) Deduce the equation for 2 dimensional incompressible flow. **[2]**

Q6) a) Derive the expression for the substantial derivative $\frac{Du}{Dt}$. **[8]**

b) Using the substantial derivative expression (or otherwise), derive the Euler (inviscid momentum) equation in the x-direction. **[8]**

Q7) a) Deduce the Navier-Stokes equation for one dimensional un-steady flow. **[5]**

b) Let $\Psi = x^2 - y^2$. Is this a case of irrotational flow? If so, find the velocity potential ϕ and the velocity components at (1, 2). **[8]**

c) Find the pressure difference between the points (1, 2) and (3, 0). Assume density (ρ) = 1. **[4]**

Q8) A pipe has 300mm diameter at the inlet. At the oulet, the diameter is 220mm. The flow rate is $0.27m^3$ per sec. of water. The pipe has a 90 degree bend in the horizontal plane. The pressures at the inlet and outlet are 25 kPa and 10.8 kPa respectively.

Find :

a) Velocity at inlet and outlet. **[4]**

b) Resultant Force on the pipe. **[8]**

c) Frictional Loss (in kPa). **[4]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1678

[3965]-145
M.E. (Electronics) (Digital systems & Computer)
DSP & APPLICATIONS
(2002 Course) (504302)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the Inverse Z - Transform of **[8]**

i) $X(z) = \dfrac{z(z^2 - 4z + 6)}{(z-4)(z-2)(z-1)}$, for ROC |z| < 1

ii) $X(z) = \dfrac{z}{3(z-1)(z-\frac{1}{3})}$ for ROC | z | < $\frac{1}{3}$

b) State and prove following properties of Z - Transform **[8]**

i) Differentiation in Z - Domain.

ii) Convolution of Two sequences.

Q2) a) Explain the following terms. **[6]**

i) Decimation by factor D.

ii) Interpolation by a factor U.

b) Consider the signal **[6]**

$x(n) = a^n . u(n), | a | < 1$

i) Determine the spectrum $x(w)$.

ii) The signal $x(n)$ is applied to a decimator that reduces the rate by a factor of 4. Determine the output spectrum.

c) Explain the subband coding of speech signals. **[4]**

P.T.O.

Q3) a) The ARMA process is generated by the difference equation. **[8]**

$x(n) = 1.8\ x(n-1) - 0.6\ x(n-2) + w(n) + 0.8\ w(n-1)$

i) Determine the system function of the whitening filter and its poles and zeros.

ii) Determine the power density spectrum of $x(n)$

b) Explain the power spectrum estimation by the periodogram? **[8]**

Q4) Write short notes on **[18]**

a) Multiresolution analysis using Wavelet Transform.

b) Levinson Durbin algorithm.

c) IJR wiener Filter.

SECTION - II

Q5) a) Draw the basic structure of Two - channel Quadrature Mirror Filter (QMF) bank and explain synthesis of subband coding using QMF? **[8]**

b) Explain the use of DFT in power spectrum estimation. **[8]**

Q6) a) Explain MAC unit in DSP processor? Also explain the difference between pipelined MAC configuration and nonpipelined MAC configuration? **[10]**

b) Explain how FJR digital filtering can be carried out on DSP processor? **[6]**

Q7) a) Draw the diagram of speech production model and explain how the speech is produced? **[8]**

b) List the various properties of linear prediction error filter? Further explain the whitening property in detail? **[8]**

Q8) Write short notes on: **[18]**

a) Hardware architecture comparison of DSP processors & microprocessors.

b) DTMF signal analysis.

c) Image compression using wavelet transform.

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages :2**

P1680

[3965]-168
M.E. (Electrical) (Control System)
NON LINEAR CONTROL SYSTEMS
(2002 Course) (503102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain nonlinear characteristics- **[9]**

i) Soft and Hard Excitation.

ii) Jump resonance

iii) Limit cycle/self excited oscillations

b) Classify different types of singular points and discuss their significance. Comments on stability based on types of singular points. **[8]**

c) Explain the following non linearities in control system components. **[8]**

i) Saturation

ii) Relay with Hysterisis.

iii) Dead zone

iv) Back lash

Q2) a) Explain phase plane trajectory method to plot phase plane trajectory. **[8]**

b) Describe Delta method for constructing phase plane trajectory. **[8]**

c) Using isoclines method draw phase plane trajectory of $\ddot{x} + \dot{x} - 2x = 0$ for starting point as $x = 0.2,\ \dot{x} = 0$. **[9]**

P.T.O.

Q3) a) Derive describing function for relay with dead zone. **[8]**

b) In a unity feed back control system relay is connected in cascade with forward path transfer function $G(s) = \frac{2}{s(s+1)}$ .Draw phase plane trajectory for given control system. Also examine the existance of limit cycle. Comment on stability. **[17]**

SECTION - II

Q4) a) Explain Liapunov's direct method and it's mathematical representation for stability determination. **[8]**

b) Define terms in the sense of Liapunov **[8]**

i) Stability

ii) Asymptotic stability.

iii) Global Asymptotic stability.

iv) Instability.

c) Select Liapunov function and determine stability. **[9]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Q5) a) For the system **[17]**

$\dot{x}_1 = x_2$

$\dot{x}_2 = -x_1 - 2x_2$

Select i) $V = x_1^2 + x_2^2$

ii) $V = x_1^2 + 2x_2^2$ as Liapunov function and determine stability for each case.

b) Discuss different types of adaptive control system with illustrations. **[8]**

Q6) a) Explain krasovski method. Give advantages and disadvantages of it. **[9]**

b) Explain **[16]**

i) Popov method.

ii) Circle criteria.

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages :1**

P1681

[3965]-177
M.E. (Ele.) (Power Systems)
POWER SYSTEM MODELLING
(2002 Cource) (503203)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Your answers will be valued as a whole.***

SECTION - I

Q1) What is the need for power system modelling? What is simulation in P.S. modelling?

Q2) Describe with mathematical equations flux linkage modelling using pak's transformation.

Q3) Write about different loads and their modelling.

SECTION - II

Q4) Write about simplified mathematical model of hydro-turbine and governor system.

Q5) Obtain simplified model of excitation system of synchronous generator.

Q6) Write about mathematical modelling of auto - transformer and tap - changing transformer.



Total No. of Questions : 6] **[Total No. of Pages : 1**

P1682

[3965]-178
M.E. (Electrical) (Power Systems)
POWER SYSTEM PLANNING & RELIABILITY
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain the terms short term, medium term and long term planning in power system. Discuss the role of p.s - planner in short term planning. **[25]**

Q2) a) Discuss different types of loads on p.s. and describe their characteristics. **[10]**

b) Describe various methods used for load forecasting. **[15]**

Q3) a) Describe transmission system planning. **[12]**

b) Discuss procedure for distribution system planning. **[13]**

SECTION - II

Q4) a) What is capacity outage probability table? With an example explain how it is prepared. **[12]**

b) What is LOLP? How it is used for reliability of generating station? **[13]**

Q5) a) Explain frequency duration method used for reliability of p.s. **[13]**

b) Describe continuous Markov process and its application in reliability study. **[12]**

Q6) a) Show that MTTF is reciprocal of failure rate. **[13]**

b) Write brief notes on: **[12]**

i) Two state model.

ii) Energy forecasting.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1684

[3965]-203
M.E. (Computer)
ADVANCED DATABASE MANAGEMENT SYSTEMS
(2002 Revised Course) (Theory)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain with examples following concepts in the context of databases : **[16]**

a) Database schemas (Hint : Table definitions.....)
b) Data types (Hint : column types .....)
c) Need for distributed databases.
d) Query performance and query optimization.

Q2) In context of databases give examples, advantages and disadvantages of following database architectures/approaches. Write on ANY FOUR : **[16]**

a) Parallel databases.
b) Multimedia databases.
c) Object oriented databases.
d) Relational databases.
e) XML based databases.
f) CAD databases.

Q3) Explain ANY FOUR of the following concepts with examples : **[16]**

a) What is multidimensional data and multi dimensional queries.
b) Draw an ER diagram for a hypothetical examination system.
c) What do you understand by replicas, database caching.
d) Commit, rollback.
e) database views.

P.T.O.

Q4) Write short notes on ANY THREE : **[18]**

a) OLAP.
b) Point and range queries.
c) ACID properties of a transaction.
d) Role of Log Writer process, checkpoint process.
e) First three Normalization rules of databases.
f) MYSQL database.

SECTION - II

Q5) Write short notes on ANY THREE : **[18]**

a) Search engines and databases (Hint : google/www..).
b) Concurrency control using LOCKS.
c) Database Administrator's role (Hint : performance, tuning, security.....).
d) ODBC.
e) E - SHOPPING as application of databases (Hint : shopping for books.....).
f) ORACLE databases.

Q6) Give example and applications of following. Write on ANY FOUR : **[16]**

a) Data mining algorithms and applications.
b) Data warehousing.
c) SQL queries.
d) GIS.
e) Mobile databases.
f) XML.

Q7) Banks are doing transactions, business, and customer support at branches using computers (as database applications) as well as online using Internet. In context of banking and online web based banking in particular, explain with examples the following. **[16]**

a) Draw a ER diagram for a savings account application.
b) Need for security in banking (Hint : for banking using computers/internet).
c) Features, services that can be provided ONLINE and what kind of data needs to be maintained by bank for same (Hint : example tables.....).
d) Compare three modes to banking : : at a branch, through ATM, Through Internet.

Q8) With suitable examples, explain ANY FOUR of the following : **[16]**

a) Application of databases for automobile industry.
b) Deadlocks.
c) ER diagrams.
d) Primary and foreign keys.
e) SQL WHERE query.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1685

[3965]-205
M.E. (Computer)
MOBILE COMPUTING
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) State what are the five different kinds of bursts used in a GSM signaling system. Describe functions of any TWO of them. **[16]**

Q2) a) Enlist the functions of a Mobile Station (MS).

b) Explain how the mobile station automatically times and synchronizes to frequency and time slots provided by the BSC.

[16]

Q3) a) Narrate the distinction between the following service areas:

GSM, PLNM, MSC, LA and CELLS.

b) Why do the mobiles require two IDs viz. MS ISDN and IMSI?

c) What are the logical channels in GSM?

[18]

Q4) a) State why is it necessary to perform location updates for an MS in the GSM System.

b) How does an MS become aware of its change of location?

c) With the help of a suitable diagram explain the message sequences required to be generated in order to complete the GSM location update procedure.

[16]

P.T.O.

SECTION - II

Q5) Explain the functions of the following: **[16]**

a) Mobile ad-hoc network.

b) Access Router.

c) AUC database.

Q6) State what are the various multiple access procedures with respect to the communication medium using radio channels. Describe with suitable diagrams the functions and properties of any TWO of the following: **[16]**

a) FDMA.

b) TDMA.

c) CDMA.

Q7) Write short notes on the following: **[18]**

a) GPRS architecture.

b) SMS Gateway.

c) SIM card.

Q8) With respect to basic call set up scenario describe the process of mobile unit originating a call to a PSTN/ISDN subscriber. Using a suitable diagram show the various stages of call setup starting from RIL-RR channel request until RIL - CC Channel acknowledge when connection starts. **[16]**



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1686

[3965]-208
M.E. (Computer)
ADVANCED COMPUTER NETWORKS
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Consider a M/M/1 queuing model in which inter-arrival time distribution and service time distribution are both exponential and there is only one server. Assume that messages independently arrive to a system at the rate of 20 messages per minute. Their lengths are exponentially distributed with an average of 3600 characters.

They are transmitted on a 19200 bps channel. A character is 8 bits long.

(a) What is the average service time?

(b) What is the arrival rate A?

(c) What is the service rate D?

(d) What is the utilization of the server U?

(e) What is the probability that there are two messages in the system?

(f) What is Q, the average number of messages in the queue?

(g) What is N, the average number of messages in the system?

(h) What is Tw, the average waiting time in the queue? **[18]**

Q2) Write short notes on the following : **[16]**

a) ESAU - William Algorithm.

b) H - 323 protocol stack and inter-working architecture.

P.T.O.

Q3) a) What is the relationship between reliability of a channel, mean time between failures and mean time to repair?

b) State and explain the various modules of a typical network design tool. **[16]**

Q4) a) Explain in detail the management of network storage architecture.

b) Explain the significance and use of pilot signal. **[16]**

SECTION - II

Q5) a) State what is meant by a constraint minimum spanning tree problem. Explain the constraints used and the greedy algorithm to solve this problem.

b) Consider a network of 6 nodes starting from node zero to node 5. Given below are the links between the nodes and their costs. Let weight of each node be 1.

Link	Cost	Link	Cost
0 - 1	7	0 - 2	8
0 - 3	11	0 - 4	14
0 - 5	17	1 - 2	6
1 - 4	10	1 - 3	5
1 - 5	12	3 - 2	10
3 - 4	8	3 - 5	8
5 - 4	9	5 - 2	14
4 - 2	7		

Assume that it is desirable to find trees of minimum total cost subject to the constraint that the aggregate weight of the terminals on any multipoint line does not exceed a given weight i.e. Wmax is 3. The costs of the lines are shown in the above table. Lines chosen for the topology should not include any cycles.

What is the total cost of the network as per CMST algorithm? Does this algorithm give an optimal solution? **[18]**

Q6) Write short notes on : **[16]**

a) Prim's algorithm.

b) Ford-Fulkerson algorithm.

Q7) a) Using Shannon's channel capacity, find the ration C/Bw for CDMA systems - which operate at much lower Signal to Noise (S/N) ratios - given :

C - Channel capacity in bits per second

Bw - Bandwidth in Hz

S - Signal Power

N - Noise Power

If we want the system to operate on a link in which the integration rate is 10 kbps and the S/N ratio is 0.01, find out the bandwidth.

b) What are the major states of call processing in CDMA mobile station. Draw suitable state diagrams.

[16]

Q8) Explain the characteristics of

a) Adaptive routing and

b) Multitasking in deatil. **[16]**



Total No. of Questions : 10] **[Total No. of Pages : 4**

P1688

[3965]-219
M.E. (Petroleum)
ARTIFICIAL LIFT AND STIMULATION TECHNIQUES
(2002 Course) (512103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question numbers one and six are compulsory. Out of the remaining solve 2 questions from section-I and two questions from section-II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find out the depth for point of gas injection in continuous gas lift. Use the following data.

Depth = 8650 ft. Expected rate = 980 bbls/day. Tubing size = 2 ⅜ inch. P_{wh} = 200 psig, SBHP = 2750 psig. P.I. = 2.5, solution GOR = 260, SCF/STB, Sp. Gravity of injection gas = 0.68, S/C available pressure = 950 psig, ^{o}API = 41, S/C Temp. = 122^{o}F B.H. Temp. = 221^{o}F 275 psi/1000 ft = flowing gradient of FBHP. 22.5 psi/1000 ft = casing pressure gradient. Subtract 100 psi from point of balance. **[10]**

b) Draw IPR for a saturated oil reservoir using both Vogel's equation and Fetkovich's equation. Refer following data :

Reservoir pressure = 3,200 psia

Tested flowing bottom-hole pressure, pwf - 1 = 2,100 psia

Tested production rate at pwf - 1 = 500 stb/day

Tested flowing bottom-hole pressure, pwf - 2 = 1,000 psia

Tested production rate at pwf - 2 = 800 stb/day.

Assume n = 1 and c = 0.0001 stb/day-psi^{2n} **[8]**

P.T.O.

Q2) a) Following are the typical well conditions. Categorize the suitable parameters to select ESP, Gas lift-Continuous, Intermittent. PCP, Hydraulic-Jet, Reciprocating, as per applications, in a tabular form.

GOR, PI, BHP - High/Low

Applications in handling of viscous fluid, paraffin, solids handling capability. Offshore, deviated hole, High and low volume lift capability-Poor/fair/good/excellent/not applicable. **[12]**

b) It was desired to produce 630 bbls of oil per day from a well using gas lift. The optimum GLR at the operating point is 3070 SCF/STB. The Formation oil has a gravity of 32 ^{o}API and a GLR of 350 SCF/STB. Calculate the required gas injection rate. **[4]**

Q3) Draw the schematic sketch of subsurface layout of ESP components and their assembly. Calculate TDH and total HP, if pump with 0.39 HP/stage is available and each stage can provide a head of 25 feet.

Given Data :

It was expected to produce water of Sp. Gravity 1.07 (No gas) at the rate of 1300 bbls/day from 5350 ft deep well. The static liquid level = 2300 ft. Casing = 5 ½ inch O.D. Tubing = 2 ⅜ inch O.D. T = 154 ^{o}F. During the test on this water well it was seen that, it is producing 800 bbls/day with liquid level at 3000 ft in the csg., which then stabilized to above 2300 ft. Use 100 ft. safety in setting pump. Tubing friction is given as 30.5 ft/1000ft. At the surface there is 2300 ft of 2.0 inch flow line with an increase in elevation = 39 ft., with friction = 30.5 ft/1000ft. **[16]**

Q4) a) If the maximum stress should be within the allowable working stress, check the following SRP string and give your comments.

Given :

Well depth = 7,900 ft, Sp. Gravity of fluid = 0.88, Plunger diameter = 2 ¼ inch, Pumping speed = 18 SPM and Stroke length = 54 inch. Sucker rods are available in 25 ft lengths. Allowable working stress = 45,000 psi. You can use the expression,

Wf = 0.433 G (L.Ap - 0.294. Wr) to Calculate fluid weight in Ibs.

Percentage length and wt. per unit length of each section of the tapered rod string is,

1 inch rods = 36.9% = 2.9 lb/ft

7/8 inch rods = 36.0% = 2.22 lb/ft

3/4 inch rods = 27.1% = 1.63 lb/ft **[12]**

b) Draw the neat schematic sketch of subsurface pumping cycle of SRP. Indicate various components of it. **[4]**

Q5) Following are the oil and gas well production problems. Discuss the workover operations and or procedure in brief, to solve these problems. **[16]**

a) Low productivity.

b) Excess gas production.

c) Sand production.

d) Scale deposition.

SECTION - II

Q6) a) State the Inflow and Outflow expressions applicable at any two nodes of the well bore and explain them in brief. **[6]**

b) Draw the schematic graphs for any four of the following : **[12]**

i) Choke performance curves.

ii) Vertical lift performance curves with operating point.

iii) Vertical lift performance curves without operating point (TPR above IPR).

iv) Wellhead pressure Vs flow rate to indicate operating point of S/C flow line.

v) Pressure drop across the sandface Vs flowrate for specific tubing profile and perforation with operating point.

Q7) Refer the given relevant data, bottom hole flowing pressure Vs gas flow rate readings, pressure drop in 2.441 inch tubing against the said flow rate and find out the operating points to optimize the perforation sizing, flow capacity and pressure loss across the sand face. **[16]**

Given Data :

T_s = 100 °F, γ_g = 0.83, ϵ = 0.0006 inch, H = 11,800 ft,
T_R = 259 °F μ_g = 0.012 Cp, r_e = 1138 ft, r_w = 0.50 ft., S = 0,
h = 20 ft., perforation diameter = 0.7 inch., z = 0.97, Gravel permeability = 41 darcys., Screen O.D. = 3.06 inch., Hole diameter = 12.25 inch, 4, 8 and 12 perforations per foot are to be checked.

Q_{sc} Mscfd	Pwfs. Psia	Δ P psi (d = 2.441)
25,000	5650	500
20,000	5500	1500
15,000	5400	2230
10,000	5300	3090
5,000	5150	3740

Q8) Explain the following PVT parameters along with the necessary graphs. **[16]**

a) Oil formation volume factor.

b) Gas compressibility factor.

c) Oil viscosity.

d) Bubble point pressure.

Q9) a) Calculate the maximum acid injection rate using, safety margin 250 psi and maximum expected surface injection pressure at above rate for following job.

30 ft thick, 40 md sandstone pay zone at a depth of 9,000 ft is to be acidized with 1.07 Sp. Gravity acid solution and viscosity of 1.2 Cp using 2 inch ID coiled tubing. Fracture gradient is 0.7 psi/ft. Well bore radius is 0.328 ft.

Assume : reservoir pressure = 4100 psia.,

drainage area radius = 1600 ft and S = 9 **[10]**

b) Write and explain chemical reactions one each for matrix acidization of Carbonate and Sandstone mineral in brief. Also explain the meaning of dissolving power of acid. **[6]**

Q10) a) Use the inflow equations, drainage area concept and fracture conductivity defined skin factor given below. r_w = 0.35 inch,

r_e = 1790 ft., S = – 3.58. Calculate the productivity ratio, fold of increase in well productivity after fracturing job. **[4]**

b) Explain the hydraulic fracturing process using a typical surface read-out graph. Also write the various properties and selection criteria for fracturing fluid. **[12]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1692

[3965] - 233
M.E. (Petroleum)
OFFSHORE TECHNOLOGY
(2002 Course) (Elective - I) (512108)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answers any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List out the various deepwater drilling challenges. Discuss hole problems in deep water drilling operations, in brief. **[10]**

b) Classify different types of offshore structures and discuss the merits and demerits of fixed structures in brief. **[8]**

Q2) Write short notes on : **[16]**

a) Types of station keeping.

b) forces acting on a offshore vessel.

c) drill stem testing.

d) Horizontal well completion.

Q3) a) Describe any one type of mathematical model to calculate the current and wave forces during offshore drilling. State and express the assumptions, equations and limitations of this model. **[12]**

b) Write various reasons for well kick. **[4]**

Q4) a) Draw the schematic sketch and explain in detail the, 'dynamic positioning system'. **[10]**

b) Draw the schematic sketches of different types of, Blow out preventor stacks. **[6]**

P.T.O.

SECTION - II

Q5) Describe in detail any one case study to explain the application of horizontal and multilateral drilling technology in offshore field development. Write in brief the challenges in field development, selection criteria, advantages and demerits in the application of this technology. Also describe any one method to design trajectory of horizontal well. **[16]**

Q6) a) Explain with sketch, sub sea well completion. **[10]**

b) Write a note on, 'diving system'. **[6]**

Q7) a) Discuss various principles and equipments for oil and gas separation in brief. **[8]**

b) Write short note on : **[8]**

i) Remote operated vehicles (ROV).

ii) Offshore safety.

Q8) a) List the various methods of productive formation testing and explain any one in detail. **[10]**

b) Explain drillers method of well control in brief. **[8]**



Total No. of Questions : 10] **[Total No. of Pages :4**

P1693

[3965]-281
M.E. (Industrial)
HUMAN FACTORS ENGINEERING
(2003 Cource)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic calculators , MTM tables & PTS tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the basic presumptions in the Human Factors Engineering? **[6]**

b) Explain in brief the development of Human Factors Engineering over the years. **[6]**

c) Discuss the characteristics of Man Machine Systems. **[6]**

Q2) a) Define and explain the following: **[8]**

i) Qualified worker.

ii) Interference allowance.

b) What is meant by performance rating? What is the necessity of rating? What is rated in rating? What factors influence rating? **[8]**

Q3) a) Explain the reason for having low efficiency of about 15% for using heavy hammer in comparison to that of about 25% in case of cycling. **[8]**

b) A worker is shoveling sand at a rate of 10kcal per minute. How much rest does he need in a shift of 8 hours? How should the rest be allocated? **[8]**

Q4) a) Explain the concept of methods time measurement(MTM). **[6]**

b) What do you understand by activity sampling. State its application. **[6]**

c) Explain in brief stop - watch method of work measurement. **[4]**

P.T.O.

Q5) Write short notes on: **[16]**

a) Basal Metabolism,

b) Maximum Aerobic Power.

c) Importance of manual material handling analysis.

d) Factors influencing human power and capacity for physical activity.

SECTION - II

Q6) a) What is the reason to have static and dynamic factors in method time measurement analysis? How do these factors affect the time required for doing an activity? **[8]**

b) What is a Time Measurement Unit? Is it uniform for different predetermined time standard systems? Give the reasoning for your reply with suitable example. **[8]**

Q7) a) Discuss the approach you will use to design a mall counter and student seating arrangement in a college. **[8]**

b) Discuss the general principles of seat design. **[8]**

Q8) a) Discuss different approaches used in determining the maximum manual material handling capacity. **[8]**

b) How will you reduce the risks involved in manual material handling? **[8]**

Q9) a) An object, which has a diameter of 15 mm. is kept on a table within reach of an operator. It has to be kept aside on the same table at a distance of 200 cm on the same table. You are required to find out the time required for this, mentioning clearly the assumptions made by you. Make use of the data tables enclosed. **[10]**

b) Mention the advantages of predetermined time standards over conventional methods of evaluation of work content. **[6]**

Q10) a) Explain the concept of micro - motion study and its applications. **[6]**

b) State the various types of work elements used in work measurements. State the criteria for selecting various work elements. **[6]**

c) What are the errors in activity sampling? **[6]**

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages :2**

P1695

[3965]-291
M.E. (Chemical)
ADVANCED THERMO DYNAMICS
(2002 Course) (109102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Curvature has an effect on surface properties. Explain the phenomenon. **[7]**

b) List the surface thermodynamic properties. **[6]**

c) What are exergonic & endergonic processes. **[5]**

Q2) a) What are the different types of systems? Explain any one type. **[8]**

b) What is LCST & UCST? Explain in detail. **[8]**

Q3) a) How is super conductivity achieved? **[8]**

b) Explain the enzymatic action in the phosphorylation of glucose. **[8]**

Q4) a) What are the critical phase gas - liquid transitions. **[8]**

b) Explain the different types of disorders in a system. **[8]**

SECTION - II

Q5) a) Derive the equations for applying I law of thermodynamics to systems involving chemical reactions. **[8]**

b) What is a reaction coordinate? **[3]**

c) What are the reasons for non-ideality in liquid - liquid systems. **[5]**

Q6) a) What is the meaning of quantum state of the whole macroscopic system? **[4]**

b) Show that quantum states of equal energy are equally applicable. **[12]**

P.T.O.

Q7) a) Describe Debey - Huckel theory. **[10]**

b) Compare weak & strong electrolytes . **[8]**

Q8) Explain the following: **[16]**

a) Accessibility.

b) Ensemble.

c) Statistical weight factor, degeneracy.

d) Statement for De Donder's inequality.

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1697

[3965]-413
M.E. (Civil) (Const. & Mgmt.)
PROJECT ECONOMICS AND FINANCIAL MANAGEMENT
(2002 & 2008 Course) (501109) (Sem. - II)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What constitutes financial management? What is the role of the finance manager? Explain in detail, role of lender's engineer, associated with any major civil - engineering project. **[12]**

b) Explain the utility of the (PBP) with relevant example from construction sector. **[6]**

Q2) a) Explain the overall methodology of capital budgeting under risk, as applied to construction projects with appropriate examples. **[4]**

b) A particular project has the following expected cash flows and probability values as given below.

Year	Cash Outflow (Rs) C_O	Cash Inflow (Rs) C_I	Probability p
1	2,00,000	–	0.90
2	4,00,000	–	0.82
3	6,00,000	8,00,000	0.65
4	3,00,000	10,00,000	0.55
5	2,50,000	7,00,000	0.70
6	1,00,000	4,00,000	0.30

Based on NPV at 14% decide whether the proposal is worthy of investment. Why? **[12]**

P.T.O.

Q3) a) Innumerate the various ways in which the funds were raised from conception to completion of the Konkan Railway project. Discuss the hurdles faced and the solutions determined thereof. In your opinion, is the case study an example of financial success or a financial failure? Justify. **[12]**

b) Explain the terms "cost of finance" and "opportunity costs" with examples. **[4]**

Q4) a) Explain the utility of an Income - Expenditure statement to a construction organisation with an example. **[4]**

b) Prepare a balance sheet based on the following data for a contractors organisation. **[12]**

i)	Principal amounts to be paid back to the share-holders	–	Rs. 6,556,378
ii)	Amounts invested in shares	–	Rs. 7,144,318
iii)	Value of land procured	–	Rs. 3,791,893
iv)	Yearly bonus payable to share holders	–	Rs. 9,000,000
v)	Security deposit paid	–	Rs. 1,91,086
vi)	Personal loans taken	–	Rs. 4,398,581
vii)	R.A bills to be paid to Sub - contractors	–	Rs. 1,206,916
viii)	Interest charges	–	Rs. 2,029,544
ix)	Machinery procured	–	Rs. 2,88,799
x)	Bills certified by the consultants	–	Rs. 2,81,937
xi)	Bills pending of various Suppliers	–	Rs. 11,856,558
xii)	Fixed deposits	–	Rs. 1,924,816
xiii)	Debtors	–	Rs.7,544,952
xiv)	Provisions	–	Rs. 11,07,602
xv)	Amount to be paid for sundry items	–	Rs. 18,05,349
xvi)	TDS to be paid	–	Rs. 73,393
xvii)	Tax deducted at source	–	Rs. 7,73,455
xviii)	WIP inventory	–	Rs. 4,36,425
xix)	Corporation charges to be paid	–	Rs. 4,66,833
xx)	Liquidity	–	Rs. 1,23,472.

SECTION - II

Q5) Discuss merits, de-merits of the various sources of generating equity as well as debt capital, after explaining each source in brief. **[18]**

Q6) Explain importance of any 8 financial ratios used in financial analysis with an example. **[16]**

Q7) a) Explain the various principles of financial accounting with an example each. **[12]**

b) Draw a typical cash flow diagram associated with any construction project. **[4]**

Q8) Explain with examples.

a) Impact of various tender conditions on financial planning and management. **[8]**

b) S curves and their utility in financial management. **[4]**

c) Estimation of working capital needed for a major civil Engineering project. **[4]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1699

[3965]-437
M.E. (Civil) (Hydraulic Engg.)
WATER RESOURCES PLANNING &MANAGEMENT
(2008 Course) (Sem. - I) (501302)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Explain the issues related to development of water resources in India. **[8]**

b) Considering the planning aspects, explain the recent trends in water resources engineering. **[8]**

Q2) a) State the aspects of determination of industrial and domestic water demand. **[8]**

b) Explain any four methods of conservation of available water resources. **[8]**

Q3) a) Total cost of a multipurpose project is 40 million Rs. Allocate the total cost of the project to each purpose with following data by any two methods.

Purpose	Estimated Benefits	Separable Cost	Alternate Single Purpose Cost
Irrigation	19.6	11	17
Flood Control	7	5	8
Power	24	13.4	17.4

All costs are in million rupees. **[10]**

b) How do you correlate Water Resources Management and decision making. **[8]**

P.T.O.

Q4) Write short notes on (any four): **[16]**

a) Global water partnership.

b) Role of governance in Water Resources Management.

c) Waterways recreation.

d) Virtual water.

e) Flood absorption capacity of reservoir.

SECTION - II

Q5) a) Discuss about Macro Analysis of Water Resources Development strategies in detail. **[8]**

b) Explain the concept of water quality models. **[8]**

Q6) a) Explain the procedure of estimating life of a reservoir. **[6]**

b) Describing the causes of silting of reservoirs. **[6]**

c) Which are the methods of forecasting of floods? Explain any one method. **[6]**

Q7) a) What is the role of ICOLD in Water Resources Planning and Management. **[6]**

b) "Interlinking of rivers in India" Opine on the technical aspects of this strategy. **[10]**

Q8) Write short notes on (any four): **[16]**

a) Insufficient irrigation system & wastage of water.

b) Sustainable agricultural development.

c) Farmer's participation in Water Resources Planning & Management.

d) Global water partnership: issues.

e) National water policy.

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1700

[3965]-473
M.E. (Civil Structure)
OPTIMIZATION TECHNIQUES
(2008 Course) (501412) (Elective - IV)

Time : 4 Hours] ***[Max. Marks : 100***

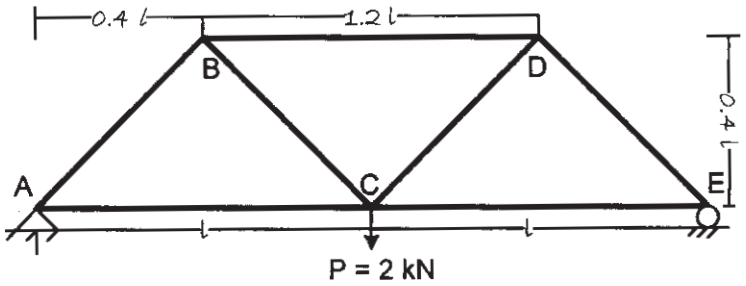
Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket claculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various engineering applications of optimization. **[5]**

b) Formulate an optimization problem for minimum weight of the given truss structure considering the tensile and compressive stress generated in each member must not be more than the corresponding allowable strength of the material. Take allowable strength as 500 MPa and E as 200 GPa. **[12]**



c) Find the maxima and minima of the function. **[8]**

$f(x) = x^3 - 10x - 2x^2 + 10$

Q2) a) Explain Post-Optimality analysis and bounded variable method. **[6]**

b) Maximize **[10]**

$Z = x_1 - x_2^2$

Subject to, $25 - x_1^2 - x_2^2 \geq 0$,

$x_1^2 + x_2 \leq 9$,

$0 \leq x_1 \leq 5$,

$0 \leq x_2 \leq 10$

Using Big-M technique.

P.T.O.

c) Maximize **[9]**

$Z = 3x_1^2 - 2x_2$

Subject to, $2x_1 + x_2 = 4$

$x_1^2 + x_2^2 \leq 19.4$

$x_1 \geq 0$

Using revised simplex method.

Q3) a) Use Fibonnaci method to maximize. **[10]**

$F = x^3 - 12x - 2x^2 + 10$

b) Use golden section method to minimize. **[10]**

$Z = 10 + x^3 - 2x$ in the range of (–5, 5).

c) Explain Interpolation methods. **[5]**

SECTION - II

Q4) a) Minimize $f = (x_1 + 3x_2 + x_3)^2 + 4\ (x_1 - x_3 - 2)^2$. If a base simplex is defined by the Vertices

$$X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix},\ X_2 = \begin{Bmatrix} 2 \\ 0 \end{Bmatrix},\ X_3 = \begin{Bmatrix} 1 \\ 1 \end{Bmatrix}$$

Find a sequence of two improved vectors using reflection, expansion and/or contraction. **[12]**

b) Minimize $f = x_1^2 + x_2^2 + 2x_3^2 + 2x_1 x_2 + 2x_2 x_3 - 3x_1$ from the starting point (2, –1, 0) using Cauchy's method (two iterations only). **[13]**

Q5) a) Complete one iteration of the reduced gradient technique for the following NLP problem. **[13]**

Minimize $x_1^2 + 2x_2^2$

Subject to $x_1^2 + x_2^2 = 5$

Use a starting feasible solution $X_0 = \begin{Bmatrix} 1.0 \\ -2.0 \end{Bmatrix}$

Initial $\alpha = 0.25$, and all termination factors equal to 0.01.

b) Minimize $f = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 + -7)^2$

Subject to $(x_1 - 5)^2 + x_2^2 - 26 \geq 0$

$x_1, x_2 \geq 0$

Use the interior penalty function method. **[12]**

Q6) a) Illustrate the difference between Genetic Algorithms and traditional methods of optimization. Explain the way of representation of design variables in GA's. **[13]**

b) What is a neural network? How is a neuron modeled in neural network based models? **[12]**



Total No. of Questions : 9] **[Total No. of Pages : 2**

P1705

[3965]-525

M.E. (Mechanical) (Design Engineering)

INDUSTRIAL TRIBOLOGY

(2008 Course) (Elective - IV) (502212 - B)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the mechanism of adhesive wear. Derive equation for the law of adhesive wear as proposed by Archad. Explain Rowe's modification of Archad equation. **[16]**

Q2) a) Explain rolling friction & rolling resistance. **[8]**

b) Derive the expression for coefficient of friction using theory proposed by Bowden and Tabor and compare it with expression obtained by modified Adhesion theory. **[10]**

Q3) Derive Reynolds equation for hydrodynamic action with assumption. **[16]**

Q4) a) With help of simple sketch resolve the frictional effects in tyre-road contact. **[8]**

b) With sketch how the nature of metal surfaces. Why surface texture assessment is essential parameter in tribology. **[8]**

P.T.O.

Q5) A fixed inclined slider bearing has maximum to minimum film thickness ratio as '2'. It operates under hydrodynamic condition. Derive an expression for its load carrying capacity in terms of following parameters.

a) Viscosity of lubricant (μ)

b) Siding velocity (v).

c) Length and width of bearing ('L' and 'B').

d) Minimum oil film thickness (h_o).

State applications of filling pad-thrust bearing. **[16]**

SECTION - II

Q6) Using modified Reynold's equation for elasto-hydrodynamic lubrication derive Ertel-Grubin equation. State the limitations of this equation. **[16]**

Q7) Assuming generalised Reynold's equation derive Reynold's equation for aerodynamic bearings in dimensionless form. Explain various terms in the equation. State the advantages and limitations of air lubricated bearings. Give their applications. **[16]**

Q8) Two cylinders of radii R_1 and R_2 and length 'L' are rotating against each other and transmitting load 'W'. The cylinders are made of same material with modulus of elasticity 'E' and poisson's ratio 'M'. Find the width of contact. **[16]**

Q9) Write short notes on (Any Three): **[18]**

a) Sommerfeild no. & its importance in bearing design.

b) Power losses in Hydrostatic step bearing.

c) Piston-pin lubrication.

d) Stick - slip vibration resulting from friction relaxation its causes and remedies.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1708

[3965]-565
M.E. (Mechanical) (Automotive)
AUTOMOTIVE FUELS AND EMISSIONS
(2008 Course) (502306) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from one section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn where necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if required, but state the assumptions clearly.***

SECTION - I

Q1) a) Discuss the number rating of Petrol and Diesel. **[6]**

b) Comment on the crude oil availability scenario in the world. What kind of impact is there on India? **[6]**

c) Discuss the benefits and drawbacks of using alternative fuels. **[6]**

Q2) a) Classify alternative fuels and discuss the importance of alternative fuels in the Indian context. **[8]**

b) Explain in brief the benefits of blending ethanol with gasoline. **[4]**

c) Explain in brief why hydrogen is termed as a freedom fuel. **[4]**

Q3) a) Explain the process of pollutant formation during various stages of diesel combustion. **[8]**

b) What do you mean by stoichiometric combustion in SI engine? What is the definition of excess air ratio and adiabatic flame temperature? **[8]**

Q4) Write short notes on : **[16]**

a) Synthetic Fuels.

b) Transesterification for Biodiesel Production.

c) LPG fuel Kit.

d) Biogas as a vehicular fuel.

P.T.O.

SECTION - II

Q5) a) Explain the health effect of pollutants from automobiles on Human health. **[6]**

b) Discuss the working of a three way catalytic converter with a neat sketch. **[6]**

c) What are evaporative emissions? How are they controlled? **[6]**

Q6) a) Discuss the role of diesel particulate filter and diesel oxidation catalyst in reducing PM and CO, HC emissions in diesel engines. **[8]**

b) What is the importance of EGR in CI engine? **[4]**

c) Explain the concept of chemical delay in CI engine. **[4]**

Q7) a) Explain the concept of enthalpy of combustion. How is enthalpy of combustion for methane combustion reaction calculated? **[8]**

b) Explain the influence of engine operating variables on pollutant formation in IC engines. **[8]**

Q8) Write short notes on : **[18]**

a) Selective Catalytic Reduction.

b) Euro emission norms.

c) Enthalpy of formation.

d) Greenhouse gas emissions.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1711

[3965]-635

M.E. (E & TC) (VLSI & Embedded System)

EMBEDDED SIGNAL PROCESSING

(Sem. - II) (2008 Course) (504189)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is correlation? Find out cross - correlation of following. Finite length sequences. **[6]**

$$x(n) = \{1, 2, 3, 9, 6\}$$
$$\uparrow$$
$$y(n) = \{-1, 2, -3, 4\}$$

b) Compare linear & circular convolution. How linear convolution is calculated using circular convolution. Find linear convolution using circular convolution for following sequences. **[6]**

$$x_1(n)\ \{1, 1, 1\},\ x_2(n) = \{1\ 1\ 1\}$$
$$\uparrow \qquad\qquad \uparrow$$

c) What is Discrete Cosine Transform (DCT)? Discuss in detail the different properties of DCT. **[6]**

Q2) a) Design a Butterworth filter using the impulse invariance method for the following specifications. **[8]**

$$0.8 \le \left|H(e^{j\omega})\right| \le 1 \qquad 0 \le \omega \le 0.2\pi$$

$$\left|H(e^{j\omega})\right| \le 0.2 \qquad 0.6\pi \le \omega \le \pi$$

P.T.O.

b) Draw the signal flow graph complete in all respect for 8 point DIT FFT. **[4]**

c) Find IDFT of a given sequence.

i) X (K) = [10, – 2.0 + 2.0 i, – 2.0, – 2.0 – 2.0i]

ii) X (K) = {0, 0, 2, 0}

[4]

Q3) a) With reference to DSP processor explain the following:

i) Pipelining.

ii) Hardware multiplier - acumulator.

iii) Special Instructions.

[8]

b) What are requirement of DSP processor? Describe important blocks & parallelism in built in DSP processor. **[8]**

Q4) Write short notes on (any three): **[16]**

a) DTMF generation & detection.

b) Data - flow graph.

c) Havelet Transform.

d) IEEE floating point representation format.

SECTION - II

Q5) a) Compute the iteration bound of the given DFG using LPM algorithm.

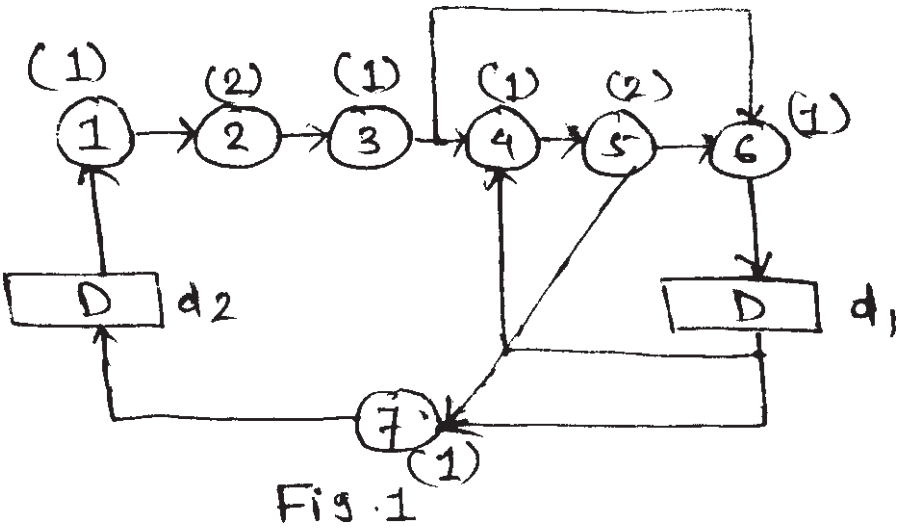


Fig. 1

[8]

b) Define unfolding? State & explain properties of unfolding. **[8]**

Q6) a) Consider the DFG shown below.

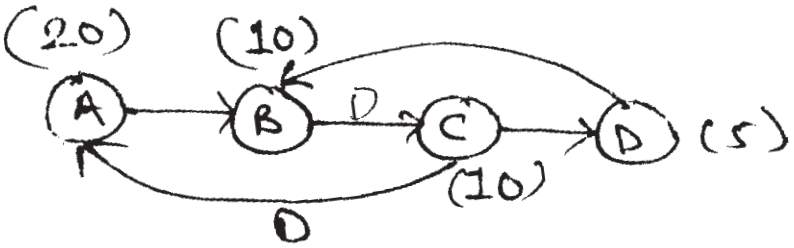


Fig. 2. DFG1

i) What is the maximum sample rate of this DFG.

ii) Manually retime this DFG to minimize the clock period.

[8]

b) What are the architecture issues of 32 bit TMS 320C67X floating point DSP processor? With the suitable example explain programming consideration for C67X processor. **[8]**

Q7) a) Draw & explain the architecture of black fin processor. **[8]**

b) Explain different addressing modes of TMS 320 C54XX. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Inverse Modeling.

b) Adaptive filters.

c) Folding transformation.

d) Window functions & their characteristics.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1714

[3965]-681

M.E. (E/TC) (Communication Networks)

MODELLING AND SIMULATION OF COMMUNICATION NETWORKS

(2010 Course) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain how simulation helps in performance studies of the following types of communication systems. **[10]**

i) Analytically tractable system.
ii) Analytically tedious system.
iii) Analytically intractable system.

b) Compare and contrast deterministic and stochastic simulations. **[8]**

Q2) a) What is effect of fixed point and floating point arithmetic on quantization error? **[8]**

b) What is up sampling and down sampling? Illustrate these concepts with reference to simulation of a communication system. **[8]**

Q3) a) What is direct component and quadrature component of a signal? Hence determine direct component x_d (t) and quadrature component x_q (t) for an angle modulated signal defined by **[6]**

$x(t) = 10 \cos [2\pi (100)t + 2 \sin (2\pi (10) t)]$

b) What are the various techniques to test random number generators? Compare and contrast the following algorithms. **[10]**

i) Scatter Plots.
ii) Durbin-Watson Test.

P.T.O.

Q4) a) Describe the situations when one will choose one of the following estimation routines based on the data generated by simulation process. **[8]**

i) Histogram.
ii) PSD.
iii) Gain, Delay and Signal-to-Noise Ratio.

b) What are correlated Gaussian numbers? Why do we need them? Explain any two techniques to generate correlated Gaussian numbers in detail. **[8]**

SECTION - II

Q5) a) Enlist factors to be considered while simulating nonlinearities. **[6]**

b) Write an algorithm for simple Monte Carlo simulation for QPSK. Assuming AWGN channel, Data symbols at source output are independent and equally probable and No pulse shaping performed at transmitter. **[12]**

Q6) a) What is semi analytic simulation technique? Hence write an algorithm for semi analytic BER estimation for QPSK. **[8]**

b) Explain two state Markov model for discrete channel with memory. **[8]**

Q7) a) What are the categories of a communication channel? What are the various specifications to be considered while simulating a radio channel? Elaborate multipath fading channel. **[10]**

b) What is state Markov model for discrete channel with memory? Write an algorithm to demonstrate the same. **[8]**

Q8) a) What is tapped delay line model for LTV system? How various tap gains are generated? **[8]**

b) What are the different techniques used to reduce run-time of the Monte Carlo method? Hence explain importance sampling. **[8]**



Total No. of Questions : 10] **[Total No. of Pages :2**

P1720

[3965]-739

M.E. (Computer Engg. & Computer Network)

PRINCIPLES & PRACTICES FOR IT MANAGEMENT

(Sem. - I) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of feasibility plan & also steps involved in feasibility planning? **[6]**

b) Explain the importance of research for a project & what percentage of a project's time, on average, is given to research? **[6]**

c) Explain the matrix organizational structure also state the merits & demerits of the same? **[6]**

Q2) a) What advice can you offer in regard to preparing budgets for IT projects? Also discuss most expensive part of IT budget? & what are first - aid tips for run over budget? **[8]**

b) How important is it for a project to have WBS? Also explain different methods to create WBS? **[8]**

Q3) a) Explain the project plan elements? **[4]**

b) What is the most difficult part of implementing a long - term project? **[4]**

c) What process should be in place to control proposed project changes? **[4]**

d) Explain the Gantt chart and it's drawbacks? **[4]**

Q4) **Identify the components/documents of an adequate project plan & explain the function of each. Components include:**

Table of contents, Executive summary, Sponsors, Team members, Requirements, WBS, Expected resources, Environmental issues, Business and technical requirements, Implementation plans, support plans, Training plans, Revision control. **[16]**

P.T.O.

Q5) Write Sort Notes on Following: **[16]**

a) CRM.

b) Use of IT in Health care.

c) Use of IT in Finance.

d) Use of IT in insurance.

SECTION - II

Q6) a) Explain different protocols & procedures along with certain example scenarios used in team management in the role of project manage?

(Hint : use following discussion points to support your answer: Decision making, working with team Members, risk management) **[10]**

b) Explain in detail how to conduct the business meeting? **[8]**

Q7) a) Explain the significance of third party review? & explain how to carry it? **[6]**

b) Explain the concept of six sigma in detail with the help of example? **[6]**

c) Explain the meaning of software licensing? **[4]**

Q8) a) Explain the meaning of change management related to IT project & best practices carried out to achieve this? **[8]**

b) What is ethical hacking? Explain the significance of it? **[4]**

c) Explain the concept of TQM (Total quality management.) **[4]**

Q9) a) Explain the concept of Supply change management in detail? **[6]**

b) Explain any process for assessing quality of project deliverables? **[6]**

c) Quality comprise what two things to a project manager? **[4]**

Q10) Write Sort Notes on : **[16]**

a) IPR (intellectual property rights).

b) CMMI

c) Team conflict management.

d) Principles of management.

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages :3**

P1723

[3965] - 790
M.E. (Chemical)
MATHEMATICAL METHODS IN CHEMICAL ENGG.
(2008 Course) (509111) (Elective - III)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Determine the stability and type of the critical point. Then find a real som. Finally sketch or plot some trajectories in the phase plane **[18]**

a) $y'_1 = y_1$, $y'_2 = 2y_2$

b) $y'_1 = -3y_1 + y_2$, $y'_2 = y_1 - 3y_2$

c) $y'_1 = y_2$, $y'_2 = -9y_1$

Q2) a) Use fixed point iteration method to determine the roots of foll. eq^{n}s. Note that correct pair of roots is $x = 2$ and $y = 3$. Initiate the computation with guess at $x = 1.5$, $y = 3.5$ **[8]**

$4(x, y) = x^2 + xy - 10 = 0$, —— ① $v(x, y) = 4 + 3xy^2 - 57 = 0$ —— ②

b) Determine the roots of following simultaneous nonlinear eq^{n}s. Use Newton Raphson method. **[8]**

$(x - 4)^2 + (y - 4)^2 = 4$ —— ①

$x^2 + y^2 = 16$ —— ②

Q3) a) Solve the following system of equations using LU decomposition **[8]**

$$12x_1 - x_2 + 3x_3 = 8$$
$$x_1 + 7x_2 - 4x_3 = -51$$
$$4x_1 - 4x_2 + 9x_3 = 62$$

b) Use Gauss elimination to solve **[8]**

$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$
$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$$
$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$$

P.T.O.

Q4) a) Employ power method to determine highest eigen value for foll system.

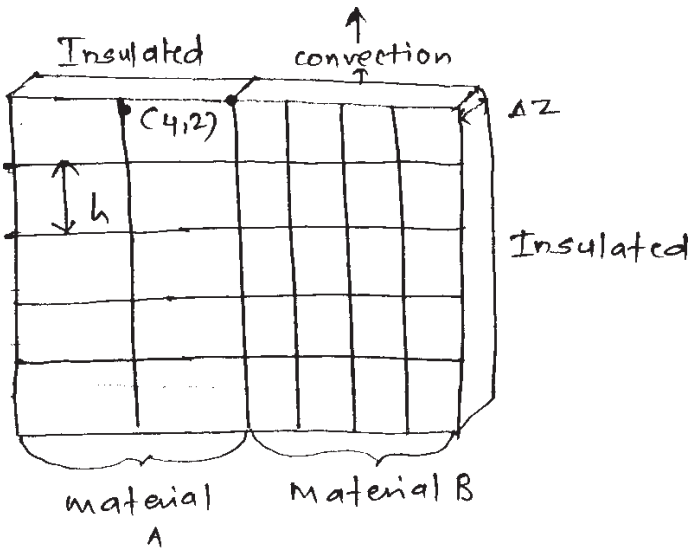
$$3.556\,x_1 - 1.778x_2 = \lambda x_1$$
$$-1.778\,x_1 + 3.556x_2 - 1.778\,x_3 = \lambda x_2$$
$$-1.778\,x_2 + 3.556x_3 = \lambda x_3$$ **[10]**

b) What do you mean by ill conditioned system and well conditioned system in case of elimination methods. Explain with suitable example.**[3]**

c) What are various method used to solve algebraic equations. Enlist them alongwith their merits and demerits. **[3]**

SECTION - II

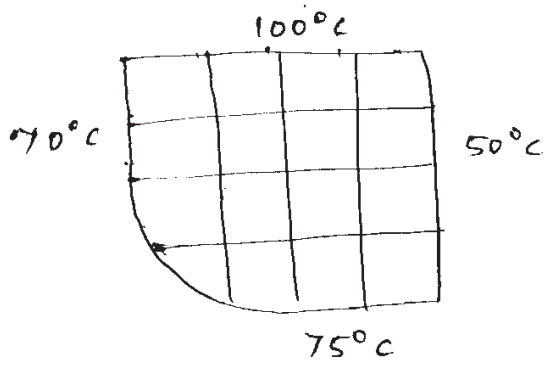
Q5) a) Use control volume approach to determine the temp. equation for the node (4, 2) in a plate shown in following figure **[8]**



b) What are various boundary conditions applied in solving laplace equations. Enlist and explain with suitable example. **[4]**

c) What do you mean by convergence and stability in explicit method.**[4]**

Q6) a) Use Liebmann method to solve for the temp. distribution of the heated plate in figure shown below. Do it for one iteration. **[10]**



b) Write short note on finite element method used for solving partial differential equations **[6]**

Q7) a) Explain step by step procedure used for implementing finite element method for solving partial differential equations. **[10]**

b) Use explicit method to solve for temp. distribution of a long, thin rod with a length of 10 cm and the following values K' = 0.49 cal/s. cm°C, Δx = 2 cm, and Δt = 0.15. At t = 0 the temp. of the rod is zero and the boundary conditions are fixed for all times at T(0) = 100°C and T (10) = 50°C. Note that rod is of aluminium with c = 0.2174 cal/g°C and ρ = 2.7 g/cm^3. Do it for two iterations. **[8]**

Q8) a) What do you mean by perturbation classify it and differentiate bet^n its main types. **[4]**

b) Use cranck nicolson method to the problem given in question 7b). **[8]**

c) Derive eq^n of implicit method used for solving parabolic eq^{n}s by using finite difference method. **[4]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1724

[3965]-807

M.E. (Chemical) (Environmental Engg.)

SOLID WASTE MANAGEMENT

(2008 Course) (Sem. - II) (509139)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the objectives of solid waste management and discuss the Environmental impact of mismanagement? **[8]**

b) Explain the hierarchy of integrated solid waste management. **[8]**

Q2) a) Discuss the types of collection system of solid waste. **[8]**

b) What are the means and methods for transportation of solid waste? **[8]**

Q3) Discuss the following in details; **[16]**

a) Factors affecting the storage and collection.

b) Guidelines for sorting of material recovery.

Q4) Explain the principle, construction and working of the following with neat diagrams; **[18]**

a) Waste Heat Boilers.

b) Pyrolysis.

c) Incineration.

P.T.O.

SECTION - II

Q5) a) Discuss the energy recovery from solid waste. **[8]**

b) Define the landfills. Explain the site selection & methods of landfilling. **[8]**

Q6) What are the various functional elements of solid waste management system & discuss the industrial scenario of solid waste management. **[16]**

Q7) For solid waste disposal site, the avg.-speed data obtained is;

Distance X, km/trip	10	20	30	40	50	60
Avg. Haul speed, Y, km/hr	25	28	38	50	58	65
Total Time, hr.	0.4	0.71	0.78	0.8	0.86	0.92

Find the haul speed constants “a” and “b” and the total time for site located at 45 km. away. **[16]**

Q8) Write short notes on: **[18]**

a) Transfer Stations.

b) Solid waste generation rate.

c) Economic Analysis of solid waste management.



Total No. of Questions : 8] **[Total No. of Pages :4**

P1726

[3965]-816
M.E. (Petroleum)
HORIZONTAL, MULTILATERAL AND INTELLIGENT WELLS
(2008 Course) (512103) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Q.1 and Q.5 are compulsory. Out of the remaining attempt two questions from section I and two questions from section II.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different types of wells from the point of field development? Explain GTO in brief. **[6]**

b) Use the common and specific case data given below and find out the case of minimum drilling cost. Also state, how will you optimize the cost for optimum bit weight and rotary speeds, if rotating / drilling time - cost is operating cost, bit and trip cost is to be considered as fixed cost. **[6]**

Data:

Rig cost = $ 4000/hr. Bit cost = $ 50,000/-

Trip time = 6.5 hr.

	Bit weight 1b	Rotary speed rpm	Drilled footage ft	Rotating time hr.
Case 1	75,000	127	149	5.06
Case 2	65,000	92	192	8.65
Case 3	65,000	65	217	12.28

c) Compare between vertical, directional and multilateral well drilling technology. Write the reservoir aspects and advantages of each type. **[6]**

P.T.O.

Q2) a) Determine pump pressure for following hydraulic system.
Also prove that, flow inside drill collar is turbulent and outside is laminar.
Data given: **[12]**

i) Length of 5" D/P = 9643 ft ID = 4.276 inch.

ii) Length of 6.5" D/C = 278ft ID = 2.815 inch.

iii) Well depth = 3100 m contains 9 5/8" casing up to 2323 m.

iv) PV = 6 CP, Yield point = 25 1B/100 ft^2.
Mud Density = 10.16 ppg.

v) Flow rate = 436.4 gpm

vi) Open hole = 8.5 inch

vii) Jet/Nozzle size = 13/32. Number of nozzles = 3

viii) Surface equipment pressure loss = 27.36 psi.

ix) Pressure loss inside drill pipe and drill collar in psi =
$(8.91 \times 10^{-5} \times \rho^{0.8} \times Q^{1.8} \times PV^{0.2} \times L) / D^{4.8}$

x) Annular pressure loss against drill pipe in cased hole is
270.66 psi and open hole is 79.17 psi.

xi) Annular pressure loss against drill collar = 21.56 psi.

The general critical velocity equation is,

$$V_c = \frac{97PV + 97\sqrt{(PV)^2 + 8.2\rho D^2 YP}}{\rho D} \text{ ft/min}$$

b) List the various factors affecting rate of penetration during drilling. **[4]**

Q3) Discuss geometrical planning and overall well planning objectives for Type - I, (L - shape) directional well and find co-ordinates of Type - I well using following data,
Slot Co-ordinate 15.32ft.N, 5.06ft.,E
Target Co - ordinate 1650 ft.N, 4510 ft.,E
TVD Target = 9890 ft.
TVD KOP = 1649 ft.
Build up rate = 1.6 per 100 ft. **[16]**

Q4) a) Explain the conventional well control techniques in brief. **[8]**

b) Write short note any two, **[8]**

i) Torque & drag

ii) MWD Tool

iii) LWD

SECTION - II

Q5) a) Discuss various loading conditions for casing string and compute the body - yield strength for 20 - in. - k - 55 casing with a nominal wall thickness of 0.635 in and a nominal weight per foot of 133 1b/ft., during axial loading conditions. This pipe has minimum yield strength of 55,000 psi (k - 55). **[8]**

b) Your company wants to complete a well at 12,000 ft., using a 6.625 inch production casing. The pore - pressure and fracture gradient data are given in table below. Design a complete casing program for all casing shoe depths and indicate the same using graphical procedure. Assume suitable safety margin and other data. **[10]**

Depth (ft.)	**Pore - Pressure gradient (1bm/gal)**	**Fracture gradient (1bm/gal)**
1,000	9.0	12.0
2,000	9.0	12.9
3,000	9.0	13.6
4,000	9.0	14.2
5,000	9.0	14.8
6,000	9.0	15.2
7,000	9.0	15.6
8,000	9.0	15.9
9,000	12.0	16.8
10,000	14.0	17.4
11,000	15.0	17.8
12,000	16.0	18.1

Q6) It is desired to drill under the lake, using a build and hold trajectory. Horizontal departure to the target is 2,655 ft. at a TVD of 9,650 ft. The recommended rate of build is 2.0°/100 ft. The kick off depth is 16.00 ft. Determine, **[16]**

a) the radius of curvature, R_1

b) the maximum inclination angle, θ

c) the measured depth to the end of the build

d) the total measured depth

e) the horizontal departure to the end of build

Q7) a) An exploration rig has the following grades of drill pipe to be run in 15,000 ft. deep well
Grade E : OD/ID 5/4.276, 19.5 1bm/ft. Yield strength = 395600 1b.
Grade G : OD/ID 5/4.276, 19.5 1bm/ft. Yield strength = 553830 1b.

The total length and weight of drill collars plus heavy - wall drill pipe is 984 ft. and 157374 1b respectively. The maximum expected mud weight at given depth is 100 pcf (13.4ppg). Given : steel density = 489.5 pcf. **[10]**

Calculate :

i) maximum length that can be used from each grade of drillpipe, if an MOP of 50,000 1b is to be maintained for the lower grade.

ii) The MOP of the heavier grade.

b) Draw the sketches of various types of multilateral wells. **[6]**

Q8) Write short notes on: **[16]**

a) Advantages of horizontal drilling technology.

b) Side tracking.

c) Types of drilling bits.

d) Under balanced drilling.

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1732

[3965]-833

M.E. (Petroleum)

ADVANCED OFFSHORE TECHNOLOGY

(2008 Course) (Elective - IV) (512112)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List the various forces acting on offshore structure. Describe the methodology to calculate them in brief. **[9]**

b) List the deep water drilling challenges and explain any one in detail. **[9]**

Q2) a) Classify the different types of floating offshore structures and write their working principle in brief. **[12]**

b) Write the maximum water limit criteria for various offshore vessels. **[4]**

Q3) Draw the neat schematic sketches and discuss the generalized procedure to drill the hole, casing lowering and cementing for any one particular size of hole, its casing to be installed and its cementation during offshore drilling operations. Also explain intermediate tools and operations involved in brief. **[16]**

Q4) Write short notes on: **[16]**

a) Well kick indications.

b) Hydro-pneumatic well control circuit.

c) Wait and weight method of well control.

d) Drillers method of well control.

P.T.O.

SECTION - II

Q5) a) Describe the general rig hydraulics design considerations for deep drilling program. Discuss the two criteria's to be used in nozzle size selection with their equations. **[9]**

b) Define NPSH and explain how to calculate NPSH available for the given pipe line system. State and explain Bernoulli's theorem, its equation and utility in offshore pipe line design calculations in brief. **[9]**

Q6) a) Draw schematic sketch and describe in brief, typical well completion methods for horizontal and multilateral well. **[12]**

b) Draw the neat schematic sketch of heave compensator. **[4]**

Q7) a) What are the methods of station keeping? Draw neat sketches and explain their basic principle, elements, merits and demerits. **[10]**

b) Explain various methods of productive formation testing. **[6]**

Q8) Write short notes on: **[16]**

a) Cementing methods.

b) Diving system.

c) Sub sea production system.

d) Offshore storage of oil and gas.



Total No. of Questions : 12] **[Total No. of Pages :3**

P1733

[3965]-836
M.E. (IT)
SOFTWARE ENGINEERING METHODOLOGIES
(2008 Course) (Sem. - I) (514402)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***From section I answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
3) ***Neat Diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) In the Rational Unified Process (RUP), what are the phases? Explain the relevance of each phase. **[16]**

OR

Q2) a) Explain in detail the **Extreme Programming,** agile type software process model. **[8]**

b) State one application for using the iterative and prototype software process model and justify for the selection of the model. **[8]**

Q3) a) **Read the following description of the system and answer the questions given below**

An institution offers UG[Under Graduate] and PG [Post Graduate] degree courses. Every course spans over few years. UG degree has four years. Post Graduate degree has two years. Every year has courses. The courses can be either theory courses or laboratory courses. Every theory course is taught by one instructor. Every laboratory course is taught by one or many instructors. Every course is attended by many students [limited to 60]. Each course requires minimum 10 students. Each student gives a feedback for each attended course. The feedback is in the form of questionnaire. The questionnaire has two parts. One part is mandatory and the other part is optional. The mandatory questionnaire has many questions. Every question has many possible answers. Out of many answers, the student has to select one answer for every question. Answering every question from the questionnaire is mandatory. The optional part is open. There is narrative description which invites individual comments from the students. They can write comments as free form sentences. The student has to submit the feedback. The mandatory part

of the feedback submitted by all the students in the class gets accumulated in the feedback repository. The optional part from the feedback submitted by every student gets attached to one another. In the end, all the accumulated parts of the optional feedback become one document and gets stored in the database.

The feedback of every instructor is the consolidation of all the answers in the mandatory parts and the single document of the optional part.

Every instructor gets the feedback of the course he has taught in his mail account as a pdf document. The copy of this feedback should also be stored in the database as the office copy.

The process of feedback for every course is enabled after two months from start date of every term. The process has the status as enabled for one week. The administrator can add/update/delete questions in the feedback form. The administrator can add/update/delete the association of instructors and the courses taught by them. The feedback cycle will only be enabled provided the administrator has indicated the status as 'READY TO ENABLE'

The possibility of updating the form is time dependent. It starts in at start date and closes after two weeks from start date.

At a time, the maximum no. of students who can give the feedback is configurable. The administrator does this. Every student can give the feedback of each instructor only once.

Once all the classes finish giving the feedback, the feedback cycle ends and the feedback details get stored in the feedback repository.

i) Identify the actors in the system. **[4]**

ii) Identify the use cases for each actor and draw use case diagram for the system, using applicable notations from UML2.0. **[6]**

b) Write the relevance of any one of following diagrams with the context of UML2.0 **[6]**

i) Activity diagram.

ii) Composite structure diagram.

OR

Q4) a) Use the same system details as described in Q3a) and draw a detailed activity diagram using all applicable notations from UML2.0 **[8]**

b) What is OCL? What is the relevance of the keywords **invariant, context, forall and self** in the context of OCL? **[8]**

Q5) a) Explain the relevance of state diagram and list down the notations used in describing composite state, region, transition, shallow history in the context of state diagram of UML2.0

b) Use the same system details as described in Q3a) and identify the classes from the system. Describe each class in detail using UML2.0 notation. **[18]**

OR

Q6) a) In the context of sequence diagram what is synchronous message, asynchronous message, return message, boundary, entity and controller? Explain in brief. **[8]**

b) Write a short note on UML metamodel. **[6]**

c) Illustrate, how do you show object flow in an activity diagram **[4]**

SECTION - II

Q7) a) Explain the design concepts modularity and functional independence. **[8]**

b) Illustrate, the relationships present among various classes with appropriate examples. **[10]**

OR

Q8) a) Explain the call and return architecture in detail. **[5]**

b) Explain the layered architecture in detail. **[5]**

c) Explain data design and interface design elements in brief. **[8]**

Q9) a) What is unit testing? **[2]**

b) What is bottom up integration testing? Explain in brief. **[8]**

c) What is validation testing? Explain in brief. **[6]**

OR

Q10) a) What is unit and integration testing from the perspective of object orientation? Explain. **[8]**

b) What is control testing? Explain in brief. **[8]**

Q11) a) Explain Ishikawa's seven tools for quality in brief. **[10]**

b) Explain any one project estimation technique which estimates size, cost and effort of the project. **[6]**

OR

Q12) a) Explain software debugging. **[8]**

b) State the salient features of process assessment model CMMI **[8]**

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1736

[3965]-845

M.E. (I.T.)

ADVANCED TRENDS IN DATABASE SYSTEMS

(2008 Course) (514409) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Make suitable assumptions whenever necessary.***

SECTION - I

Q1) a) Explain the difference between Distributed and Centralised Query Processing. Compare the two with reference to processing, cost involved and response time. Give examples. **[6]**

b) Explain the transparency issue in distributed database. Explain any two types of transparency. **[6]**

c) How is concurrency control handled in Distributed Database? Which methods are used? **[6]**

Q2) a) Describe the steps of data merging, cleansing and sampling during creation of a Data Warehouse. Draw a detailed diagram. **[8]**

b) In what manner is testing of Data Warehouse done. Describe. **[8]**

Q3) a) Suppose you have data describing the closing prices of stock you own for the last 1000 days. If you are interested in generating all rules which tell you about chances of your stock going up on a given day provided you know the pattern (up or down) on K preceding days, with some minsup and minconf defined. How would you model this problem as association rule mining problem, is there a way to represent this as transactions with binary attributes like in the supermarket case? **[8]**

b) Why is predictive modelling technique the most successful of Data Mining. List the various assumptions made. **[8]**

P.T.O.

Q4) Write short notes on any three: **[18]**

a) Apriori Algorithm.

b) Semi-structured Data and XML.

c) 3 aspects of distributed database system that define the architecture.

d) Mobile Database.

SECTION - II

Q5) a) How are active databases different from normal/passive databases? Explain with example. Discuss the design and implementation issue in active database. **[8]**

b) Explain the ECA concept in active Database. **[8]**

Q6) a) Compare relational database, Object Oriented database and Object relational database with respect to their strength, applications and limitations. **[8]**

b) Explain how Object Oriented Database works. Explain the concept of persistence in OO Database. **[8]**

Q7) a) Explain web crawler architecture and how it works for different types of web mining. **[8]**

b) What are the drawbacks of web crawler? What sort of material remains hidden from general searches? **[8]**

Q8) Write short notes on: **[18]**

a) Active Database Applications.

b) Adaptive Query Processing.

c) Textual Data Type.

d) Web Mining for banking system.



Total No. of Questions : 8] **[Total No. of Pages :2**

P1737

[3965]-879
M.E. (Instru & Control)
COMMUNICATION PROTOCOLS FOR INSTRUMENTATION
(2008 Course) (5061103) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the hierarchical communication model in Process Automation. Also discuss the Network requirements at different levels. **[8]**

b) Explain the NRZ and Manchester Data Encoding method used in different protocols with neat waveforms. **[10]**

Q2) Explain the role of Link Active Scheduler and Device Description Files in Fieldbus. Also discuss the advantages of Fieldbus. **[16]**

Q3) With neat diagrams wherever necessary, explain in detail the ControlNet Protocol based on the following points:

a) Architecture or Communication profile **[4]**

b) Role of each layer in the protocol **[8]**

c) MAC cycle time and Protocol Data Unit. **[4]**

Q4) Write short notes on: **[16]**

a) RS 485

b) Bluetooth Protocol

SECTION - II

Q5) a) Explain the master slave mode and burst mode in HART Field devices. **[8]**

b) Explain the point to point and Multidrop networks in HART devices. **[8]**

P.T.O.

Q6) a) With neat sketch, explain the mapping of PROFIBUS and its variants (FMS, DP and PA) on the OSI/ISO model. **[5]**

b) Compare the Profibus DP and Profibus PA networks **[5]**

c) With neat sketches explain the topologies used in ProfiBus **[6]**

Q7) a) With diagrams wherever necessary, explain the building blocks of a network. **[8]**

b) Explain the Resource block, Transducer block and function block in Fieldbus devices. **[8]**

Q8) Write short notes: **[18]**

a) Role of Ethernet in Communication Protocols

b) Token passing Bus arbitration method

c) Comparison between the MODBUS ASCII and MODBUS RTU protocols.

♦♦♦♦

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1739 **[3965]-897**

M.E. (Instrumentation) Process & Biomedical Instrumentation

BIO-IMAGING MODALITY

(2008 Course) (Elective - III) (5061205 - (A))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and Explain X-ray Tube with its two types. And specify the materials used for anode, cathode, target and motor rotor. Specify the factors deciding the quality of X-Rays. **[12]**

b) Justify technically, "why tungsten is used as target material in X-ray tube". **[6]**

Q2) a) What is mammography? What can Diagnostic Mammography show? **[8]**

b) What are the benefits offers by Digital mammography provides over standard mammography equipment. And also discuss disadvantages to Digital Mammography. **[8]**

Q3) a) What are the drawbacks of X-Ray imaging? Explain the method that will overcome these draw back. Enlist at least three image reconstruction methods in the same. **[8]**

b) Explain the operation of X-ray system that is used for real time imaging. List out the fluoroscopy application of X-ray system. **[8]**

P.T.O.

Q4) a) What is importance of grids and collimators in X-ray machine? Enlsit various collimators with their specific clinical applications. **[8]**

b) Write short note on "CT Numbers" in CT scanning. What is the use and importance of window selection switch available on CT scanning machine? **[8]**

SECTION - II

Q5) a) Discuss the various display modes of ultra sound tranmission. **[8]**

b) Specify the frequency ranges for abdominal, Brain Examination and for ophthalmic & pediatric study in M-scan Mode. Explain the how frequency of ultrasound and resolution of image as well as frequency of ultrasound and depth of penetration are interrelated with each other in ultrasound imaging. **[10]**

Q6) a) Why artificial radionuclides are preferred over natural radionuclide in nuclear imaging? Explain the principle of PET imaging. What is the main advantage offered by PET over other medical imaging modality? Name the device that is used to generate on site artificial radionuclide in the PET imaging system? **[10]**

b) Differentiate various medical imaging modalities with respect to factors like portability and accessibility, cost, patient acceptability, repeated exposure and safety, feature reveal through image. **[6]**

Q7) a) Explain the basic principle of MR imaging. Enlist advantages of MRI techniques. **[8]**

b) What are the various factors contribute of MR imaging? What kinds of nuclei can be used for NMR? Why Hydrogen atoms are best for MRI? **[8]**

Q8) a) What is Medical thermography? **[8]**

b) What is angiography? Explain DSA. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1741

[3965]-445
M.E. (Civil) (Hydraulic Engineering)
OPEN CHANNEL HYDRAULICS
(2008 Course) (501308) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section-I and three questions from Section-II.***
2) ***Answer to the two Sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss velocity and shear stress distribution in a smooth rectangular channel. **[8]**

b) Explain in detail the factors affecting Manning's coefficient 'n'. **[8]**

Q2) a) Explain specific energy diagram and specific force diagram for hydraulic jump with the help of sketches. **[6]**

b) Write short note on : **[10]**

i) Jump in gradually expanding rectangular channel.

ii) Jump in sloping rectangular channel.

Q3) a) Sketch the gradually varied flow profiles in the following serial arrangement of channels. **[6]**

i) Steep - horizontal - mild slope.

ii) Steep - steeper - mild - milder slope.

b) Consider uniform flow of water in a wide rectangular channel with a flow rate of $1.5 m^3/s\text{-}m$ and Manning's coefficient of 0.03. The slope of the channel is 0.0005.

i) Calculate the normal and critical depth of the flow and determine if the uniform flow is sub-critical or super-critical.

ii) A dam is installed having a new water depth of 2.5m just upstream. Determine how far upstream of the dam the reservoir extends. Consider the reservoir boundary to be the point at which the water depth is within 5% of the original uniform water depth. **[12]**

P.T.O.

Q4) a) Explain : **[6]**

i) Conveyance of a channel.
ii) Section factor curves and
iii) Normal depth of a channel.

b) Write short notes on : **[10]**

i) Types of jump in rapidly varied flow and
ii) Most efficient channel sections.

SECTION - II

Q5) a) Discuss profile computations in spatially varied flow. **[6]**

b) Derive differential equation of spatially varied flow with increasing discharge. **[10]**

Q6) a) Define stratified flow and discuss turbulence theory. **[8]**

b) Describe the various structural methods adopted for control of floods. **[8]**

Q7) a) Describe a numerical method for hydrologic reservoir routing. **[6]**

b) Describe the Muskingum method of routing an inflow hydrograph through a channel. Assume the values of the coefficient 'K' and 'x' for the reach are known. **[10]**

Q8) a) Explain : **[8]**

i) Dam break problem and
ii) Positive surges.

b) Derive the equation of motion for gradually varied uniform flow. **[10]**



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1742

[3965]-598
M.E. (Electrical) (Power Systems)
POWER SYSTEM DYNAMICS
(2008 Course) (503208) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to each section should be written on separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) A generator is supplying power to a load centre through a transmission line. The power output of the generator is increased slowly while maintaining the magnitudes of the terminal voltages of the generator and load centre constants at 1.0 p.u by manual control. Find the steady state stability limit of power that can be transmitted. Assume that x_{gen} = 0.3 p.μ; $x_{load\ centre}$ = 0.15 p.u; and x_{line} = 0.45 p.u. **[15]**

b) Write the swing equation using M = 2.5 * 10^{-4} p.u. and accelerating power as $\left(1 - \frac{2}{\pi}\delta\right)$. If $\delta = \frac{\pi}{4}$ at t = 0 solve the swing equation and show that the solution is $\delta = \frac{\pi}{4}\left[2 - \cos\sqrt{\frac{2}{\pi m}}\,t\right]$. **[10]**

Q2) a) Using the Heffron-Philips constants K_1 to K_6, write the differential equations modelling a SMIB system; and derive the conditions for dynamic stability using Routh-Hurwitz criterion. **[15]**

b) A load area supplied by infinite bus draws 50MW against a maximum power of 100MW. Estimate the maximum sudden increase of load without losing stability. **[10]**

P.T.O.

Q3) Write short notes any three of the following :

a) States of power system operation and system security; **[8]**
b) Improved model of synchronous machine; **[9]**
c) Equal area criterion and its applications; and **[8]**
d) Inclusion of SVC model in the dynamics of SMIB. **[8]**

SECTION - II

Q4) a) Explain the necessity of a power system stabiliser. With a block schematic diagram of a PSS, explain the basic functions of each block. **[13]**

b) For a SMIB system with a machine model 1.0, show that the transfer function

$$GEP\ (s) = \frac{K_2\ K_3\ EXC\ (s)}{(1 + ST'_{do}\ K_3) + K_3\ K_6\ EXC\ (s)}$$

where EXC (s) is the transfer function of the excitation system. **[12]**

Q5) a) Explain the terms : **[6]**

i) Voltage stability and
ii) Voltage collapse.

b) Discuss the factors affecting voltage instability and collapse. **[9]**

c) A large synchronous generator whose x_s = 1.2 p.u. supplies a load through a link compreising of a transformer of 0.1 p.u. reactance and an overhead line of initially 0.5 p.u. reactance; resistance is negligible. The voltage at the load is bus bar is initially 1 p.u and the load is (0.8 + j 0.6) p.u. regardless of voltage. Assuming the internal voltage of the generator to remain unchanged, determine the value of line reactance at which voltage instability occurs. **[10]**

Q6) Write short notes on the following :

a) Islanding in power systems; **[9]**
b) Multi-machine model in power systems; **[8]**
c) PSS design and application. **[8]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1743

[3965]-738

M.E. (Computer) (Computer Networks)

EMERGING TRENDS IN COMPUTER ARCHITECTURE

(Sem. - I) (2008 Course) (510102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is EPIC? Explain the architecture of Intel Itanium processor. **[8]**

b) Explain the term "single system Image". Also discuss the support provided for clusters involving such image. **[8]**

Q2) a) What is ATM? Explain the "ATM network architecture". **[8]**

b) Discuss the capabilities of Gigabit Ethernet. Also explain how a fast Ethernet backbone can be upgraded to Gigabit backbone LAN. **[8]**

Q3) a) Explain the high - level synchronization constructs used in shared - memory multiprocessors. **[8]**

b) Explain the communication algorithms used to support collective communications. **[8]**

Q4) Write short notes on **[18]**

a) Parallel Virtual Machine (PVM)

b) Myrinet.

c) User Datagram Protocol (UDP)

P.T.O.

SECTION - II

Q5) a) Explain a typical SAN architecture. Also discuss a suitable application of this architecture. **[8]**

b) What is "Network Attached Storage"? Discuss its advantages and also compare it with storage area network. **[8]**

Q6) a) Explain the terms "OSGA" and "WSRF". Also discuss "Stateful web services Architecture" based on OSGA and WSRF. **[8]**

b) What is grid computing? Discuss the benefits of grid computing. **[8]**

Q7) a) Explain the mechanisms provided to a user to specify data parallelism in High - performance Fortran. **[8]**

b) Explain the POSI,X thread model for shared-memory programming. **[8]**

Q8) Write short notes on: **[18]**

a) Direct Access File System.

b) Grid Topologies.

c) MPI messages.

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Total No. of Questions : 6] **[Total No. of Pages :2**

P1744

[3965]-593
M.E. (Electrical) (Power Systems)
POWER SYSTEM MODELLING
(Sem. - I) (2008 Course) (503203)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written on separate answer - books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Stating clearly all the assumptions made, derive the classical transfer function of hydraulic turbine. **[12]**

$$\frac{\Delta\overline{P}_m}{\Delta\overline{G}} = \left(\frac{1 - sT_w}{1 + 0.5sT_w} \right)$$

b) Develop the d - axis and q - axis equivalent circuits for a salient pole synchronous machine. **[13]**

Q2) a) A 275 kV, 50 Hz, three phase transmission line is of 428 km length and is rated at 840 A. The values of resistance, inductance and susceptance per phase per kilometer are 0.077 Ω, 1.05 mH and 9.52 μ mho respectively. Determine nominal π model and long line model of the transmission line. If the receiving end voltage is 275 kV when full load is transmitted at 0.85 p.f. lagging, determine the sending end voltage using both the models. Comment on the result, if there is a difference in the value of sending end voltage. **[15]**

b) Develop a model for a 3 - phase, phase shifting transformer. **[10]**

Q3) Write short notes on the following:-

a) Load modelling; **[8]**

b) Model for a tap - changing transformer; and **[8]**

c) Park's transformation. **[9]**

P.T.O.

SECTION - II

Q4) a) Derive the expression for the electromagnetic torque developed by a salient - pole alternator in terms of the number of poles in the machine, i_d, i_q, ψ_d and ψ_q. **[10]**

b) Determine the p.u. values of L_d, L_q, Lafd and Lfd based on the rating of the machine given the following data:-
500 MVA, 13.2 kV, 0.9 p.f. lag, 50 Hz,
Y connected, 2 pole alternator
$L_{aa} = (3.25 + 0.0458 \cos 2\theta)$ *m*H;

$$L_{ab} = -\left(1.625 + 0.0458\cos\left(2\theta + \frac{\pi}{3}\right)\right) \text{mH};$$

$L_{afd} = 41.5 \cos \theta$ *m*H;
$L_{ffd} = 521$ *m*H;
$R_a = 4.0\ m\Omega$; and
$R_{fd} = 75\ m\Omega$. **[15]**

Q5) a) Making suitable assumptions, obtain a simplified model of a boiler. **[12]**

b) State and explain the classification of methods of mathematical modelling. Explain the systematic procedure in developing a model of a physical system. **[13]**

Q6) Write short notes on the following:-

a) Structure of a detailed excitation model; **[8]**

b) Simulation studies and tools, and **[8]**

c) p.u. system for synchronous machines. **[9]**

♦♦♦♦

Total No. of Questions : 12] [Total No. of Pages :4

P1747

[3965] - 589
M.E. (Electrical)
ADVANCED DRIVES & CONTROL
(2008 Course) (Elective - IV) (503112)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, and electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) Explain the starting transient as well as steady state performance of the electric drive when the load torque is varying with the square of the speed, under variable speed (below normal) requirement. State the type of solid state controller. If the motor is a d.c. motor, state the solid state type of controller to drive 50 percent load torque at double the normal speed. Mention in brief the salient points of every controller above. **[16]**

OR

Q2) Write in detail on any two of the followings : **[16]**

a) Multiquadrant operation of Electric Drive.

b) Ratins of an electric motor and thermal consideration.

c) Role of the controller to result motor T-W characteristics to result steady state operation in variable speed drive considering stability criterion.

d) Energy consumption during starting transients of an electric drive and time to reach steady state performance and the role of operation of solid state starter cum controller.

P.T.O.

Q3) a) A single phase, half controlled, converter is supplying a separately excited d.c. motor with firing angle 'α'. The conduction period results to be discontinuous (say from β to $(\pi + \alpha)$) The average value of back emf in the armature is E_b volts. Prove that the average armature current i_a is given by

$$i_a = \frac{V_m}{\pi R_a}(1+\cos\alpha) - \frac{E_b}{\pi R_a}(\beta - \alpha)$$

where V_m = maximum (peak) a.c. voltage of the supply.

R_a = Resistance of the armature circuit.

at wt = β the armature current ceases to zero. **[8]**

b) State and explain all the conditions those result in a discontinuous conduction of the current in an armature of a separately excited d.c. motor when fed from the solid state controller. Why does the conduction results to be continuous in case of d.c. series motor. **[8]**

OR

Q4) a) The speed of 75 kW, 480 V, 1800 rpm separately excited d.c. motor is controlled by a 3-phase fully controlled converter. The converter is connected across 480 V, 3-phase, 50Hz supply the rated current of the motor is 165 Amp. The motor h_a following parameters :

$R_a = 0.874$ ohm, $L_a = 6.5$ mH, $k_e\phi = 0.33$ v/rpm

Determine the no load and full load speed of the motor for firing angle set as 30 degrees. **[8]**

b) Write short notes on (any one) :

i) System model and transfer function of the converter fed d.c. motor.

ii) Comparison of performance of converted d.c. motor with chopper fed d.c. motor.

iii) Current ripple in chopper fed d.c. motor. **[8]**

Q5) a) The P.W.M, Inverter is supplying the variable speed drive induction motor delivering constant torque load. Explain the necessity of

i) Volts to frequency ratio control for speeds below normal

ii) Boost factor

iii) Pulse width control

iv) harmonic control **[10]**

b) The operational performance of inverter fed induction motor found to be deteriorated at very low speeds. Justify the statement with the help of technical reasons. Explain the remedies. **[8]**

OR

Q6) a) Explain the effect of space harmonics and pulsating torques developed in the inverter fed induction motor, Explain the necessity of the derating of the motor. **[9]**

b) Draw the simplified, steady-state equivalent circuit of 3-phase induction motor offerred to the seventh harmonics voltages of the inverter. Write down the current equation and comment on the performance. **[9]**

SECTION - II

Q7) a) How does the slip-power recovery scheme have been utilized in the static Kramer Drive. Explain the control of converter-inverter unit connected in the scheme to regulate the speed of the drive. **[8]**

b) From generalised model in Arbitrary reference frame derive the stator reference frame model and synchronously rotating frame model of the induction motor. **[8]**

OR

Q8) Explain any two of the following in detail with reference to control of induction motor. **[16]**

a) Direct torque and flux control.

b) Direct and indirect vector control.

c) Sensor less vector control.

d) Voltage and current fed scaler control.

Q9) With reference to synchronous motor drives explain any two of the following : **[16]**

a) D-q axis equivalent circuit.

b) Flux weakening operation - the control strategy

c) Trapizoidal spm drive

OR

Q10) Explain in detail the following with reference to synchronous motor drive : **[16]**

a) Switched reluctance motor drives

b) Solid state controllers of permanent magnet motors

Q11) Explain with reference to Phase Locked Loop (PLL) **[18]**

a) The principle of phase lock.

b) Design procedure of current controller.

c) Application in closed loop controlled drive.

OR

Q12) a) Explain in detail the role of the following in closed loop control system of electric drive

i) Proportional and integral controller

ii) PID controller **[9]**

b) Explain the modern trends in the drive control. **[9]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1748

[3965]-144

M.E. (Electronics - Digital Systems)

MULTIMEDIA TECHNIQUES

(2002 Course) (504307)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the hardware & software components of a multimedia development system? Explain the functions of a multimedia development system with the help of neat block diagram. **[8]**

b) What is MM authoring tool? List the different functions of MM authoring software. **[8]**

Q2) a) Explain in brief the two components of MIDI interface which must be satisfied by a musical instrument to call it as MIDI device. **[8]**

b) What is the need of defining different file formats to store voice or audio? Explain any one file format in detail. **[8]**

Q3) a) State the objectives of MPEG-2 standard. Explain the term 'bit stream scalability'. How does layered coding approach improve the quality of picture while offering flexibility? **[8]**

b) Explain the progressive coding modes of JPEG. How does the quality of decoded image is improved by using it? **[8]**

Q4) Write short notes on: **[18]**

a) JPEG - 2000.

b) PAL encoder.

c) Static & dynamic HTML.

P.T.O.

SECTION - II

Q5) a) Draw & explain the generic block schematic of video compression scheme. Explain the difference between motion estimation & motion compensation. **[8]**

b) Justify: **[8]**

i) G-Y is not chosen as one of the chroma signals for color TV transmission.

ii) Tint control is provided in NTSC decoder.

Q6) a) Evaluate computational complexity of full search method of motion compensation for 'MAD' criterion. How does 'PDC' measure save the computations? **[8]**

b) What are the factors which influence the choice of suitable storage system for multimedia? Compare between magnetic & optical media based storage device with proper applications. **[8]**

Q7) a) Define Rate-Distortion function. Using the same compare the performance of motion compensation based & intra-frame coding based video coding techniques. **[8]**

b) A discrete memoryless source generates five symbols with probability of occurrence 0.16, 0.51, 0.09, 0.13, 0.11. Demonstrate step by step Huffman encoding algorithm to obtain variable length codes for these five symbols. Estimate the optimum length & average actual length for the same & code efficiency. **[8]**

Q8) Write notes on: **[18]**

a) OS support to MM.

b) CCIR - B standard.

c) MPEG - 4.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1750

[3965]-625

M.E. (E & T/C VLSI & Embedded Systems)

ANALOG & DIGITAL CMOS IC DESIGN

(2008 Course) (504181) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design current mirror for 100 μA. Assume suitable data. What are the techniques to improve output resistance? Give mathematical analysis to support. **[16]**

Q2) a) What are the performance parameters of voltage reference circuit? Explore in brief. What is state of art? **[8]**

b) Design differential amplifier for voltage gain of 40 dB and bandwidth of 1MHz. **[8]**

Q3) a) List and explain in brief, device & wire parasitics normally considered while design. **[8]**

b) What is need of low voltage opamp? What are its design techniques? **[8]**

Q4) Write short notes on any three: **[18]**

a) High gain opamp.

b) Macro model of opamp.

c) BGR.

d) Cascode amplifier.

P.T.O.

SECTION - II

Q5) Draw FSM diagram, write VHDL code & test bench for 10111 mealy sequence detector. **[16]**

Q6) a) Design CMOS logic for F = AB + CDE + E (F + G). Compute area on chip. **[8]**

b) What are the constraints in FSM design? How to tackle them? Explain any one in detail. **[8]**

Q7) a) Derive an expression for power delay product. How does PDP help designer? **[8]**

b) What is λ parameter? Explain technology scaling in detail. **[8]**

Q8) Write short notes on any three: **[18]**

a) Merits, demerits & applications of transmission gate.

b) Trends in ultra fast technology.

c) CMOS layout rules.

d) NORA logic.



Total No. of Questions : 10] **[Total No. of Pages :2**

P1751

[3965]-528
M.E. (Mechanical) (Mechatronics)
MECHANICAL AND ELECTRONIC MEASUREMENTS
(2008 Course) (502802) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from section I and any three questions from section II.***
2) ***Answers to each section should be written in separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Explain important static characteristic of an instrument. **[8]**

b) What will be change in resistance of an electrical strain gauge with gauge factor of 2 and resistance 50 ohms if it is subjected to strain of 0.001. **[8]**

Q2) a) Explain primary and secondary standards of calibration for mechanical measurements. **[10]**

b) The measured vibration, acceleration, amplitude of a vibrational body is 4g Express this in decibles. Take reference value as $1(10^{-6})$ m/s^2. **[6]**

Q3) a) Calculate the correlation coefficient from the data given below. **[10]**

b) Explain Mean, Mode, Deviation and Variance. **[8]**

Q4) An accelerometer has mass of 50g and spring constant 300 N/m. Maximum mass displacement is + 0.02 m (before the mass hits the top) Find **[16]**

a) Maximum acceleration.

b) Natural Frequency.

Q5) a) Explain with a neat sketch the working of logic analyzer. **[8]**

b) Explain the characteristic of thermisters. **[8]**

P.T.O.

SECTION - II

Q6) a) Explain with neat sketch the working of Spectrum analyzer. **[9]**

b) For McLeod gauge with capillary of 1.2 mm diameter and effective bulb volume of 85 cc. Find reading as indicated by Hg column for 12 Pa pressure. **[9]**

Q7) a) Explain with neat sketch construction, working and applications of electromagnetic flow meter. **[10]**

b) A LVDT has output of 6 V rms when the displacement is 0.004 mm. Determine the sensitivity of this device in V/mm. **[6]**

Q8) a) Explain with neat sketch the working of Thermal Conductivity gauge for measurement of ultra low pressure. **[10]**

b) What is the resolution of an ADC with a word length of 10 bits and analog signal input range of 100 V. **[6]**

Q9) a) Explain successive approximation method in ADC. **[8]**

b) Explain two methods of EMI measurement. **[8]**

Q10) a) Explain important features of DSO. **[8]**

b) Explain construction and working of RTD. **[8]**

♦♦♦♦

Total No. of Questions : 10] **[Total No. of Pages : 4**

P1752

[3965]-436
M.E. (Civil-Hydraulic Engineering)
COMPUTATIONAL METHODS IN HYDRAULICS
(2008 Course) (501301) (Sem. - I)

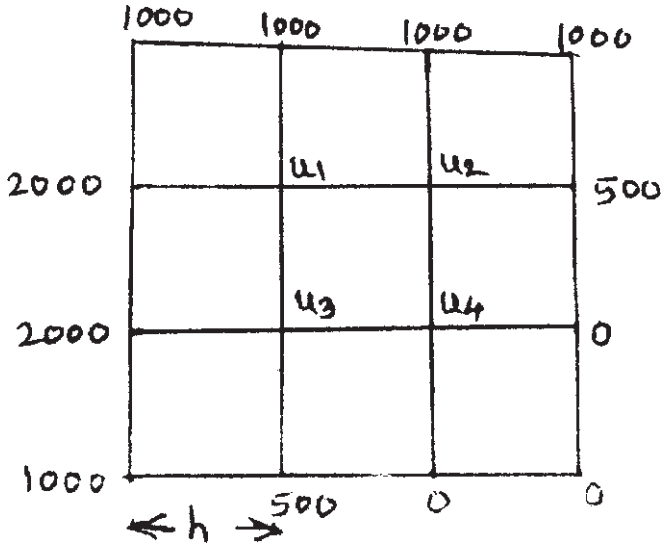
Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid in the fig.1 (a). **[8]**



b) Solve the partial differential equation $\nabla^2 u = -10\,(x^2 + y^2 + 10)$ over the square with sides $x = 0 = y$, $x = y = 3$ with $u = 0$ on the boundary and mesh length $h = 1$. **[8]**

P.T.O.

Q2) a) What is mean by boundary value problem explain two-point linear boundary problems. Which numerical method is used commonly to solve such boundary problems. **[5]**

b) What do you understand by elliptic, parabolic and hyper bolic partial differential equation? **[4]**

c) At what circumstances binomial distribution is used. State applications of binomial distribution. Use binomial distribution method for solving the following example "on an average 10% of slabs are found to have leakages. In an inspection of 8 slabs find the probability that

i) None of the slab is defective.
ii) Exactly two slabs are defective.
iii) At most two slabs are defective. **[8]**

Q3) a) Define Poisson probability distribution. Under what conditions it is taken as approximation to binomial probability distribution. State the additive property of Poisson probability distribution. **[6]**

b) Fit a Poisson distribution to the following : **[6]**

x	0	1	2	3	4
f	46	38	22	9	1

c) In an examination taken by 500 candidates, the average and standared deviation of marks obtained (normally distributed) are 40% and 10% find approximately. **[5]**

i) How many will pass, if 50% is fixed as a minimum?
ii) What should be the minimum if 350 candidates are to pass?
iii) How many have scored marks above 60%?

Q4) a) What is Gamma distribution? Show that for the Gamma distribution : **[5]**

$$f(x) = \frac{e^{-x} \cdot x^{l-1}}{\sqrt{l}} \quad , \quad 0 < x < \infty,$$

the mean and variance are both equal to l.

b) Describe chisquare test for goodness to fit. **[3]**

c) Solve the following system of simultanious equations by relaxation method. **[8]**

$9x - 2y + z = 50$
$x + 5y - 3z = 16$
$-2x + 2y + 7z = 19$

Q5) a) The two regression lines are : **[7]**

$5x - 6y = -90$
$15x - 8y = 130$

Find $\bar{x}$ and $\bar{y}$. Also obtain regression coefficient of Y on X and regression coefficient of X on Y.

b) Define the following terms : **[5]**

i) Stochastic process.
ii) Markov chain.
iii) One-step transition probability matrix.

c) If $\{x_n, n \geq 0\}$ be a Markov chain with three state 0, 1, 2 and with one step transition probability matrix. **[5]**

$$P = \begin{bmatrix} 0.75 & 0.25 & 0 \\ 0.25 & 0.50 & 0.25 \\ 0 & 0.75 & 0.25 \end{bmatrix}$$

find :

i) $p(x_3 = 1 \mid x_2 = 2)$
ii) $p(x_2 = 2 \mid x_0 = 1)$
iii) $p(x_1 = 0)$ given $p(x_0 = 0) = p(x_0 = 1) = 0.33$

SECTION - II

Q6) a) In what situation numerical integration process is used. State different formulas used to find numerical integration. In what area this process is used in Hydraulic Engineering? **[6]**

b) Evaluate $\int_0^{\pi} \frac{\sin^2\theta}{5 + 4\cos\theta}\, d\theta$ by Simpsons $\frac{3}{8}^{th}$ rule by taking $h = \frac{\pi}{6}$. **[5]**

c) Discuss the motion of fluid having complex potential $\Omega(z) = i\,k \log^z$ where $k > 0$. **[6]**

Q7) a) What is Schwarz - Christoffel transformation? Explain with sketch. **[5]**

b) Show how you use Schwarz - Christoffel transformation to map the semiinfinite strip enclosed by the real axis and the lines $u = \pm 1$ of the W plane in to the upper hulf of the z plane. **[6]**

c) Evaluate $\int_1^2 \frac{x^2}{1+x^3} dx$ using Simpsons $\frac{1}{3}^{rd}$ rule. Compare the value with exact value of the integral. **[6]**

Q8) a) Expand $f(z) = \cos z$ about the point $z = \pi/2$. **[5]**

b) Explain conformal transformation in complex variables with neat sketches. **[6]**

c) Discuss the transformation $w = \sqrt{z}$. Is it conformal at the origin. **[6]**

Q9) a) Explain in detail Joukowski transformation $w = z + \frac{1}{z}$. Draw neat sketches. **[6]**

b) Evaluate $\int_0^{1+i} (x^2 - iy)\,dz$ along the paths. **[6]**

i) $y = x$.

ii) $y = x^2$.

c) Use trapezoidal rule to evaluate $\int_0^1 x^3\,dx$ considering five subintervals. **[5]**

Q10) a) A river is 24 meter wide. The depth d in meter at a distance x meter from one bank is given by the following table : **[6]**

x	0	3	6	9	12	15	18	21	24
d	0	1	2	3	4	5	4.5	2.7	1

find approximately the area of the cross section.

b) Evaluate $\int_{-0}^{1} \frac{1}{1 + x^2}\,dx$ by using Gauss quadrature two point formula. **[5]**

c) Use Cauchy Integral formula to evaluate $\oint_c \frac{3z^2 + z}{z^2 - 1}\,dz$ where C is the circle $|z - 1| = 1$. **[5]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1753

[3965]-536

M.E. (Mechanical) (Mechatronics)

MICROCONTROLLERS

(2008 Course) (Sem. - II) (502808)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Compare microprocessor and microcontroller. **[8]**

b) With the help of block diagram explain the architecture of 8051. **[10]**

Q2) a) Explain the different addressing modes of 8051. **[8]**

b) Explain the following instructions of 8051.

i) SWAP A.

ii) DJNZ, Rn,lable.

iii) ADD A, 0F 3H.

iv) RRC.

[8]

Q3) a) Write a program for keyboard interfacing and explain it. **[8]**

b) Write a program for LCD interfacing and explain it. **[8]**

Q4) a) Explain the need of power saving modes in 8051. State and explain steps in using power down and ideal modes. **[8]**

b) Explain the four modes of timers of 8051. **[8]**

P.T.O.

SECTION - II

Q5) a) With memory map explain internal memory organization of 8051. **[8]**

b) Explain memory organization of ARM. **[8]**

Q6) a) Write down the steps to transfer data serially. Explain in short the special function registers for serial data transfer. **[8]**

b) Write a program in which 8051 reads data from p_0 and write it to p_2 continuously while giving copy of it to serial COM port to be transferred serially. Assume X' tal = 11.0592MHz and baud rate = 2400. **[8]**

Q7) a) Explain in detail interfacing of ADC 0808 to 8051. **[8]**

b) Explain in detail interfacing of DAC to 8051. **[8]**

Q8) Write a short note on: **[18]**

a) Logic Analyzer.

b) PSW register in 8051.

c) Interrupt logic.

d) RS 232.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1754

[3965]-835
M.E. (Computer Science and Engineering - IT)
APPLIED ALGORITHMS
(2008 Course) (514421) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer THREE questions from each section.***
2) ***Answers to the two sections should be written in SEPARATE answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Give complete analyses of Merge sort algorithm where the input array of length 'n' is divided in two parts 2n/3 and n/3. **[10]**

b) Write a recursive relation for the following function and solve the same : **[8]**

```
int fib (int n)
{
        if (n < 2)
            return (n);
        else
            return (fib (n – 1) + fib (n – 2));
}
```

Q2) a) Write Kruskal's algorithm for finding minimum spanning tree and analyze the same. **[8]**

b) Solve following recurrences :

i) $t(m) = 0$ if $m = 0$
$t(m) = 2t(m-1) + 1$ otherwise **[4]**

ii) $t(n) = t(n-2) + t(n-1)$ if $n > 1$
$t(n) = n$ if $n = 0, 1$ **[4]**

Q3) a) Write an algorithm for finding Hamiltonian cycle in an undirected graph. How do you claim that, this algorithm is probabilistically good algorithm? **[8]**

P.T.O.

b) Analyze the following algorithm BUILD-MAX-HEAP for time complexity BUILD-MAX-HEAP (A).

```
  {
  heap-size [A] = length [A]
  for i = [length [A] / 2] downto 1
  do MAX-HEAPIFY (A, i)
  }
MAX-HEAPIFY (A, i)
{
l = LEFT (i)
r = RIGHT (i)
if (l < = heap-size [A] and A [l] > A [i]) then
        largest = l
else    largest = i
if r < = heap-size [A] and A [r] > A [largest]
      then largest = r
if largest ≠ i then exchange (A [i], A [largest])
      MAX-HEAPIFY (A, largest)
}
```

[8]

Q4) a) Compare CRCW and EREW PRAM Models. **[6]**

b) Explain following terms in brief with suitable examples. **[10]**

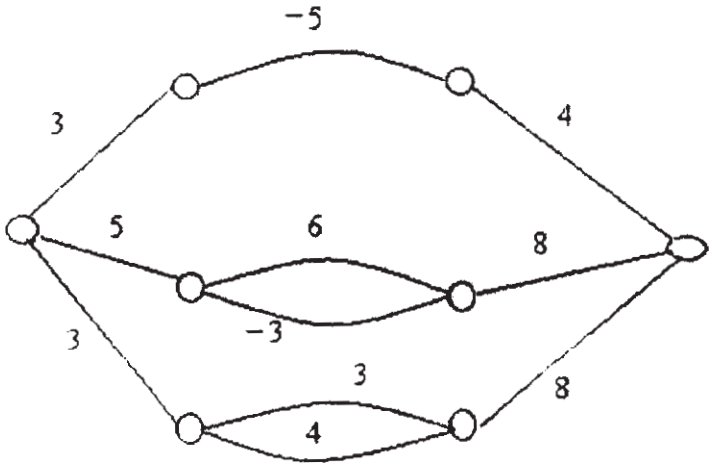
i) NP-Hard Problem.
ii) Approximate Algorithms.
iii) NP-Hard Approximation Problem.
iv) Heuristic Algorithms.
v) Probabilistic Analysis of Algorithms.

SECTION - II

Q5) a) Write and analyze the algorithm for splitting a B-Tree node. **[8]**

b) Write algorithm for Convex-Hull with divide and conquer method. Analyze this algorithm for time complexity and compare it with Grahm-scan Algorithm. **[8]**

Q6) a) Solve the following example using Bellman-Ford algorithm for shortest path with negative edges. **[10]**



b) Analyze the following algorithm for time complexity. **[8]**

FORD-FULKERSON (G, s, t)

1. for each edge (u, v) ∈ E [G]
2. do f [u, v] = 0
3. f [v, u] = 0
4. while there exists a path p from s to t in the residual network G*f*
5. do c*f* (p) = min {c *f* (u, v) : (u, v) is in p}
6. for each edge (u, v) in p
7. do f [u, v] = f [u, v] + c*f* (p)
8. f [v,u] = – f [u, v]

Q7) a) State and Analyze Pointer Doubling Algorithm. **[8]**

b) Write sweep-line algorithm for determining whether any pair of segment intersects. Analyze the algorithm for it's time complexity. **[8]**

Q8) a) State and analyze algorithm for Traveling Salesman Problem. **[8]**

b) Maximize $Z = 5x + 4y$
Subject to $3x + 2y <= 50$
$x + y <= 22$ **[8]**



Total No. of Questions : 10] **[Total No. of Pages :3**

P1755

[3965]-538
M.E. (Mechanical) (Mechatronics)
INDUSTRIAL AUTOMATION
(Sem - II) (2008 Course) (502809) (Part - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to each section should be written in separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) Answer any two of the following: **[18]**

a) Explain on delayed timer with suitable example.

b) Significance of Boolean algebra in constructing ladder program. Explain with suitable example.

c) Types of switches used in PLC applications.

Q2) a) Describe the objectives and various components involved in general conveyor systems. **[8]**

b) Write a PLC ladder program for staircase wiring and direction reversal of DC motor with unipolar power supply. **[8]**

Q3) Develop ladder program for the following industrial objective. Given START, STOP, UP and DOWN buttons are push to on momentary switches. LS1 and LS2 are limit switches of NC type. The motor M1 is employed to take the platform up and motor M2 is used to take the platform down. Figure Q3 (a) shows the details. **[16]**

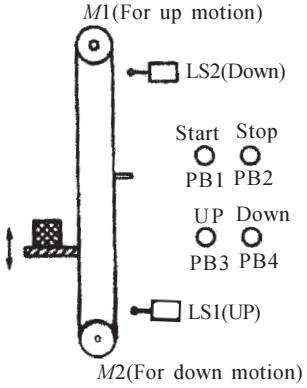


Figure Q3(a)

P.T.O.

a) When START button is pushed the platform shall move downwards if not at bottom.
b) When STOP button is pushed the platform shall stop where it is.
c) When UP button is pushed the platform shall move upward if it is not going down.
d) When DOWN button is pushed the platform shall move downwards if it is not going up.

Write the PLC program for objectives (a) to (d) individually and then write the complete program.

Q4) a) Applications of OFF Delay timers used in ladder program with illustrative example. **[8]**

b) Compare Function Block Diagrams and Ladder Diagrams for logic AND and logic OR. **[8]**

Q5) Three push to on buttons PB1, PB2 and PB3 are given as input and RED and GREEN light as output are given. Develop a ladder diagram to accomplish following objectives. **[16]**

a) When PB1 is pushed the process starts.

b) When PB2 is pushed after 5 seconds RED bulb glows.

c) When PB3 is pushed after 9 seconds GREEN bulb glows.

d) When PB2 and PB3 is pushed for 4 times collectively, the program stops and starts after PB1 is pushed.

& PB2 is pushed GREEN light glows.

SECTION - II

Q6) Attempt any two of the following: **[18]**

a) Explain significance of Machine Zero & Work Zero in CNC program with suitable examples.

b) Principle of working, and types of Position sensors used in CNC machines.

c) Explain any three M Codes with full form of syntex.

Q7) a) Figure Q7(a) shows a job profile for milling. Prepare a NC part program for the same. Write all the assumptions including raw material dimensions. Write the program in TAB sequential format. **[12]**

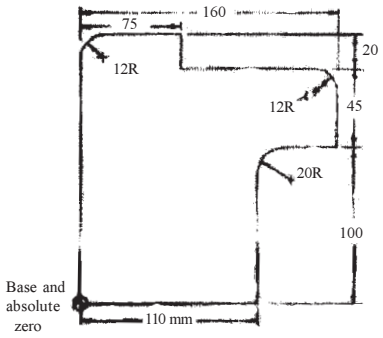


Figure Q7(a)

b) Explain the term Distributed Numerical Control. **[4]**

Q8) a) Explain closed loop positioning system in NC systems. **[8]**

b) Discuss various tools used in CNC turning with their specifications, advantages and applications. **[8]**

Q9) a) Figure Q9(a) shows a profile for turning job. Prepare a NC part program, mention all the assumptions including raw material dimensions. Write the program in TAB sequential format. Do not use special canned cycles. **[12]**

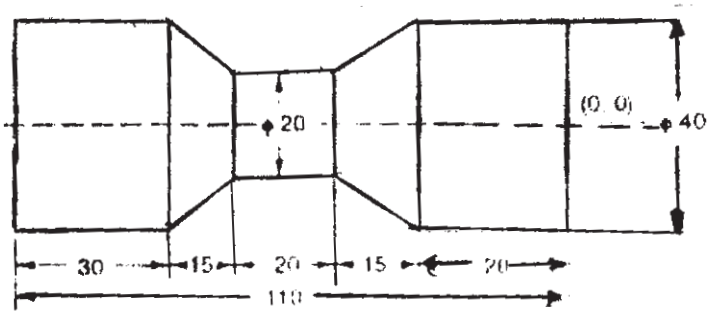


Figure Q9(a)

b) Discuss advantages of CNC part programming over NC part programming. **[4]**

Q10) a) Explain the full form of G codes for linear interpolation and circular interpolation. **[8]**

b) Incremental positioning in NC part programming with suitable job profile. **[8]**

♦♦♦♦

Total No. of Questions : 12] **[Total No. of Pages :2**

P1756

[3965]-446
M.E. (Civil) (Hydraulic Engineering)
HYDROLOGY
(2008 Course) (Sem. - II) (501309)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections to be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Use of calculators is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the design applications of the depth area duration relation? Explain the procedure for developing these relations. **[10]**

b) Describe the principle of rainfall measurement using RADAR with neat sketch. Also state its advantages over other rainguages. **[8]**

OR

Q2) a) What is evaporation? How evaporation is measured? Draw neat labelled sketches of Class A pan and Colorado sunken pan also state different methods to control evaporation loss from reservoir and explain any one method in detail. **[10]**

b) What is unit hydrograph? Explain instantaneous unit hydrograph with sketch and explain its application in water resources engineering. **[8]**

Q3) a) What is infiltration? Write the equations for infiltration indices. How will separate the base flow? Explain in detail with neat sketch. **[8]**

b) What are initial abstractions? Explain interception and depression storage with sketch. **[8]**

OR

Q4) a) Explain what do you understand by return period? Give few formulae to determine return period. **[8]**

b) Explain extreme value (Gumbel's) distribution. **[8]**

Q5) a) Write a note on Envelope curves. **[8]**

b) State Dickens and Ryves formulae to estimate flood and explain the terms in formulae. **[8]**

OR

P.T.O.

Q6) a) State various methods of flood estimation and explain rational method in detail. **[8]**

b) Explain pumping and recuperation test. What should be the diameter of an open well to give safe yield of 4.8 lit/sec? Assume the working head at 3.75 m and the subsoil consists of fine sand. (For fine sand specific yield = 0.5/hour) **[8]**

SECTION - II

Q7) a) Explain with neat sketch the Cooper and jacob method of determining the aquifer parameters. **[10]**

b) Explain Chow's method of determining aquifer parameters using the pumping test data? **[8]**

OR

Q8) a) Derive the expression for steady state discharge of a fully penetrating well into a confined aquifer with a neat sketch. **[10]**

b) In an artesian aquifer of 8 m thick, a 10 cm diameter well is pumped at a constant rate of 100 lit/minute. The steady state drawdown observed in two wells located at 10 m and 50 m distances from the centre of the well are 3 m and 0.05m respectively, compute the transmissivity and the hydraulic conductivity of the aquifer. **[8]**

Q9) a) Explain Dupits - Thiems theory and state the assumptions made for it also explain method of images in short. **[10]**

b) Enlist different types of tube wells and explain strainer type with a neat sketch. **[6]**

OR

Q10) a) Write notes on **[12]**

i) Ground water budget.

ii) Ground water pollution.

iii) Pumping equipments for tube wells.

b) Describe any one method of artificial water recharge with sketch. **[4]**

Q11) a) What is Pade's approximation? **[4]**

b) What are the steps involved in steepest gradient method? **[6]**

c) Which are the various methods in potential theory. **[6]**

OR

Q12) a) State and prove that conformal map preserves the angle between two differentiable arcs. **[8]**

b) What are models? What is use of models? Which are the different types of models to solve ground water flow problems? **[8]**

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages :2**

P1757

[3965]-473A
M.E. (Civil) (Environmental)
NUMERICAL METHODS & APPLIED STATISTICS
(501501) (2010 Course) (Sem. - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be writtten in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Solve the system of equations using Gauss Seidel Method. **[9]**

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$
$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$
$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$
$$-x_1 - x_2 - 2x_3 + 10x_4 = -9$$

b) Solve the system of equations using Newton Raphson Method. **[8]**

$x^2 + xy + y^2 = 7$ & $x^3 + y^3 = 9$

c) The distance travelled by a point 'p' in the x - y plane in a mechanism is shown in the table below. Estimate the distance travelled at $x = 1.5$ and at $x = 4.5$ using appropriate interpolation formula. **[8]**

x	1	2	3	4	5
y	14	30	62	116	198

Q2) a) Compare the merits and demerits of various measures of dispersion. **[10]**

b) Minimize $z = 6x_1 + 5x_2$, **[10]**
Subject to

$$4x_1 + x_2 \geq 10$$
$$2x_1 + 3x_2 \geq 15$$
$$x_1 \leq 10 \quad x_1, x_2 \geq 0$$

c) Write simplex algorithm. **[5]**

P.T.O.

Q3) a) Write short note on **[10]**

i) Skewness.

ii) Kurtosis.

b) State and explain Baye's Theorem. **[5]**

c) A textile mill produces cloth in three different shades, blue, black and brown production of these shades are 30%, 50% & 20% respectively of total production. It is found from experience that 2%, 3% and 4% of blue black & brown are defective respectively. On a general inspection of entire population, a specemen is selected at random. Find the probability that **[10]**

i) It is defective.

ii) Defective is of black shade.

SECTION - II

Q4) a) Show that mean and variance of a Poisson distribution are equal. **[8]**

b) Two teams A & B play a series of independent games. The probability that team 'A' wins a game is 0.60. Find probability that series will end in atmost six games. **[8]**

c) In a distribution exactly normal, 7% of items are under 35, and 89% are under 63. What is mean & standard deviation of the distribution. **[9]**

Q5) a) Write short note on **[10]**

i) Interval estimation of parameters.

ii) Chi - Square Test.

b) Using method of least squares fit the curve $f = ae^{-3t} + be^{-2t}$ for the following data **[15]**

t	0.1	0.2	0.3	0.4
f	0.76	0.58	0.44	0.35

Also fit a straight line to for the above data.

Q6) a) Write short note on the following **[15]**

i) Utility of time series analysis.

ii) Rank correlation.

iii) Latin Square Design.

b) The lines of regression of a bivariate population are $8x - 10y + 66 = 0$. and $40x - 18y = 214$. The variance of 'x' is q, find **[10]**

i) Mean of x & y

ii) Correlation coefficient of x & y.

iii) Standard deviation of y.

♦♦♦♦

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1758

[3965]-483

M.E. (Civil) (Environmental Engineering)

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

(2010 Course) (501509) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain Fluorimetry with schematic diagram. **[9]**

b) Differentiate between chemical adsorption exchange adsorption and physical adsorption. **[9]**

Q2) Explain the principal and mechanism of optical methods in the pollutant removal in the industrial effluent with their advantages and disadvantages. **[16]**

Q3) Give the principle and types of spectro-photometry and also discuss the application of spectro-photometry in environmental analysis. **[16]**

Q4) Discuss the selectivity of mobile phase in Gas Chromatography as well as HPLC in the wastewater treatment and analysis. **[16]**

Q5) Explain the principle of Ion Chromatography and also write a short note on types of various electrodes in ion chromatography. **[16]**

P.T.O.

SECTION - II

Q6) a) List out the various enzymes and their role in the field of environmental microbiology. **[9]**

b) Explain the facultative respiration in the wastewater treatment and microbiological techniques in the environmental research. **[9]**

Q7) Write a note on Compound Microscopy and Micrometry and their applications in the Environmental Engineering. **[16]**

Q8) a) Write a note on staining techniques. **[8]**

b) Explain microbial cell structure with sketch. **[8]**

Q9) What is 'Bioremediation', explain it with suitable example? Explain the phenomenon of 'Self purification of natural water body'. **[16]**

Q10) Explain in detail Sequencing Batch Reactor Process and Activated sludge process (ASP) anaerobic treatment and microbiology to industrial effluent. **[16]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1759

[3965]-634

M.E. (E & TC) (VLSI & Embedded Systems)

REAL TIME OPERATING SYSTEMS

(2008 Course) (Sem. - II) (504188)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Which are the basic steps involved in embedded system software development? **[6]**

b) Describe Foreground/Background Systems with its merits and demerits. **[8]**

c) What are the basic requirements of operating system for embedded systems? **[4]**

Q2) a) Context switch adds overhead. Explain why and also how it limit the performance of the system software. **[8]**

b) Describe the role/function of the each subsystem of typical operating system. **[8]**

Q3) a) What is the role of reentrant function? Describe the rules used to decide the function is reentrant. What are the different techniques used to make any function reentrant? **[10]**

b) Describe the various reasons for occurrence of deadlock situations in operating system. **[6]**

Q4) a) Which are the inter process communication mechanisms used in operating system? **[10]**

b) Accurate delay generation is difficult in RTOS. Explain why? **[6]**

P.T.O.

SECTION - II

Q5) a) Describe need and operation of stack checking feature of μCOS - II. **[6]**

b) Write and describe RTOS Initialization Code for three different tasks using μCOS - II. **[6]**

c) Describe various task states defined in μCOS - II. **[6]**

Q6) a) What are the techniques used to protect shared data? **[8]**

b) What is the need of task synchronization? What are the techniques used to synchronize different tasks? **[8]**

Q7) a) Describe role and operation of following μCOS - II services. **[10]**

i) OSMboxCreate(),

ii) OSMboxPend(),

iii) OSMboxPost(),

iv) OSMboxAccept() and

v) OSMboxQuery().

b) What is meant by "porting the RTOS"? What are the basic requirements for porting μCOS - II? **[6]**

Q8) a) How IDE is useful for design and development of system software? Explain. **[8]**

b) Describe file manipulation techniques used in Linux/RT-Linux. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1760

[3965]-775

M.E. (Chemical)

MANAGEMENT OF RESEARCH AND DEVELOPMENT IN CHEMICAL INDUSTRIES

(2008 Course) (509102) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Every answer shall be explained by taking a proper case study from chemical/ancillary chemical industry.***

SECTION - I

Q1) What are the developments in research to save the earth planet from Global warming effect? **[17]**

Q2) What are the typical manpower needs of a research project on product development? How the manpower resources can be optimized well? Explain with a typical example in practice. **[17]**

Q3) How a R & D project can be planned well? What is a degree/level of success of such a project Vs a planned construction project? Cite the failure/risk point. Do complete risk analysis. **[16]**

Q4) What is the role of money management in research and development in industry? What are the ways to control/monitor expenses on R & D? Explain with example. **[16]**

SECTION - II

Q5) What are PERT & CPM techniques? How can they be utilized to better the outputs in R & D project? Explain with suitable example. **[17]**

P.T.O.

Q6) What is an interdisciplinary research? Which branches of life sciences/ engineering touch the new frontiers of research in Chemical Engineering? How according to you the chemical engineering research is poised in this context? Discuss. **[17]**

Q7) Which sub branch in chemical industry has shown significant improvement in the last few decades? Give chronological survey of research in that sub branch and its role in improving standard of life of society. **[16]**

Q8) Write short notes on (Any Three): **[16]**

a) Controlling expenses in R & D.

b) Natural rate of growth of economy Vs Rate of growth of Chemical industry.

c) Pollution free technologies.

d) Research for modifications in existing chemical processes.



Total No. of Questions : 12] **[Total No. of Pages : 5**

P1761

[3965]-583
M.E. (Electrical) (Control Systems)
SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL
(2008 Course) (503109) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define "System Identification". Draw a neat flow-chart for system identification and explain each step in details. **[6]**

b) The loss function is given by $V(\theta) = \frac{1}{2} e^T e$ where $e(t) = y(t) - \phi^T(t)\,\theta$ with usual notations. If matrix $(\phi^T \phi)$ is positive definite then prove that

i) $V(\theta)$ has a unique minimum point given by $\hat{\theta} = (\phi^T \phi)^{-1} \phi^T y$ and the corresponding minimal value of $V(\theta)$ is given by

ii) $V(\hat{\theta})_{minimum} = \frac{1}{2} y^T [I - \phi (\phi^T \phi)^{-1} \phi^T] y$. **[10]**

OR

Q2) Consider the FIR Model $y(t) = b_0 u(t) + b_1 u(t-1) + e(t)$; t = 1, 2, ... N where $e(t)$ is a sequence of independent normal random variables with zero mean and standard deviation σ.

a) Determine the regressor vector and parameter vector of the linear regression model. **[6]**

b) Data collected from the above FIR Model is given below : **[10]**

t	1	2	3
$u(t)$	1000	1001	1000
$y(t)$	0	2001	2001

P.T.O.

Estimate the parameter vector $\hat{\theta}$ from the available data using least square estimation method.

Q3) a) Discuss the various model structures that are commonly used in system identification technique. **[8]**

b) Are the following signals persistently exciting signals? Justify your answer. **[8]**

i) Pulse,
ii) Step and
iii) Random signal.

OR

Q4) a) A linear, underdamped second order system is given by **[10]**

$$\frac{Y(s)}{U(s)} = \frac{w_0^2}{s^2 + 2\xi w_0 s + w_0^2}$$

Derive the expressions for

i) Damping ratio ξ and
ii) Natural frequency of oscillations w_0 , in terms of peack overshoot Mp.

b) Output response of a linear, second order system is shown in fig.1 for the step input of magnitude 1.5. Calculate the damping ratio ξ and the natural frequency of oscillations w_0. **[6]**

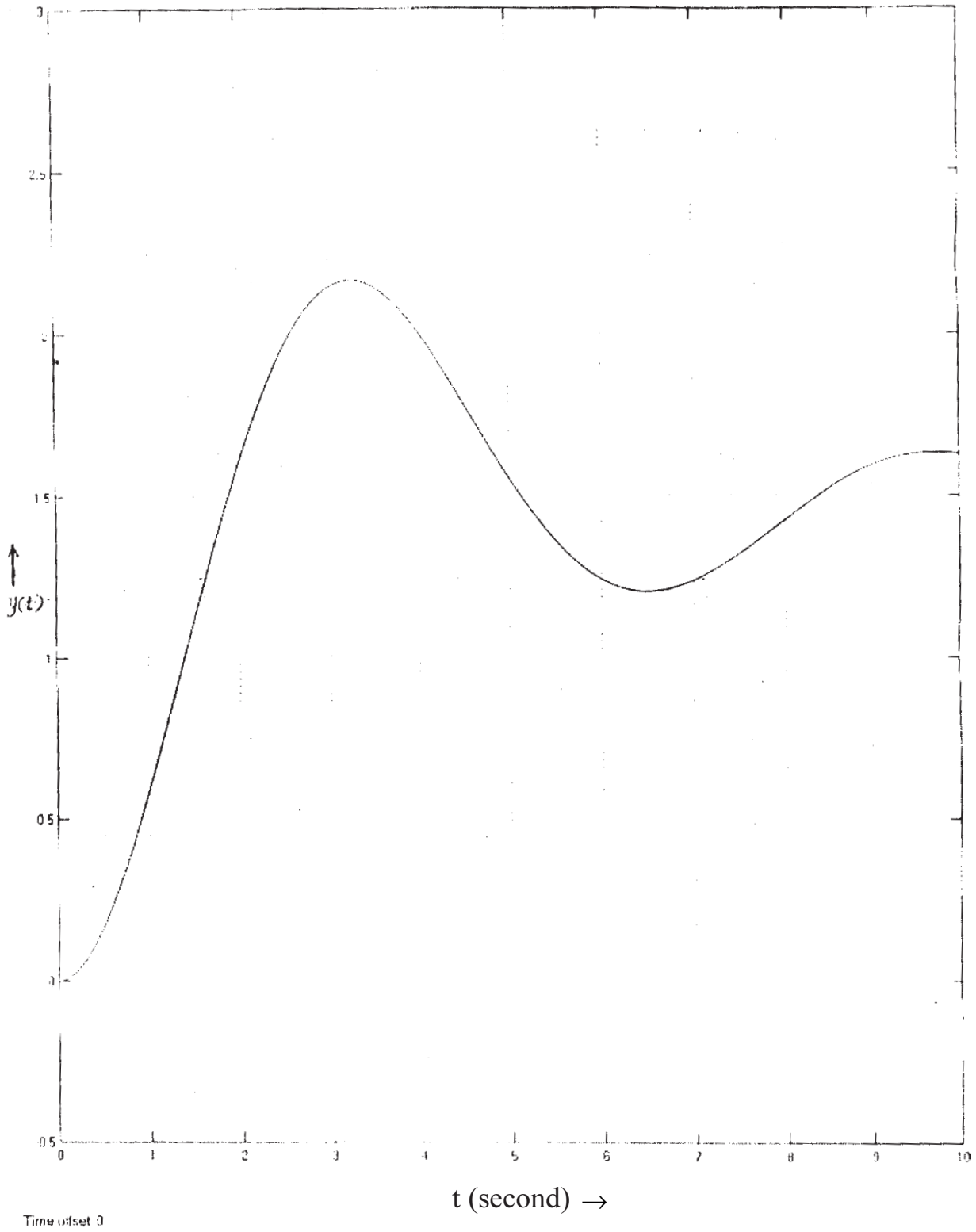


Fig. 1 : Output response. [Q.4. (b)]

Q5) Write detailed notes on any two of the following :

a) Learning in redundant computer configuration. **[9]**

b) Bayesian learning. **[9]**

c) Persistent excitation. **[9]**

d) Proof of Matrix Inversion Lemma. **[9]**

$[A + BCD]^{-1} = A^{-1} - A^{-1} B [C^{-1} + DA^{-1} B]^{-1} DA^{-1}$

OR

Q6) Write detailed notes on any two of the following :

a) Instrument Variable Methods (IVM). **[9]**

b) Prediction Error Methods (PEM). **[9]**

c) Recursive (on-line) Identification Methods. **[9]**

SECTION - II

Q7) a) Explain precisely the term "Adaptive Controller". Draw a block diagram of an adaptive system and explain the working of each block. **[8]**

b) With the help of neat diagrams explain the various "Adaptive Schemes". **[8]**

OR

Q8) a) Explain the term "Gain Scheduling". Why it is called open-loop adaptation? Explain the working principle of "Gain Scheduling" adaptive control scheme with neat diagram. State the advantages and drawbacks of the gain-scheduling. **[8]**

b) What are the different ideas used while designing the gain scheduling controller? Explain any one of them. **[8]**

Q9) a) Explain the self tuning adaptive control scheme. **[8]**

b) Consider the process characterized by the transfer function

$$G(s) = \frac{k}{1 + sT} e^{-sL}$$

where k is the static gain, L is the apparent time delay, T is the apparent time constant. Explain the Zigler-Nichol's step response method to determine the parameters of the PID regulator. **[8]**

OR

Q10) a) Draw a block diagram of a relay auto-tuner and explain the Zigler-Nichol's closed loop method to determine the parameters of the PID-Controller based on the ultimate gain K_u and the ultimate period T_u. **[8]**

b) An ideal relay with a saturation level ± 1 unit, is connected in cascade with a linear transfer function $G(s) = \frac{1}{(s+1)^3}$ in a unity feedback control system. Calculate the ultimate gain k_u and ultimate period T_u, using the method of describing function. **[8]**

Q11) a) Explain the pole-placement design and derive the diophantine equation. **[9]**

b) Further show that the pole-placement can be interpreted as model-following design. **[9]**

OR

Q12) a) State and explain the MIT rule. **[9]**

b) Consider a system described by $\frac{dy}{dt} = -ay + bu$ where a and b are unknown parameters, u is the input variable and y is the measured output. Assume that it is desired to obtain a closed loop model described by $\frac{dy_m}{dt} = -a_m\ y_m + b_m\ u_c$ where u_c is the controlled input. The controller is given by $u(t) = \theta_1\ u_c(t) - \theta_2\ y(t)$. Draw a MRAS based on the MIT rule. Explain any approximations made and comment on any prior knowledge about the plant that may be required. **[9]**



Total No. of Questions : 6] **[Total No. of Pages :2**

P1762

[3965]-575
M.E. (Electrical Engineering) (Control system)
PROCESS CONTROL MANAGEMENT
(2008 Course) (Sem. - I) (503102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Asnwers to the two sections should be written in separate book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is groupthink? What is its effect on decision making quality? Explain with example. **[10]**

b) How could a manager stimulate conflict in his or her department? Give examples. **[8]**

c) Does motivation come from within a person or is it a result of situation? Explain your response. **[7]**

Q2) a) Explain process reaction curve in detail. **[10]**

b) Given that : m = mass, H = Heat, C = specific Heat, T's = Temperatures, W's = weight ratios of flow. Develop a mathematical model for mixing process as shown in fig. 1 with Thermal Balance equation. **[15]**

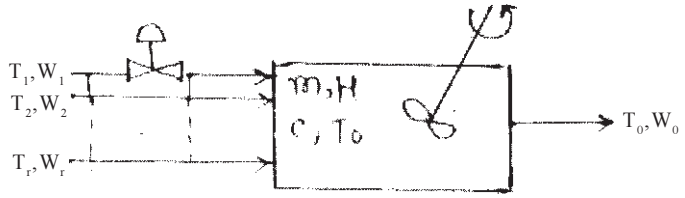


Fig.1: mixing process

Q3) a) Draw a Block diagram of Feed back control system & for each component write transfer function relating its outputs to inputs. **[10]**

b) Compare P, PI and PID control actions in detail. **[8]**

c) Explain ziegler - Nichols closed loop method. **[7]**

P.T.O.

SECTION - II

Q4) a) Write short note on Discrete PID control algorithm. **[15]**

b) Explain with proper example process objectives and process hardware. **[10]**

Q5) a) Develop a feed forward control system for heat exchanger. Also give advantages & disadvantages of feed forward control system. **[15]**

b) Explain with block diagram, how Tunning is done in cascade control system. **[10]**

Q6) a) Describe the Relative Gain Array for a process with two inputs & two outputs. **[15]**

b) Explain the effect of Interaction on stability of process control system. **[10]**

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1763

[3965]-62
M.E. (Mechanical - Design Engineering)
DESIGN ENGINEERING
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an expression for maximum space efficiency of helical springs. **[8]**

b) Show the effect of height to thickness relation on characteristics of belleville springs. **[8]**

Q2) a) Show and explain with neat sketch the various forces acting on rigid follower end. **[4]**

b) A cylindrical cam has a rise of 25.4 mm in 80^{o} angle. The prime circle radius is 50.8 mm and the follower radius is 20 mm.

Find the follower force 'P' for $x = 0.6$, the work load $F_w = 135$ N. The initial spring force is 110 N. The weight of the follower is 9 N. Spring constant 0.8 N/mm and cam rotates at 600 rpm. **[12]**

Q3) a) Explain the following terms in context with creep. **[8]**

i) True stress and true stress.
ii) Estimated time to rupture.

b) A cantilever beam has a rectangular crosssection 5 cm wide and 9 cm deep. The length is 200 cms with a load of 12000 N on it at the end. The material is carbon steel with $\eta = 7$ and $B = 40 \times 10^{-39}$ $(cm^2/N)^{\eta}$ per day. Find permanent deflection after 10 years. **[8]**

P.T.O.

Q4) a) What is difference between design for finite and infinite life problems? Explain modified Goodman diagram. **[8]**

b) The work cycle of mechanical component subjected to completely reversed bending stress consists of following three elements. **[8]**

i) ± 350 N/mm^2 for 85% of time.
ii) ± 400 N/mm^2 for 12% of time.
iii) ± 500 N/mm^2 for 3% of time.

The material for component is 50C4 (Sut = 660 N/mm^2) and the corrected endurance limit of the component is 280N/mm^2. Determine life of the component.

Q5) Write short note on the following : **[18]**

a) Polydyne cam.

b) Ribration and surging of Helical springs.

c) Fatigue under complex stresses.

SECTION - II

Q6) a) How do you identify the optimum solution in the simplex method. **[6]**

b) There are two different sites, each with four possible target (or depths) to drill an oil well. The preparation cost for each site and the cost of drilling at site 'i' to target 'j' are given below : **[10]**

Site 'i'	Drilling cost to target 'j'				Preparation
	1	2	3	4	Cost
1	4	1	9	7	11
2	7	9	5	2	13

formulate the problem of determining the best site for each target so that the total cost is minimized.

Q7) a) Explain the term peaking and topping as applied to gear. **[6]**

b) Two 10 teeth gears are to mesh without undercutting. The gears are generated using standard hob with 20^{o} pressure angle. Modue is 4mm, the clearance is 0.2mm. Using extended centre distance method find out,

i) Hob shift.
ii) Blank diameter and depth of cutter setting.
iii) Actual pressure angle.

Take usual notations.

$\theta = \text{inv}\ \phi$

$$\phi = \upsilon - \frac{2}{15}\upsilon^3 + \frac{3}{175}\upsilon^5$$

where, $\upsilon = \sqrt[3]{3\theta}$

θ & ϕ are in radians. **[10]**

Q8) a) What is the importance of the reliability in the modern engineering design? How it differs from the factor of safety? **[6]**

b) A batch of 100 helical compression springs are tested for the deflection under the axial load. The results are tabulated as follows. **[10]**

Deflection of springs, mm	Number of springs
26 - 28	2
28 - 30	12
30 - 32	50
32 - 34	32
34 - 36	4

If the permissible deflection for the springs is between 29mm and 33mm, determine the % of the springs likely to be rejected. The area below the standard normal distribution curve from zero to z are as follows :

Z	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Area	0.2881	0.3159	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641

Q9) a) Explain the use of composite material in mechanical engineering giving examples of such use, state reasons for a preference in favour of such materials. **[8]**

b) Consider a graphite-epoxy laminate, whose elastic constants along and perpendiculor to the fibres are as follows, **[8]**

E_{xx} = 181 GPa; E_{yy} = 10.3 GPa; G_{xy} = 7.17 GPa;

υ_{xx} = 0.28; υ_{xy} = 0.01594

obtain the compliance coefficients appropriate to x^1 y^1 axes which are at

i) + 30° (counter-clockwise) to *xy* axes.

ii) + 9° to *xy* axes.

Q10) Write short note on the following : **[18]**

a) NOVIKOV'S gears.

b) Multifunctional optimization.

c) Classical lamination theory of composite material.



Total No. of Questions : 6] **[Total No. of Pages : 3**

P1764

[3965]-37
M.E. (Civil) (Structures)
STRUCTURAL DYNAMICS
(2002 Course) (501504)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define vibrations. What are the types of vibrations? Obtain the equation for natural frequency for damped free vibrations of SDOF system. **[6]**

b) Determine the weight of the system shown in Fig. 1.1 whose cyclic linear frequency is 4.21 Hz. Assume $K_1 = K_2 = 2000$ N/m, $K_3 = 1000$ N/m. **[9]**

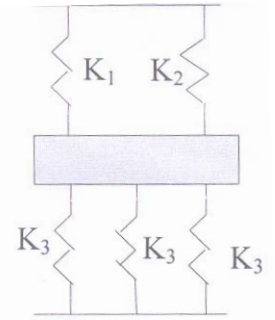


Figure1.1

c) In a free vibration test on single storey RC structure following observations are recorded -

i) Lateral force = 36000 kg.
ii) Initial horizontal displacement = 50.8 mm.
iii) Time required for 4 complete cycles = 2 sec.
iv) Amplitude at the end of 4 complete cycles = 25.4 mm

Compute:

1) Damping ratio,
2) Natural period of un-damped vibrations,
3) Stiffness,
4) Number of cycles required for the displacement amplitude to decrease to 5.08 mm. **[10]**

P.T.O.

Q2) a) Derive the formula for dampening ratio using logarithmic decrement principle. **[6]**

b) Obtain steady state and transient response of SDOF un-damped system subjected to harmonic excitations. **[9]**

c) Obtain expressions for dynamic amplification factor (DAF) for un-damped SDOF system subjected to harmonic loading. Also state when the displacement will remain in phase with applied load? **[10]**

Q3) a) Write notes on: **[10]**

i) SDOF system subjected to short duration Impulse.

ii) Damping Effects and Types of Dampers.

iii) Linear Acceleration Method for Non-linear Analysis.

b) Derive expression for the response of SDOF system for loading function using Fourier Series. Refer Fig. 3.2. **[15]**

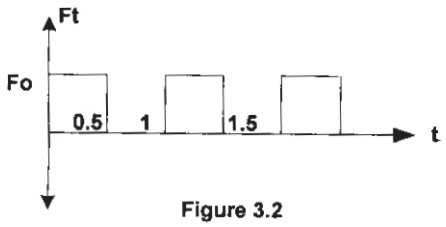


Figure 3.2

SECTION - II

Q4) a) What are normal modes of vibrations in MDOF? Prove that normal modes of vibrations are orthogonal. **[10]**

b) Calculate normal frequency and mode shapes of a three storey building having masses as shown in figure 4.1. The building consists of one bay only and EI for each column is 4.5 x 10^6 N/m^2. **[15]**

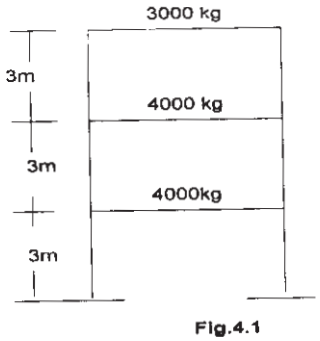


Fig.4.1

Q5) a) In a continuous system, derive the equation of free vibrations of uniform shear beam. **[10]**

b) Explain two DOF system as MDOF and write in matrix form the equation of motion. Hence determine the natural frequencies and mode shapes assuming mass and stiffness of ground storey equal to twice that of first storey. **[15]**

Q6) Write notes on: **[25]**

a) Stodola Method of Analysis.

b) Wilson Theta Method.

c) Finite Element Techniques in Vibration Problems.

d) Rayleigh Method for Frequency in Fundamental Mode.

e) Coupled and Un-coupled MDOF system.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1765

[3965]-104

M.E. (E & TC) (Instrumentation)

VLSI DESIGN & TECHNOLOGY

(2002 Course) (504101)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the expressions for static & dynamic power dissipations in CMOS logic. **[8]**

b) Design CMOS logic for γ = ABCD + E (F + G + H). Compute area on chip. **[8]**

Q2) Draw FSM diagram, write VHDL code & test bench for 1010111 Mealy Machine. **[16]**

Q3) a) With the help of schematic, explain voltage transfer curve of CMOS invertor. How to achieve symmetry in this curve. **[8]**

b) What are the constrains in digital CMOS design? What are the techniques to handle them? **[8]**

Q4) Write short notes on any three: **[18]**

a) Fan out delay.

b) Low power design.

c) Mixed signal chip design issues.

d) Weak 0 & weak 1 concept.

P.T.O.

SECTION - II

Q5) Write VHDL code for 8 bit ALU to operate on four logical and arithmetic functions. Also write test bench for it. **[16]**

Q6) a) What are the methods of component instantiation? Explore with suitable examples. **[8]**

b) List the delays in VHDL. Explain each with suitable example. **[8]**

Q7) Explain high level design flow in detail. State the input & output files of each stage. Give the user constraints and advance tools used at every stage. **[16]**

Q8) Write short notes on any three: **[18]**

a) Procedures & functions.

b) Passive process.

c) Noise margin.

d) Architectural modeling.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1766

[3965]-105

M.E. (E&T/C) (Instrumentation)

RECONFIGURABLE COMPUTING

(Elective - I) (2002 Course) (504109)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the research challenges in RC? **[8]**

b) Compare the performances of various architectures w.r.t. multiplier case study. **[8]**

Q2) a) Give mathematical analysis alongwith suitable examples for functional density. **[8]**

b) List characteristics of reconfigurable device. **[8]**

Q3) a) What are different types of conventional interconnects? Compare them. **[8]**

b) What is Rent's rule? What is its importance? **[8]**

Q4) Write short notes on any three: **[18]**

a) Network utilization efficiency.

b) Fine & coarse grain structures.

c) Instruction compressibility.

d) Current FPGAs.

P.T.O.

SECTION - II

Q5) a) What are the instruction compression techniques? Compare them and suggest suitable technique for new reconfigurable architecture. **[8]**

b) What is context? Why are contexts important in reconfigurable devices? **[8]**

Q6) With the help of detail block diagrams, explore the architecture of DPGA/TS FPGA. List merits & demerits **[16]**

Q7) a) Explain switch, channel & wire growth equations in detail. **[8]**

b) What is RP space area model? Give analysis in brief. **[8]**

Q8) Write short notes on any three: **[18]**

a) Hierarchical interconnects.

b) Instruction growth versus interconnect growth.

c) Peak performance density.

d) Delays offered by various blocks of FPGA.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1768

[3965]-138

M.E. (E & T/C) (VLSI & Embedded Systems)

RFIC DESIGN

(2002 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw a.c. equivalent ckt. of MOSFET. Modify it for RF signal. What are different parasitics? List RF sensitive parasitics. **[8]**

b) Explore OCT & SCT methods to compute bandwidth of an amplifier. List their limitations. **[8]**

Q2) a) How do zeros act as bandwidth enhancer? Explore with suitable example. **[8]**

b) What are bandwidth enhancement techniques? Explain any one in detail. **[8]**

Q3) a) Design CMOS amplifier for voltage gain of 60dB and bandwidth of 100 MHz. Assume suitable data. **[8]**

b) What is need of neutralization & unilaterization in RF amplifiers? Explain any one in detail. **[8]**

Q4) Write short notes on any three: **[18]**

a) AM-PM conversion.

b) Cascaded amplifiers.

c) S parameters.

d) SPICE model.

P.T.O.

SECTION - II

Q5) a) What different noise types are important in RF amplifiers? Explain any one noise type in detail. **[8]**

b) Design LNA for voltage gain of 60 dB. Assume suitable data. What type of matching technique will you use? **[8]**

Q6) a) What are the types of mixer? Explain any one with the help of mathematical analysis in detail. **[8]**

b) What is meant by power match & noise match? Explore with the help of suitable schematics. **[8]**

Q7) a) With the help of mathematical analysis, explain power constrained noise optimization in detail. **[8]**

b) Design CMOS mixer for IF = 455 kHz at signal frequency of 900 kHz. Assume suitable data. **[8]**

Q8) Write short notes on any three: **[18]**

a) Linearity in mixer.

b) Spurs.

c) Diode ring mixer.

d) Crosstalk mitigation techniques.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1769

[3965]-150

M.E. (Electronics) (Digital Systems)

RECONFIGURABLE COMPUTING

(504310) (2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) With the help of detail block diagram, Explore the architecture of TSFPGA. Give its features, merits & limitations. How these limitations can be minimized? **[16]**

Q2) a) What are the research challenges in an architectural and software development of reconfigurable devices? **[8]**

b) Compare various processor architectures with reconfigurable architecture in brief. **[8]**

Q3) a) Explore design metrics such as density, diversity and capacity. Give mathematical analysis & ckt schematics to support. **[8]**

b) Compare programmable, configurable & fixed function devices. **[8]**

Q4) Write short notes on any three: **[18]**

a) Limitations of general purpose processor.

b) Status of current FPGAs.

c) Various reconfigurable devices developed yet.

d) Characteristics of reconfigurable devices.

P.T.O.

SECTION - II

Q5) a) Give the first order comparison of area occupied by different blocks on chip of FPGA. What is conclusion? **[8]**

b) Why is excess stress being given on optimization of interconnects? What are challenges in it? **[8]**

Q6) a) Give mathematical analysis of switch, channel and wire growth. **[8]**

b) With the help of necessary schematic, explore hierarchical interconnects in detail. **[8]**

Q7) a) Explain RP space area model mathematically. **[8]**

b) What is peak performance density? Which different factors are affecting it? **[8]**

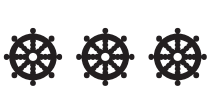
Q8) Write short notes on any three: **[18]**

a) Granularity.

b) Contexts.

c) Instruction compression.

d) MATRIX.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1770

[3965]-212

M.E. (Computer Engineering)

ADVANCES IN COMPILER TECHNIQUES

(2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain bootstrapping with respect to compiler. Also explain what is a cross compiler. **[8]**

b) Explain the design and implementation of LEX tool. **[8]**

Q2) a) Explain the working of code generator - generator. **[8]**

b) Explain the need for intermediate code in the compiler design. **[8]**

Q3) a) Explain with example the fundamental data flow properties. **[8]**

b) Explain : SSA form. **[8]**

Q4) Write short notes: **[18]**

a) Role of symbol table in compiler.

b) Bidirectional data flow analysis.

c) Unified algorithm for data flow analysis.

P.T.O.

SECTION - II

Q5) a) Explain: structure of parallelizing compiler. **[8]**

b) What are various issues in planning a compiler. **[8]**

Q6) a) Discuss issues related to compilation for distributed machines. **[8]**

b) Explain: JIT compilers. **[8]**

Q7) a) What is need for code optimization? Support your answer with proper examples. **[8]**

b) Explain : Auto scheduling compilers. **[8]**

Q8) Write short notes: **[18]**

a) Register assignment and allocation.

b) Tools for compiler generation.

c) Control flow analysis.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1771

[3965]-285
M.E. (Industrial Engg.)
ADVANCED OPERATIONS RESEARCH
(2003 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is goal programming? Discuss in detail with examples. **[8]**

b) Solve the following linear programming problem optimally.

Maximize $Z = 8X_1 + 6X_2 + 10X_3$

Subject to

$$8X_1 + 4X_2 + 2X_3 \leq 155$$
$$3X_1 + 6X_2 + 12X_3 \leq 135$$

All decision variables are non-negative and integers. **[10]**

Q2) a) What do you understand by separable programming? Give an example. **[6]**

b) A company wishes to plan its production of two items with seasonal demands over a 12-month period. The monthly demand of item 1 is 1,00,000 units during the months of October, November and December; 10,000 units during the months of January, February, March and April; and 30,000 units during remaining months. The demand of item 2 is 50,000 during the months of October through February and 15,000 during the other months.

Suppose that the unit product cost of items 1 and 2 is Rs.5 and 8 respectively, provided that these were manufactured prior to June. After June, the unit costs are reduced to 4.5 and 7 respectively. The total units of items 1 and 2 that can be manufactured during any particular month cannot exceed 1,20,000 for Jan.-Sept., and 1,50,000 for Oct.-Dec.

Formulate the production scheduling problem (LPP) so that the total production and inventory costs are minimized. **[10]**

P.T.O.

Q3) a) Explain decomposition principle used in large scale LPP. **[6]**

b) Solve the following problem using dual simplex method. **[10]**

Maximize $Z = -2x_1 - x_3$

Subject to $x_1 + x_2 - x_3 \geq 5$

$x_1 - 2x_2 + 4x_3 \geq 8$

$x_1, x_2, x_3 \geq 0.$

Q4) The optimal table of the LP problem. **[16]**

Maximize $Z = 10x_1 + 15x_2 + 10x_3$

Subject to $2x_1 + 4x_2 + 6x_3 \leq 24$

$3x_1 + 9x_2 + 6x_3 \leq 30$

is given below :

	G.	10	15	10	0	0	
	B.V.	x_1	x_2	x_3	x_4	x_5	RHS
10	X_3	0	– 1	1	½	– ⅓	2
10	X_1	1	5	0	– 1	1	6

Then :

a) Find the range of objective function coefficient G_1 of decision variable X_1 such that the optimality is unaffected.

b) Check whether the optimality is affected if the profit coefficients are changed from (10, 15, 10) to (17, 14, 15). If so find the revised optimal solution.

SECTION - II

Q5) a) Explain stepwise procedure of Branch and Bound method. **[6]**

b) Solve the following travelling salesman problem using Branch and Bound method. **[10]**

	A	B	C	D	E
A	∞	375	600	150	190
B	375	∞	300	350	175
C	600	300	∞	350	500
D	160	350	350	∞	300
E	190	175	500	300	∞

Q6) A manufacturer is offered two machines, namely A and B. A is priced at Rs.8000 and maintenance cost are estimated at Rs.500 for the first year and an equal increment of Rs.100 from second to fifth year and Rs.1500 for the sixth year and an equal increment of Rs.500 from seventh year onwards.

Machine B which has the same capacity is priced at Rs.6000. The maintenance cost of the machine B are estimated at Rs.1000 for the first year and an equal yearly increment of Rs.200 thereafter. If the money is worth 16% per year, which machine should be purchased? **[16]**

Q7) A small scale company has 20 sewing machines. Machines break down with a mean rate of 5 per hour. The maintenance shop of the company has only one mechanic who can attend to the breakdown of machines. The service rate of the mechanic is 2 machines per hour.

a) Then find all the performance parameters of the system.

b) In order to reduce waiting time to repair, company has recruited one more mechanic, then find new values of all the parameters. **[16]**

Q8) Write short notes on any three of the following : **[18]**

a) Procedure to solve LPP in MS Excel.

b) Replacement decisions for sudden failure items.

c) Monte-Carlo simulation for queuing problems.

d) Decision algorithms for investment models.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1772

[3965]-438

M.E. (Civil) (Hydraulic Engg.)

FLUID MECHANICS

(2008 Course) (501303) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithms tables, slide rule, Mollier charts, electronics pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) In cylindrical polar coordinate system consider an elementary volume with sides δx, δr, $r\delta\theta$ taking V_x, V_r and V_θ as the velocity components in x, r, and θ directions respectively, show that the continuity equation takes the form **[8]**

$$\frac{\partial p}{\partial t}+\frac{\partial}{\partial x}PV_x+\frac{1}{r}\frac{\partial}{\partial r}\ (P*r*V_r)+\ \frac{1}{r}\frac{\partial}{\partial \theta}\ (P*V_\theta)=0\,.$$

b) Write short notes on: **[8]**

i) The Source flow.

ii) The Doublet.

Q2) a) Working from fundamentals, show that the flow per unit width past a fixed cross-section for laminar flow between two parallel plates, moving in opposite directions (lower one moving with velocity V and upper one with velocity U). Let 'a' be the distance between the two plates. **[8]**

$$q=\frac{a}{2}(U-V)-\frac{1}{12\mu}a^3\left(\frac{\partial p}{\partial x}\right).$$

P.T.O.

b) Determine pressure gradient, average velocity and the discharge for an oil of viscosity 0.02 NS/m^2 flowing between the 2 stationary parallel plates 1m wide maintained 1 cm apart. The velocity midway between the plates is 2m/s. **[8]**

Q3) a) Derive the Momentum Integral Equation for boundary layer. **[10]**

b) Air ($v = 1.44 \times 10^{-5}$ m^2/s) flows over a 0.5 m long and 1 m wide flat plate at a velocity of 10 m/s. Determine. **[6]**

i) Boundary layer thickness at the end of the plate.

ii) Shear stress 0.25m from the leading edge.

iii) Total drag force on both sides of the plate.

Take P = 1.208 kg/m^3.

Q4) Write short notes on (any three): **[18]**

a) Relaxation Method.

b) Navier-Stokes equation – Significance of body force, Boundary conditions, limiting cases of N-S equation.

c) Method of controlling boundary layer separation.

d) Laminar Sub layer.

SECTION - II

Q5) a) Derive energy equation for compressible fluids. **[8]**

b) Explain what do you mean by: **[8]**

i) Transonic flow.

ii) Hypersonic flow.

iii) Shock wave.

iv) Mack Angle.

Q6) a) How does the velocity and pressure vary with area for **[9]**

i) Subsonic flow.

ii) Supersonic flow.

b) A projectile is travelling in air ($p = 66kN/m^2$, $t = -7°C$), the Mach angle is found to be 30°. Determine the velocity of the projectile. **[7]**

Q7) a) What are the semi-empirical theories of turbulence. Explain the concept of mixing length and state the relationship between turbulent shearing stress and the mixing length. **[8]**

b) Describe the factors which affect the transition of flow from laminar to turbulent. What is turbulence? Give examples of common occurrences which characterize turbulent flow. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Aging of pipes.

b) Hydro dynamically smooth and rough pipes.

c) Moody's diagram.

d) Reynold's equation of motion.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1773 **[3965]-450**

M.E. (Civil) (Hydraulic)

WATER MANAGEMENT AND CONVEYANCE SYSTEMS

(2008 Course) (Elective - III) (501311)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Describe in detail about the nature of different kind of wastes to water systems. What are the harmful effects of those wastes? What kind of preventive measures can be taken? **[9]**

b) An overflow spillway has the following data. **[9]**

i) Discharge per running metre length of spillway is 14 $m^3/s/m$.

ii) The upstream face is vertical.

iii) The downstream face has a slope of 0.75 (H) : 1.0 (V).

iv) The RL of the river bed is 105 metre.

v) The RL of the maximum water level is 150 metres.

vi) The spillway is an ungated one.

Determine the

1) Crest level of the spillway.
2) Shape of u/s and d/s portion of the crest of spillway as per USWES recommendations.
3) Sketch the profile.
4) The depth of water in the tail channel of spillway so that the hydraulic jump type apron, can be used as an energy dissipater.

P.T.O.

Q2) a) What do you mean by diffusion and dispersion regimes? Describe them in detail. **[8]**

b) Describe in detail about the pollutant transport mechanisms. What are the major obstructions faced in this mechanism. **[8]**

Q3) a) What do you mean by local water problem and Global water problems? What is the basic difference between them? What are the feasible solutions to these problems? **[8]**

b) What is the basic mechanism of River Flow? Discuss in detail about the component of self-weight of water which is responsible for the flow of water in a river. Explain it with a proper sketch which will show the components of self weight of the water within the control volume, responsible for flow in a channel. **[8]**

Q4) a) Discuss in detail about Reservoir analysis. **[8]**

b) Write in brief about Contaminant decay modeling. **[4]**

c) Write in brief about dissolve oxygen models. **[4]**

SECTION - II

Q5) a) In a wide stream, a suspended load sample taken to a depth of 0.6 metre from the bed indicated a concentration of 1500 ppm of sediment by weight. The stream is 5m deep and has a bed slop of 1:2400. Estimate the concentration of the suspended load at the mid depth.

Consider the fall velocity of uniform size bed material as 0.15 m/s and the shear friction velocity as 0.11 m/s. Take Von-Karman constant as 0.4. **[9]**

b) Write elaborately about Design elements of water distribution systems and system modeling. **[9]**

Q6) a) What do you mean by Design Elements. Discuss in detail about that. **[8]**

b) "Urban drainage and runoff control is a challenge to the city engineers". Justify this statement and how to solve this problem. At least discuss about one method by which this problem can be minimized to a considerable extent. **[8]**

Q7) a) What is flood? What are the various methods of controlling flood? How to forecast and estimate flood? **[8]**

b) Draw the sketch of a 'Diversion Head Works' and show all the important parts of it. **[8]**

Q8) a) Draw the neat sketch of a Thermal Power Plant and label all the parts. What are major problems faced by a Thermal Power Plant? In spite of so many problems; in India maximum energy comes from Thermal Power Plant only. Why is it so? **[8]**

b) What are the major Economic Aspects and Decision making related to the growth of a Hydroelectric Power Plant? Discuss them in brief. **[8]**



Total No. of Questions : 10] **[Total No. of Pages : 2**

P1775

[3965]-513

M.E. (Mechanical) (Design Engineering)

ADVANCE MATERIAL SCIENCE

(2008 Course) (Elective - I) (502204 B)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Square bracketed figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Sketch the three most important types of spatial arrangement encountered in the lattice structures of metals. Show how the density of packing of the atoms in each case effects volume changes in those metals which, like iron, are polymorphic. **[16]**

OR

Q2) Explain the term 'dendritic solidification'. Show how certain mechanical properties of cast metals can be explained by reference to this type of crystal structure. **[16]**

Q3) What effect does a substitutional element have upon the iron-carbide thermal equilibrium diagram is **[16]**

a) It is γ - stabilizer.

b) It is an α - stabilizer? What effects do these substitutional elements have upon the ability to be heat treated and other properties of steels?

OR

Q4) List, and briefly describe, the essential requirements of a bearing metal. Show by discussing the constitution and structure of the materials, how the requirements are realized in **[16]**

a) Certain copper base alloys and

b) White metals. Compare the applications of the two groups and give typical compositions.

P.T.O.

Q5) Write short notes: **[18]**

a) Miller's indices.

b) Coordination Number.

c) Dual Phase Steel.

SECTION - II

Q6) a) List and explain desirable properties of orthodental metals. **[8]**

b) Discuss mechanical, chemical physical and biological requirements of orthopaedics biomaterials. **[8]**

OR

Q7) A composite material consists of 50% (by volume) continuous, uniaxially aligned, E - glass fibers in a matrix of thermoset polyester. Predict the tensile strength of composite parallel to the fibers. Tensile strength of E-glass fibers is 1800 MPa and modulus is 76 GPa. The tensile strength of the thermoset polyester is 55 MPa and the modulus is 3 GPa, assume linear elastic response upto tensile strength. **[16]**

Q8) a) Describe the mechanical and thermal behavior of shape memory alloy NiTi, explain its application. **[8]**

b) Describe the use of cermets in cutting tools for machining. **[8]**

OR

Q9) a) Explain vacuum based coating methods to reduce friction. **[8]**

b) Describe the advantages and limitations of shape memory alloys. **[8]**

Q10) Write short notes: **[18]**

a) Super conducting materials.

b) Ion implantation method.

c) Nano materials.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1776

[3965] - 539

M.E. (Mechanical) (Mechatronics)

DRIVES AND ACTUATORS

(2008 Course) (502810) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections must be written on separate answer papers.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain different methods used for turning ON the thyristor. **[8]**

b) Explain different methods used for turning OFF the thyristor. **[8]**

Q2) a) Explain advantages and disadvantages of single phase full-converter-fed dc motor drives. **[8]**

b) The maximum junction temperature of a transistor is T_j = 200°C and the ambient temperature is T_A = 15°C. If the thermal impedance are R_{JC} = 0.3°C/W, R_{CS} = 0.2°C/W and R_{SA} = 0.4°C/W. **[8]**
Calculate

i) Maximum power dissipation.

ii) Case temperature.

Q3) a) Explain the principle of closed locked loop control of dc drives. **[8]**

b) Explain transfer and output characteristics of p-channel MOSFET. **[8]**

Q4) Write any three short notes on : **[18]**

a) Characteristics of DC motor.

b) Speed control of three phase induction motor.

c) Driver circuit for stepper motor.

d) Cycloconverters.

P.T.O.

SECTION - II

Q5) a) Compare single seated valves and double seated valves with respect to construction, advantages, disadvantages and applications. **[8]**

b) Discuss four important stepper motor specifications with respect to stepper motor used as actuator. **[8]**

Q6) a) Discuss the components used in a Hydraulic circuit when a double acting hydraulic cylinder is used as actuator in earth moving equipment like bulldozer. **[8]**

b) Compare Hydraulic systems over Pneumatic systems w.r.t. used as actuators w.r.t. applications, advantages, and maintenance. **[8]**

Q7) a) Discuss the features of three phase induction motor used as a prime mover for the pump used in hydraulic power packs. **[8]**

b) A actuator has movement which at full travel is 40 mm. It is mounted on process control valve with an equal percentage plug which has minimum flow rate of $0.2m^3/s$ and maximum of $4m^3/sec$. What will be the flow rate when stem movement is (1) 10 mm and (2) 20 mm.**[10]**

Q8) a) Design a mechanical system which can be used to transform a rotary motion into a linear reciprocating movement. Comment on output motion with respect to displacement, velocity and acceleration. **[8]**

b) What is an induction motor? Discuss applications of single phase and three phase induction motors used as actuators in Mechatronic systems. **[8]**

❖ ❖ ❖ ❖

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1777

[3965]-541
M.E. (Mechanical) (Mechatronics)
ROBOTICS
(2008 Course) (Elective - III) (502811)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of pocket non programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Define and explain the meaning of the following terms. **[8]**

i) Repeatability.
ii) Resolution.
iii) Work volume and
iv) Remote Compliance.

b) In one degree of freedom robot, it has one sliding joint with full range of 1 meter. The robots control memory has a 12 bit storage capacity. Determine the control resolution for this axis of motion. **[5]**

c) Explain briefly the classification of robots. **[5]**

Q2) a) Compare different drive systems used in robotics. **[8]**

b) Explain the steps to implement D-H convention for three axis articulated arm robot. **[8]**

Q3) a) Derive the equation to calculate force generated by the end of the arm given the joint torques as shown in figure 2. T1 and T2 are the torques applied at the joints O and A respectively. **[8]**

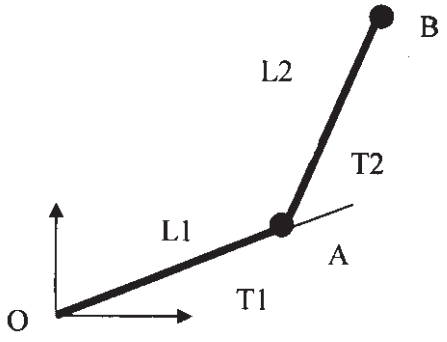


figure 2,

P.T.O.

b) Explain the different parameters considered during planning of joint interpolated trajectories. **[8]**

Q4) a) Suggest suitable Gripper used to load and unload thin sheets and explain its working with neat sketch. **[4]**

b) Find the resultant rotation matrix for Euler's angle representation in following sequence of rotation. **[12]**

i) Rotation by an angle Φ about OW axis.

ii) Rotation by an angle θ about OV axis.

iii) Rotation by an angle ψ about OU axis.

Find the desired position and orientation of the hand of a Cartesian-RPY robot is given next. Find the necessary roll, pitch and yaw angles and displacements.

$$\begin{bmatrix} 0.534 & -0.674 & 0.649 & 4.33 \\ 0.505 & 0.722 & 0.475 & 2.50 \\ -0.788 & 0.160 & 0.595 & 8 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Q5) a) What is the requirement of actuators used in robotics? **[8]**

b) A part weighing 15 kg to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the figures and the part surface is 0.3. Assume appropriate g factor for the gripper. Compute the required gripper force. **[8]**

SECTION - II

Q6) a) Sketch and explain the terms "Path points", "via points" and "pseudo via points" with suitable example. **[8]**

b) Explain feedback sensors used in Robot Joints. **[8]**

Q7) a) Explain lead through Robot Programming. **[8]**

b) It is desired to have the first joint of six axis of robot go from initial angle of 30 degree to the final angle of 75 degree in 5 seconds. Using a third order polynomial. Calculate the joint angle at 1, 2, 3 and 4 seconds. **[8]**

Q8) a) Classify and explain MOVES, DEPART, WAIT, DELAY, SIGNAL, SPEED and CLOSE commands used in Robot Programming. **[10]**

b) Explain the method of defining position in space of robot arm and wrist during teach mode programming. **[6]**

Q9) a) Explain use of sensors in robotics. **[6]**

b) The A/D converter has an 8 bit capacity. **[10]**

i) A continuous voltage signal is to be converted into a discrete signal. The range of the signal after simplifications 0 to 5V. Determine the no of quantization levels, quantization level spacing The resolution and the quantization error.

ii) For an image digitized at 128 points per line and 128 lines. Determine total no of bits to represent the gray level values.

Q10) Write short notes on:

a) Robots joint space scheme. **[6]**

b) Robot Applications in Painting. **[6]**

c) Frame buffers and grabbers. **[6]**



Total No. of Questions : 10] **[Total No. of Pages : 2**

P1778

[3965]-544

M.E. (Mechanical) (Mechatronics)

FUZZY LOGIC & NEURAL NETWORKS

(2008 Course) (Elective - IV) (502812 - B)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any 3 questions from Section - I and 3 from Section - II***
2) ***Answers to each section should be written in separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Discuss architecture of Genetic Algorithm. **[9]**

b) Discuss any two applications of Fuzzy Logic Control. **[9]**

Q2) a) Describe in brief assumptions in fuzzy control system design. **[8]**

b) Discuss the steps in general to map the classical set to function. **[8]**

Q3) a) Explain adaptive neuro controllers. **[8]**

b) What are limitations of Fuzzy Systems? **[8]**

Q4) a) Describe Fuzzy rule based interference. **[8]**

b) Discuss supervised and unsupervised learning algorithms of neural networks. **[8]**

Q5) a) Explain singular value decomposition w.r.t. rule based reduction method. **[8]**

b) Explain Cardinality and operations on Crisp relations. **[8]**

P.T.O.

SECTION - II

Q6) a) Discuss structure of Fuzzy Rules. **[9]**

b) Describe features of membership functions. **[9]**

Q7) Describe: **[16]**

a) Mutation and Cross over portability.

b) Fitness of evaluating function w.r.t. design of Genetic algorithms.

Q8) a) Discuss in brief the schemes of neuro control. **[8]**

b) What is noninteractive fuzzy sets? **[8]**

Q9) a) Explain in brief the self organizing maps. **[8]**

b) Discuss the process of Defuzzification. **[8]**

Q10) a) Explain deductive inferences in classical logic. **[8]**

b) Explain properties of fuzzy sets. **[8]**



Total No. of Questions : 9] **[Total No. of Pages : 3**

P1779

[3965] - 560
M.E. (Mechanical) (Automotive Engg.)
FINITE ELEMENT METHOD
(2008 Course) (502302) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

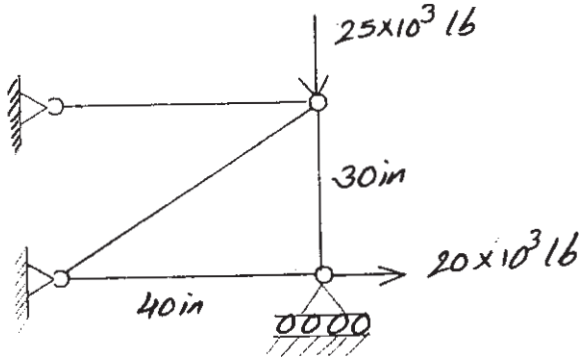
Q1) a) Briefly explain the properties of stiffness matrix. **[6]**

b) Consider the four-bar truss as shown in the figure. It is given that $E = 29.5 \times 10^6$ psi and $A = 1$ in^2 for all elements. Calculate the following

i) Element stiffness matrix. **[10]**

ii) Global stiffness matrix.

iii) Nodal Displacement.



Q2) a) Explain Quadratic shape functions of three-node 1-D element. **[6]**

b) Derive stiffness matrix for 1-D element using "Potential-Energy Approach". **[6]**

c) Briefly explain the non-structural areas of engineering where the finite element method is used. **[6]**

P.T.O.

Q3) a) One Dimensional element is defined by two nodes at x = 20 mm. and at 36 mm. for the point P(x = 24 mm) determine : **[10]**

i) Evaluate natural coordinates and shape functions.

ii) If u1 = 0.003 mm and u2 = – 0.005 mm, determine the value of displacement.

b) Sketch and explain the Beam element. **[6]**

Q4) a) What are types of boundary conditions and how they are treated in finite element method? **[8]**

b) Discuss the Problem Modeling and Boundary Conditions for the following cases : **[10]**

i) A cylinder of length L subjected to internal pressure and one end attached to rigid wall.

ii) Press fit of a ring of length L and internal radius r onto a rigid shaft of radius r + δ.

SECTION - II

Q5) a) What are higher order elements? Explain with suitable example. **[4]**

b) Explain how axi-symmetry and rotational symmetry is used in FEA with suitable applications. **[6]**

c) Explain how descritization is carried out using software with suitable example. **[6]**

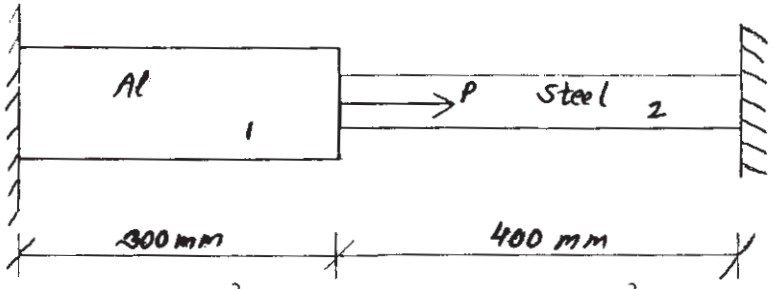
Q6) a) Derive an expression for stiffness matrix of a Truss element. **[8]**

b) Consider the bar as shown in the figure. An axial load of P = 200 kN is applied as shown. Determine : **[8]**

i) The nodal displacement.

ii) The stresses in each element.

iii) The reaction forces.



A1 = 2400 mm^2 A2 = 600 mm^2

E1 = 70 x 10^9 N/m^2 E2 = 200 x 10^9 N/m^2

Q7) a) Obtain the strain-nodal displacement relationship for the one-dimensional element. **[8]**

b) Evaluate the shape functions at the internal point P(3.85, 4.8) for the triangular element defined by I (1.5, 2), J(7, 3.5) and K(4, 7). **[8]**

Q8) a) Consider the truss element having nodes at (10, 10) and (50, 40), $E = 30 \times 10^6$ psi, and $A = 2.1$ in^2. If $q = [1.5, 1.0, 2.1, 4.3] \times 10^{-2}$, determine the following : **[10]**

i) The vector q'

ii) The stress in the element.

iii) The k matrix and

iv) The strain energy in the element.

b) Discuss how results are verified in FEA software. **[6]**

Q9) Write a short note on any three : **[18]**

a) Plane frame element.

b) Isoparametric Representation of CST Element.

c) Temperature effects in One-Dimensional Problems.

d) Different loading conditions in Frame Elements.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1780

[3965] - 611
M.E. (E&TC) (Microwave)
COMMUNICATION NETWORKS
(2008 Course) (504224) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain any four different Network design issues briefly. **[8]**

b) Explain centralized and distributed networks briefly. **[8]**

Q2) a) Messages independently arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600bps channel. A character is 8 bits long. **[8]**

Calculate i) Average service time Ts.

ii) What is arrival rate A.

iii) What is Service rate D.

iv) What is utilization of server U.

b) Explain Erlang-B function. **[4]**

c) Consider two systems that both use a 9600 bps line to transmit messages. One produces 300 character (2400 bit) messages at the rate of 3 per second. The other produces 150 character (1200 bit) Messages at the rate of 6 per second. In both systems the messages arrive independently and have exponentially distributed lengths. Calculate traffic intensity & Utilization factor of both systems. **[4]**

P.T.O.

Q3) a) Explain the Explicit routing, Distributed routing and Adaptive routing. **[6]**

b) Explain Poission function in detail. **[6]**

c) Write Socket address for Class-A, Class-B, with Private IP address of FTP server and Telnet Server. **[4]**

Q4) Write short note on (any three) : **[18]**

a) Frame relay Virtual Circuit Switching.

b) 802.11 MAC layer.

c) SMTP and POP-3 for Email.

d) Adaptive routing.

SECTION - II

Q5) a) Compare H.323 and SIP in detail. **[8]**

b) Write a short note on S/MIME. **[4]**

c) Explain the advantages & applications of Wi-Max. **[4]**

Q6) a) Explain Features, applications & Drawbacks of network monitoring tool. **[6]**

b) Explain the Features, applications & Drawbacks of Protocol Analyzer. **[6]**

c) Write a short note on LAN Cable Tester. **[4]**

Q7) a) Compare Public key and private key algorithm with example. **[8]**

b) Explain the drawbacks of Circuit switched PSTN and write short note on VoIP. **[8]**

Q8) Write short note on (any three) : **[18]**

a) Cryptography model.

b) Streaming video.

c) Confidentiality, Integrity & Availability.

d) DNS system.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1781

[3965]-627

M.E. (E&TC) (VLSI & Embedded Systems)

EMBEDDED SYSTEM DESIGN

(Sem. - I) (2008 Course) (504183)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the major design rules used for implementation of RISC architecture? **[8]**

b) Describe load-store architecture using ARM core dataflow model. **[8]**

Q2) a) What are the critical specifications of memory used in an embedded system design? Explain how they limit the performance of the embedded systems? **[10]**

b) What are the different cache replacement policies? Also describe merits and demerits of each policy. **[8]**

Q3) a) What are the various design metrics used to characterize an embedded system? **[10]**

b) Describe the architecture of typical FPGA. **[6]**

Q4) a) What are the architectural features of the ARM-9 Processor? Draw and explain the architecture of typical ARM-9 Processor/Controller. **[10]**

b) Describe the ARM Nomenclature in detail.

"ARM {x} {y} {z} {T} {D} {M} {I} {E} {J} {F} {-S}". **[6]**

P.T.O.

SECTION - II

Q5) a) How many devices can form network in Bluetooth protocol? Describe the concept of piconet and scatternet. Also specify communication between two devices using state transition diagram. **[10]**

b) What are the various issues related with signal integrity? **[8]**

Q6) a) Describe following I/O transfer techniques. **[8]**

i) Polling I/O.

ii) Interrupt driven I/O.

b) Why following type of parallel buses are used in an embedded system? Justify the answer using suitable example. **[8]**

i) Multiplexed buses.

ii) Tristate buses.

iii) Open drain buses.

Q7) a) What are the different stages of simple design methodology? What are the advantages & disadvantages of this methodology? If verification fails during some stage of a design methodology, what action is taken? **[10]**

b) What is meant by top-down design? **[6]**

Q8) a) What are the three basic steps involved in physical design? Also explain the factors those influences the physical design. **[8]**

b) Describe two techniques used for reducing power consumption. **[8]**



Total No. of Questions : 8] **[Total No. of Pages :2**

P1782

[3965]-628
M.E. (E & TC) (VLSI & EM bedded Systems)
ASIC DESIGN AND MODELING
(2008 Course) (504184) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain in detail ASIC Design Flow. **[12]**

b) Explain design rule checkers required for ASIC design **[4]**

Q2) a) Explain the different modeling techniques used in VHDL. Write a VHDL code for 4-bit up down counter using behavioral modeling. **[10]**

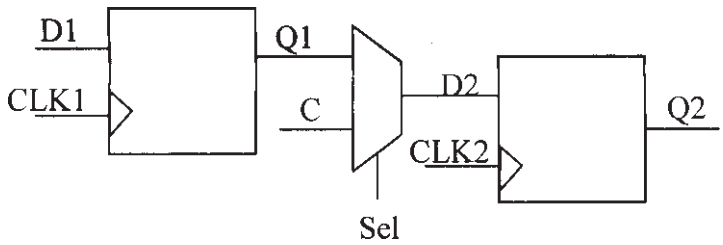
b) What is necessity of timing analysis? Explain in detail static analysis. **[6]**

Q3) a) What do you mean by clock skew? How it can be rectified? Explain it with neat waveforms for cases when **[10]**

i) CLK1 > CLK2

ii) CLK1 < CLK2

For following figure 1.



b) Compare hardware design verification and software design verification. **[6]**

Q4) Write short note on: **[18]**

a) Verification issues

b) Mixed signal design issues

c) Types of Simulation

P.T.O.

SECTION - II

Q5) a) Explain step by step process to be followed in design for test flow in ASIC. **[8]**

b) Explain how the wire - load tables are used to measure delays in floor planning. **[8]**

Q6) a) Define layout planning? How automatic layout planning is playing important role in CMOS fabrication. **[8]**

b) List the different fault models present. Explain in detail stuck at fault models. **[8]**

Q7) a) Why the testability is required while designing the ASIC? Explain following terms w.r.t. testability. **[10]**

i) Fault coverage

ii) Controllability

iii) Observability

b) Explain the logic synthesis and post layout synthesis. **[6]**

Q8) Write short note on **[18]**

a) Stick Diagram

b) Power Grid Analysis

c) Automatic Test Pattern Generation

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1783

[3965]-631

M.E. (E&T/C) (VLSI & Embedded Systems)

RECONFIGURABLE COMPUTING

(2008 Course) (Elective - II) (504185)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are configurable, programmable & fixed function devices? Explore each with suitable example in brief. **[8]**

b) What are the limitations of General Purpose Processor? Why evolution in it is necessary? What are characteristics of an ideal reconfigurable device? **[8]**

Q2) a) Why is reconfigurable ALU said very close to reconfigurable device? Explain with suitable schematics. **[8]**

b) What is relationship of interconnect growth & requirement of area on chip? Why do interconnects consume dominant area on chip? Give example. **[8]**

Q3) a) List the challenges involved in the reconfigurable interconnect design. **[8]**

b) Give the growth equations for wire, channel & associated hardware in reconfigurable device design. **[8]**

Q4) Write short notes on any three: **[18]**

a) Various reconfigurable devices developed yet.

b) Wire delays & solutions.

c) Rent's rule.

d) Switch requirement in reconfigurable device.

P.T.O.

SECTION - II

Q5) a) Give the mathematical analysis of design metrics such as density, diversity & capacity in brief. Draw suitable schematics to explore each. **[8]**

b) What is need of instruction compression? What are the techniques? Draw figures to support. **[8]**

Q6) a) Which method of instruction compression will you suggest for reconfigurable device? Why? Draw the schematic in detail to explore. **[8]**

b) Explain the concept of peak performance density in RP space area model. **[8]**

Q7) With the help of suitable block diagrams, explore the architecture of DPGA in detail. Which section is responsible for bottleneck in throughput? List the merits & limitations of DPGA alongwith the causes. **[16]**

Q8) Write short notes on any three: **[18]**

a) TSFPGA.

b) MATRIX.

c) Interconnect hierarchy.

d) Challenges in complete reconfigurable device design.



Total No. of Questions : 8] **[Total No. of Pages :3**

P1784

[3965] - 637
M.E. (E & TC) (VLSI Embedded System)
FAULT TOLERANT SYSTEM DESIGN
(2008 Course) (504191) (Elective - III)

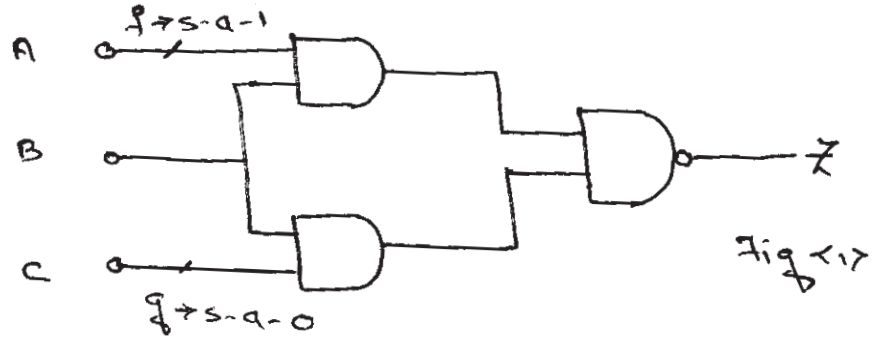
Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

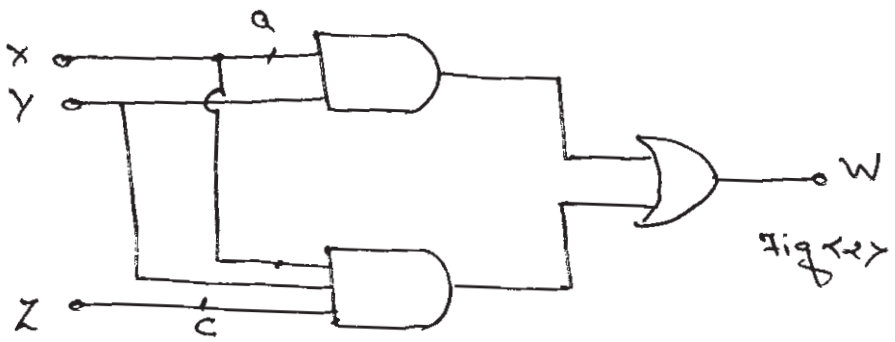
SECTION - I

Q1) a) Explain with theorem the masking relations among faults. Show with the truth table fault f → s-a-1 mask fault g → s-a-o, shown in fig (1) **[6]**



b) Explain general procedure for detecting static hazards in a combinational ckt and generate a table of 6-valued logic. **[6]**

c) For the circuit shown below in fig (2). Find the set of all tests that the fault c → s-a-1 and a → s-a-1. **[6]**



P.T.O.

Q2) a) Explain step by step working of any one functional modeling tool. **[4]**

b) With neat diagram explain the working of fault simulator to measure fault coverage. **[6]**

c) Explain in brief with block diagram the general simulation process. Draw the flow diagram of even driven simulation. **[6]**

Q3) a) Classify and explain in brief the different forms of testing. **[4]**

b) Explain with architecture the functioning of a centralised and separate Board level specific BIST architecture. **[8]**

c) List out several factors that contributes in the selection of best BIST architecture. **[4]**

Q4) Write short note on : **[18]**

a) Physical segmentation and Logical segmentation.

b) Path sensitization D-algorithm.

c) Errors and Faults.

SECTION - II

Q5) a) List and define important factors that determine the complexity of deriving a test for a circuit. **[6]**

b) Explain in detail the rule of following Adhoc design for Testability : **[10]**

i) Employing control and observation points.

ii) Initialisation.

iii) Partitioning a Register.

iv) Clocks and oscillators.

Q6) Write short note on : **[18]**

a) Bridging fault model

b) Different Task in-volved in fault simulation.

c) Truth table and Primitive cubes.

Q7) a) What are the drawbacks of conventional testing approach. List out general aspects of compression techniques. **[6]**

b) Explain with neat diagram the concept of reducing complete output response to a signature. **[4]**

c) What are the common ways to measure the masking characteristics associated with a compression technique. **[6]**

Q8) a) Differentiate between separable and Non-separable code. Explain the properties and structure with neat diagram, of the code which detect multiple bit errors. **[6]**

b) List out the advantages and disadvantages of checking circuits in conjunction with coded output. **[6]**

c) Define and classify Deterministic Test generation. Explain with neat diagram a deterministic TG system. **[6]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1785

[3965]-673
M.E. (Electronics) (Digital System Design)
DIGITAL SYSTEMS DESIGN USING PLD'S
(2008 Course) (Elective - III) (504204)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the various digital design implementing technologies, compare all the technologies and comment on Evolution of PLD's. **[10]**

b) What is selection criteria of CPLD and FPGA? **[6]**

Q2) a) Compare ASIC's with PLD's. **[8]**

b) With the help of suitable diagrams describe the role of I/O section in the CPLD. **[8]**

Q3) a) Describe the construction of the micro cell within the function block of the CPLD XC9500XV. **[8]**

b) Why CPLD is less suitable for a digital circuit design with high complexity and high component count? **[8]**

Q4) Write short notes on : **[18]**

a) Advanced VLSI tools for synthesis.

b) Optimization power and area of CPLD.

SECTION - II

Q5) a) Discuss about the factors of Cool Runner-II CPLD. **[6]**

b) Implement the technology to drive 8 bit LED using CPLD, write VHDL code. **[10]**

Q6) a) Describe the various output logic supported by spartan series of FPGA. **[8]**

b) Describe the architecture of CLB slice used in FPGA. **[8]**

P.T.O.

Q7) a) Give the various FPGA devices available in market, list the different architectural factors of all the devices. **[8]**

b) What are the reasons for the clock-skew? How it can affect the operation of the high frequency digital circuit? **[8]**

Q8) Write short notes on : **[18]**

a) DSP processor.

b) 5200 FPGA family.

c) In system programming.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1786

[3965]-676

M.E. (Electronics) (Digital Systems)

RECONFIGURABLE COMPUTING

(504205) (2008 Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare different types of processor with reconfigurable device in brief. Give the importance & need of reconfigurable device. **[8]**

b) With the help of suitable ckt. diagram, explain the design metric-functional density in detail. **[8]**

Q2) a) Compare various computing architectures w.r.t. multiplier operation. How will you locate reconfigurable divice? Where? **[8]**

b) Why are interconnects so important? Compare conventional interconnects in detail. What is your conclusion at the end? **[8]**

Q3) a) What is Rents rule? How will you apply it in design of your own reconfigurable device? **[8]**

b) Give the detail mathematical analysis of interconnect growth. What are solutions. **[8]**

Q4) Write short notes on any three: **[18]**

a) Granularity.

b) Challenges in design of general purpose processor.

c) Reconfigurable ALU.

d) Limitations of current FPGAs.

P.T.O.

SECTION - II

Q5) a) List various reconfigurable devices developed yet & give features of each in brief. **[8]**

b) What is meant by data bandwidth? What is its impact in design of new architecture? **[8]**

Q6) a) Why is context needed? Explore related design issues. **[8]**

b) Explain hierarchical interconnects in detail. **[8]**

Q7) With the help of detail block diagram. Explain the architecture of iDPGA. List its features, merits and limitations. **[16]**

Q8) Write short notes any three: **[18]**

a) Comparison of DPGA with FPGA.

b) MATRIX.

c) Challenges in reconfigurable interconnect design.

d) Crossbars.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1787

[3965] - 690

M.E. (E&TC) (Communication Network)

WIRELESS SYSTEM DESIGN

(2010 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are conditions of lossless transmission line? Explain using transmission line model. Also write expression for characteristic impedance. **[8]**

b) Describe functionality of RF amplifier using suitable block diagram. Also write expressions for input and output reflection coefficients (Γ_{in} and Γ_{out}). **[10]**

Q2) a) What is the significance of the following terms for RF amplifier? **[8]**

i) Transducer power gain,

ii) Available power gain

iii) Operating power gain

Write expression for transducer power gain, and condition of unilateral power gain.

b) What are the characteristics of typical RF amplifier? **[8]**

Q3) a) What do you mean by stability of RF amplifier? Define conditional stability and unconditional stability. **[4]**

b) What is the meaning of stability circle? Draw output stability circle denoting stable and unstable regions. **[6]**

c) What are various stabilization methods? Explain using suitable block diagram. **[6]**

P.T.O.

Q4) a) Draw and explain, negative resistance oscillator. **[8]**

b) Describe Colpitts oscillator with its function model. Also derive expression of tank voltage (V_{tank}). **[8]**

SECTION - II

Q5) a) Describe quartz crystal oscillator. What do you mean by fundamental mode and overtone mode of operation? **[8]**

b) What are the advantages of Clapp oscillator? Justify the answer by referring circuit diagram and its operation. **[8]**

Q6) a) Draw and describe characteristic for conversion compression and inter modular distortion (IMD) of a mixer. **[8]**

b) Draw and explain single balanced mixer. What is role of RF transconductors in mixer? **[8]**

Q7) a) Explain the following parameters for mixer : **[8]**

i) Conversion gain.

ii) Noise figure.

iii) Isolation between LO and RF signal ports.

iv) Nonlinearity.

b) Draw and explain square-law-MOSFET mixer, write expression for conversion gain (G_c). **[8]**

Q8) Write short note on any three of the following : **[18]**

a) Link budget of wireless system architecture.

b) Propagation loss.

c) Voltage controlled oscillator (VCO).

d) YIG-Tuned oscillator.

e) Double-balanced mixer.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1788

[3965] - 700
M.E. (Production)
(Manufacturing Engineering & Automation)
ADVANCE MECHATRONICS
(2008 Course) (511104) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Draw figures wherever required.***
2) ***Assume suitable data wherever necessary and state them clearly.***
3) ***Use of Programmable calculator is not allowed.***

SECTION - I

Q1) a) Compare and contrast the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor? **[12]**

b) State the steps that might be present in the sequential control of a dishwasher. **[4]**

OR

What is mechatronics? Explain with suitable example different types of measurement and control systems used in Mechatronics? **[16]**

Q2) Explain the role and significance of Sensors, Signal Conditioner and Display pattern used for measurement systems? Explain working of potentiometer sensor in detail **[16]**

OR

P.T.O.

a) Explain what do you understand by following mechatronic data of strain gauge pressure transducer **[8]**

Ranges: 70 to 1000 kPa, 2000 to 70000 kPa
Supply Voltage: 10 V dc or ac rms
Full range output: 40 mV
Non-linearity and hysteresis: :± 0.5 % full range output
Temperature range: -54°C to + 120°C when operating
Thermal zero shift: 0.030 % full range output /°C

b) Suggest a sensor that could be used as a part of control system, to determine the difference in levels between liquids in two containers. The output is to provide an electrical signal for the control system.**[8]**

Q3) a) Explain in detail General internal architecture of a microprocessor with neat sketch. **[12]**

b) Explain programming of microprocessor using 8085 instructions **[6]**

OR

a) Explain the issues of interfacing D/ A converters and A/D converters. **[12]**

b) Explain working and applications of stepper motor controls used in machine tools **[6]**

SECTION - II

Q4) Explain following w.r.t. process control systems : **[16]**

a) Characteristics functions.
b) Input/Output arrangements
c) Addressing techniques
d) Memory systems

OR

a) Simplify following Boolean equations **[8]**

i) Q = A.C + A.C.D + C.D

ii) Q = A.B.C + C.D. + C.D.E

b) Use De Morgan's laws to show that a NOR gate with inverted inputs is equivalent to an AND Gate. **[8]**

Q5) Devise a system, using PLC which can be used to control the movement of the piston in a cylinder so that when a switch is momentarily pressed, the piston moves in one direction and when a second switch is momentarily pressed the piston moves in the other direction. Consider the used of 4/2 solenoid valve. Compare important characteristics of mechatronics design with tradition pneumatic system. **[16]**

OR

a) Explain how a PLC can be used to handle an Analogue input. **[6]**

b) Devise a PLC system that could be used with a conveyor belt which is used to move an item to a work station. The presence of the item at the work station is detected by means of breaking a contact activated by a beam of light to the photosensor. There it stops for 100 s for an operation to be carried out before moving on and off the conveyor. The motor for the belt is started by a normally open start switch and stopped by a normally closed switch. **[10]**

Q6) Design a mechatronic system for car park barriers which is having facility to lift and lower based on number of cars existing in the parking. **[18]**

OR

Write a short notes on : **[18]**

a) Selection criteria for PLC.

b) Shift Registers.

c) Latch Circuit.

❖ ❖ ❖ ❖

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1789

[3965] - 702

M.E. (Production)

(Manufacturing Engg. & Automation)

SUPPLY CHAIN MANAGEMENT

(2008 Course) (Elective - I) (511104)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define supply chain and explain clearly the decision phases in a supply chain. **[8]**

b) What are the essential differences in the Supply Chain Management of Products vs. Services? Discuss the application of Supply Chain Management principles in Financial Services. **[8]**

Q2) a) Give difference between demand uncertainty and implied demand uncertainty. Also explain the implied uncertainty spectrum with example. **[8]**

b) Explain the basic trade-off between responsiveness and efficiency for each of the major drivers of supply chain performance. **[8]**

Q3) a) Discuss clearly with examples the various factors influencing network design decisions. **[8]**

b) Explain the capacitated plant location model with single out sourcing. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Tailored risk mitigation strategies during network design.

b) Framework for structuring Drivers.

c) Efficient versus responsive supply chains.

d) Aggregate planning using linear programming.

P.T.O.

SECTION - II

Q5) a) Discuss the importance of location of warehouse for the SCM. Explain the different determining the location of the warehouse. **[8]**

b) Explain with necessary analysis the economies of scale to exploit quantity discounts. **[8]**

Q6) a) Discuss with relevant examples the impact of supply uncertainty and impact of aggregation on safety inventory. Support your answer with necessary analysis. **[10]**

b) Explain how to estimate cycle inventory related costs. **[6]**

Q7) a) "In the era of outsourcing, third party logistics can add value to existing supply chains." Explain this statement with examples. **[8]**

b) Discuss with suitable examples transportation and inventory cost trade-off. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Managing Multi-echelon Cycle Inventory.

b) Role of Electronics data Interchange in the SCM.

c) Impact of promotion on demand within a supply chain.

d) Milk round system.

❖ ❖ ❖ ❖

Total No. of Questions : 8] **[Total No. of Pages : 4**

P1790

[3965]-728

M.E. (Production) (CAD / CAM)

ENERGY MANAGEMENT

(2010 Course) (Elective - II) (511205)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Comment on the current Energy situation in the state of Maharashtra, highlighting the strengths and weaknesses. **[8]**

b) Discuss in brief the importance of: **[2 x 5 = 10]**

i) Energy Management.

ii) Methods of evaluation of alternative proposals.

Q2) a) What do you understand by the term Life Cycle Cost? Discuss with suitable example. **[8]**

b) Define and explain the term 'specific energy consumption'. How is it used for Energy Management? **[8]**

Q3) a) What are the legal provisions about Energy Audit in industry? What are the steps involved in it? **[8]**

b) Mention the items to be considered while costing the utilities like steam. **[8]**

P.T.O.

Q4) a) How energy audit can help in improving energy efficiency? Discuss with suitable examples. **[6]**

b) Answer the following: **[10]**

i) Which of the following is not a Primary Energy Source?

1) Oil. 2) Natural Gas.

3) Electricity. 4) Wood.

ii) Which of the following is a renewable energy source?

1) Bitumen. 2) Solar Energy.

3) Coal. 4) Natural Gas.

iii) O_2 content in atmospheric air on volume basis is:

1) 21%. 2) 23%.

3) 30%. 4) 40%.

iv) Pulverised fuel is used for:

1) Better burning. 2) More calorific value.

3) Less radiation loss. 4) Ease of handling.

v) The latent heat of steam with increases of pressure.

1) Remains same. 2) Increases.

3) Decreases. 4) Behaves unpredictably.

vi) The objective of energy management is:

1) To minimize energy costs.

2) To minimize environmental effects.

3) 1 & 2.

4) None of the above.

vii) Which of the following is used to represent energy balance of a system?

1) Sankey Diagram,

2) Flow chart,

3) Single line Diagram,

4) Block Diagram.

viii) Energy available in fuels is stored as:

1) Heat Energy.
2) Chemical Energy.
3) Atomic Energy.
4) Explosive Energy.

ix) Capital costs are the costs associated with:

1) Design.
2) Installation & Commissioning of project.
3) 1 & 2.
4) Savings from project.

x) What is the NPV of a project, (life 2 year) which requires an investment of Rs. 50000 & yield Rs. 30000 in the 1st year and Rs. 40000/- in the next year, if the interest rate is 10%.

1) 10330,
2) (10330),
3) 20660,
4) (30660).

SECTION - II

Q5) Write short notes on any three of the following: **[18]**

a) Methods of Demand Control.

b) Power Factor and its importance.

c) Co-generation and its importance in industry.

d) Methods of improving efficiency in motors and pumps.

Q6) a) Mention the ways in which you can improve energy efficiency on the shop floor. **[8]**

b) What is meant by Energy Efficient illumination? Which are the devices used in this? **[8]**

Q7) a) Discuss the importance of Energy Management in Process Industry. **[8]**

b) Which are the areas for possible energy efficiency improvement in domestic sector? **[8]**

Q8) Write short notes on: **[16]**

a) Co-generation - benefits and limitations.

b) Areas for energy efficiency improvement in industry.

c) Energy losses in boilers.

d) Sanky Diagram and its applications in Energy Management.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1791

[3965]-734
M.E. (Production) (CAD/CAM)
ADVANCED MATERIALS AND PROCESSING
(2010 Course) (511211 (b)) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is superalloy? What metals or combination of metals forms the base of superalloy? Explain its properties and applications. And what class of metal or alloy must be used when operating temperature exceeds the limits of superalloys? **[8]**

b) Explain in short : **[8]**

i) Dual-phase steel.
ii) TRIP steel.
iii) Maraging steel.

Q2) a) What are metallic-glass? Why is the word "glass" used to these materials? Explain how it is produced with its properties and applications. **[8]**

b) What is bio-ceramics and bio-plastics? State their properties and applications. **[8]**

Q3) a) Explain different types of ceramics with their characteristics and applications. **[10]**

b) What different additives are used in plastics? And explain its effect on plastics. **[6]**

Q4) a) Why aircraft skins made up of aluminum alloys? Even though magnesium is the lightest metal. **[6]**

b) What is super conductor? What are the types of superconductors? And how HTSC are processed? **[6]**

c) What is the significance of Al_2O_3? How is it produced? State its application. **[6]**

P.T.O.

SECTION - II

Q5) a) What are some typical product that are made by Filament winding? Why might this process be attractive for the production of small quantities of large parts. **[8]**

b) List the technique of processing polymer. Matrix composit and explain SMC and BMC in detail. **[8]**

Q6) a) Explain mechanism of USM. Also explain the process parameters of USM in detail. **[8]**

b) What are the function of electrolyte? List the name of different electrolyte used in ECM, and how electrolyte flow is design. **[8]**

Q7) a) Explain the principal, advantages and application of wire EDM. **[8]**

b) Explain in detail physical vapor deposition and chemical vapor deposition. **[8]**

Q8) a) Explain the process of thermal metal spraying with its principal, advantages and applications. **[6]**

b) Explain the principal of LBM with its process parameters, advantages and applications. **[6]**

c) In what way pultrusion is similar to wire drawing. **[6]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1792 **[3965]-734A**

M.E. (Production Engg.) (CAD / CAM)

QUALITY AND RELIABILITY ENGINEERING

(2010 Course) (Elective - III) (511211)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Differentiate between classical approach towards quality and Taguchi's approach. **[8]**

b) Express with example meaning of off line and on line quality control. **[8]**

Q2) a) Explain Taguchi's concept of 'Quality loss function'. **[8]**

b) Write note on parameter design strategy. **[8]**

Q3) a) Explain meaning of: **[8]**

i) Control factors.

ii) Noise factors.

b) What is use of signal to noise ratio? Why a designer should minimise the variance first & then adjust the mean on target? **[8]**

Q4) Write short notes on (any 3): **[18]**

a) Steps in Robust parameter design.

b) Planning and conducting the experiment.

c) Advantages of Response Surface Methodology.

d) Crossed array experiments.

e) Second order model.

P.T.O.

SECTION - II

Q5) a) Define reliability. Comment on trade off between performance, cost and reliability by giving suitable examples. **[8]**

b) Draw bath tub curve. Describe its various phases. Write the equation for modeling useful life phase. **[8]**

Q6) a) A certain type of electric component has uniform rate of failure of 0.00001 per hour. What is the reliability for a specified period of service of 10,000 hrs. **[8]**

b) A unit has reliability of 0.99 for a specified mission time. If two identical units are used in parallel redundancy, what overall reliability will be obtained. **[8]**

Q7) a) Describe FTA and FMEA. **[8]**

b) Define: **[8]**

i) Maintainability.

ii) Inherent availability.

iii) MTBF.

iv) Operational availability.

Q8) Write short notes on (any three): **[18]**

a) Burn in testing.

b) Accelerated life testing.

c) Allocation of reliability.

d) Markov reliability model.

e) Failure rate.



Total No. of Questions : 12] **[Total No. of Pages :4**

P1793

[3965] - 736A

M.E. (Production)

DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY

(2010 Course) (Elective - IV) (511212)

Time : 3 Hours] ***[Max. Marks:100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to TWO sections should be written in Separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the various research methods? Explain in brief experimental research. **[8]**

b) Distinguish between research methods and research methodology. **[8]**

OR

Q2) a) Explain variation application fields of researchers. **[8]**

b) Briefly describe the research process with flow chart. **[8]**

Q3) a) What are the techniques involved in defining a problem? **[8]**

b) Explain creative problem solving process. **[8]**

OR

Q4) a) Explain group problem solving techniques. **[8]**

b) Explain problem solving types, process & approaches. **[8]**

P.T.O.

Q5) a) What are the stages in model building? **[8]**

b) Define Heuristics and explain Application and reasons for using Heuristics. **[5]**

c) Explain data consideration & testing of models. **[5]**

OR

Q6) a) What are the principles of modeling? **[8]**

b) Define stimulation. Application and classification of simulation model. **[5]**

c) What are steps & Features of simulation Experiments. **[5]**

SECTION - II

Q7) a) What are the strategies of experimentation? **[8]**

b) What are the basic principles of experimentation? **[8]**

OR

Q8) a) What are the steps involved in design of experiment? **[8]**

b) Explain methods of manipulating variables. **[8]**

Q9) a) Explain robust design briefly. **[8]**

b) The impurity present in chemical products is affected by two factors pressure & temperature. The Impurity data from single replicate of factorial experiment is as shown in the table. **[8]**

Temperature	Pressure					
(F)	25	30	35	40	45	Yi
100	5	4	6	3	5	23
125	3	1	4	2	3	13
100	1	1	3	1	2	8
Yj	9	6	13	6	10	44=Y

OR

Q10) a) Explain factorial design principles. **[8]**

b) The following table presents the effective life (in hrs) observed in battery desing. The row & column totals are shown in the margins of the table and the circle Numbers are the cell totals life data (in hrs) for the battery design experiment. **[8]**

Material	Temperature (F)			
Type	15	70	125	Yi
1.	130 155	34 40	20 70	
	(539)	(229)	(230)	998
	74 180	80 75	82 58	
2.	150 188	136 122	25 70	
	(623)	(479)	(198)	1300
	159 126	106 155	58 45	
3.	138 110	174 120	96 104	
	(576)	(583)	(342)	1501
	168 160	150 139	82 60	
Yj	1738	1291	770	3799=Y

Q11) a) Explain different steps in report writing. **[8]**

b) A product rating organization tested battery life for four mobile phones. Six mobiles of each maker were purchased off the shelf from local retail stores & identical fully charged Batteries were inserted on random basis. The observation on battery playing hours at high Volume are as follows.

Observation	Treatment(j)			
(i)	1	2	3	4
1	5.5	4.7	6.1	4.5
2	5.0	3.9	5.7	5.1
3	5.2	4.3	5.0	4.3
4	5.3	4.5	5.3	4.1
5	4.8	4.1	5.2	4.5
6	4.8	4.3	6.3	5.1

Obtain the ANOVA table & state which mobile is better. **[10]**

OR

Q12) a) Explain a general format of research report. **[8]**

b) What precaution one has to take while writing the research report. **[5]**

c) Discuss in brief various types of research reports. **[5]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1794

[3965]-745
M.E. (Computer Engineering)
ADVANCED COMPILERS
(2008 Course) (510105) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain and compare different approaches for compiler design. **[6]**

b) What is the role of tools LEX and YACC in the overall compiler design? Explain your answer by giving proper examples. **[10]**

Q2) a) Explain in detail the various aspects to be considered for code generation. **[8]**

b) Explain the code generation process for pipelined machines. **[8]**

Q3) a) What is bidirectional data flow analysis? **[8]**

b) Explain the unified algorithm for data flow analysis. **[8]**

Q4) Write short notes (any three) : **[18]**

a) Register allocation techniques.
b) SSA form.
c) Passes and phases of compiler.
d) Need for code optimization.

SECTION - II

Q5) a) Explain different techniques for parallelism detection. **[8]**

b) Explain in detail the structure of a parallelizing compiler. **[8]**

Q6) a) Explain various aspects to be considered for the compilation for distributed machines. **[10]**

b) Explain : Dynamic compilation. **[6]**

P.T.O.

Q7) a) What is JIT compiler? How JIT compilers are different from conventional compilers? **[8]**

b) Explain : Auto scheduling compilers. **[8]**

Q8) Write short notes (any three) : **[18]**

a) Data Partitioning.

b) Role of symbol table in compiler design.

c) Register allocation for distributed machines.

d) Tools for compiler generation.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1795

[3965]-793

M.E. (Chemical)

PROCESS OPTIMIZATION (A)

(509112) (2008 Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) Minimize $f(x)=2x^2+12/x$. Use

a) Fibonacci Search Method,

b) Internal having method. Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function. **[17]**

Q2) Minimize $f(x)=3x^3-2x^2$ in the interval [–1 1]. Use

a) Newton Raphson Method,

b) Golden Search Method. Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function. **[17]**

Q3) A typical material balance envelope around a reactor/mass transfer unit is example of steady state set of linear equations. The typical constraints on such a problem are of physical type based on dimensions of units, of system type based on the physicochemical considerations which can also be linear in nature. Considering above, construct a problem around any one out of reactor/ mass transfer unit (like distillation column, absorption column etc.) and identify objective function, constraints. Also discuss the strategy to get optimized solution out of it. **[16]**

P.T.O.

Q4) Write short notes (any 3): **[16]**

a) Conditions of sufficiency.

b) Secant method.

c) Parameters used in mixed flow reactor optimization.

d) Grad function.

SECTION - II

Q5) Minimize $f(x)=(x_1-4)^2+(x_2-3)^2$ **[17]**

Subject to linear constraints

$x_1 \geq 0,\ x_2 \geq 0,\ 5-x_1-x_2 \geq 0,\qquad -2.5+x_1-x_2 \leq 0.$

Q6) State condition of strictly positive definite function using Hessian matrix. Find whether the following function is strictly convex.

$$f(x)=3x_1^2+4x_1x_2+2x_1-3x_2-5x_2^2+6$$

Discuss the importance of having a convex function in getting an optimized solution. **[17]**

Q7) Explain the Simplex Search Method and demonstrate for minimization of $f(x)=x_1^2+x_2^2+3$ starting at $(x^0)^T = [2\ 1]$ in the direction $s^0 = [-2\ -2]^T$. Perform 4 steps. **[16]**

Q8) Write short notes (any three): **[16]**

a) Degree of freedom.

b) Linear programming.

c) Gradient based methods.

d) Constrained optimization examples.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1796

[3965]-794

M.E. (Chemical)

FUEL CELLS TECHNOLOGY

(2008 Course) (Elective - IV) (509112)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Derive Tafel equation relating overpotential in a fuel cell to the current generated in the external circuit, from first principles. **[17]**

Q2) a) Describe types of solvents used in the fuel cell. Discuss various design aspects related to their selection in a fuel cell. **[8]**

b) Calculate the resultant current from a fuel cell assembly from the following data. **[9]**

Given:

i) Reduction Slope in a Tafel plot = 8.12,

ii) Temperature of cell = 25°C,

iii) Overpotential = 240 microvolts,

iv) $i_{\circ}$ = 15 micro amperes.

Q3) a) Calculate the current in amperes required to liberate silver completely from a solution containing 7.5×10^{-3} kg of $AgNO_3$ in one hour. (E.C.E. of Ag = 1.118×10^{-3} kg/C, Atomic Mass of Ag = 108, N = 14, O = 16). **[8]**

b) Describe the construction and working of polymer electrolyte membrane fuel cell. **[8]**

P.T.O.

Q4) Write short notes on any three: **[16]**

a) Electrolyte conductivity.

b) Cell time constants.

c) Helmholtz plane.

d) Overpotential.

SECTION - II

Q5) Derive Cottrell equation used in the design of a fuel cell relating current generated in fuel cell with time.

[17]

Q6) Describe completely the mechanism of current generation around electrode by oxidation reduction reaction phenomena. Explain with the help of a proper diagram. Also write down the mathematical model equations at every step in the mechanism. **[17]**

Q7) a) Zinc reacts with 1 M solution of sulphuric acid as, $Zn_{(s)} + H_2SO_{4(aq)} \rightarrow Zn\ SO_{4\,(aq)} + H_{2(g)}$ · Construct the cell with this reaction. If $E°_{(Zn^{+2}/\,Zn)} = -0.76$ V Calculate the standard emf of the cell. Is this reaction really spontaneous. **[8]**

b) Describe the construction and working of solid oxide fuel cell. **[8]**

Q8) Write short notes on any three: **[16]**

a) Rotating Disc Electrode.

b) Noisy current.

c) Nernst Equation for single electrode potential.

d) Reference Electrode.



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1797

[3965]-853

M.E. (IT)

HIGH PERFORMANCE COMPUTER NETWORKS

(Elective - IV) (2008 Course) (514412)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design a High Performance Computer Network for the scenario given below: **[16]**

Number of Machines: 600

Number of Laboratories: 20 (30 machines per laboratory),

Number of buildings : 2 (10 laboratories per building and laboratories are located in 3 different floors)

Number of servers: 5

Connect all the machines in the laboratories to Server room. Internet connectivity will be given to all the machines. Suggest internet lease line capacity.

Justify your design with proper specifications.

Q2) a) Explain Architecture of Gigabit Ethernet.

b) Describe standards of gigabit Ethernet with relevant application.

[16]

Q3) a) What are ISDN Interface, Functions and Services?

b) Explain techniques of Frame Relay Congestion control.

[16]

P.T.O.

Q4) Solve Any Three: **[18]**

a) Queuing system.

b) SRP Protocol and Authentication.

c) QoS in HPCN.

d) ATM Service Categories.

SECTION - II

Q5) a) Compare different techniques of DSL technologies.

b) Explain DMT with neat block diagram.

[16]

Q6) a) Explain DWDM in detail.

b) Explain Gigabit Capable Passive Optical Networks (GPON).

[16]

Q7) a) Explain Wi-Fi and Wi-Max in detail with practical example.

b) Explain 3G technologies along with their applications.

[16]

Q8) Solve Any Three: **[18]**

a) UMTS.

b) SONET Architecture.

c) GSM Architecture.

d) Mobile IP.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1798

[3965] - 888

M.E. (Instrumentation & Control)

ORGANISATIONAL BEHAVIOUR & MANAGEMENT

(2008 Course) (5061110) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) State and explain the definitions and functions of management. Analyse critically the role played by managers in a changing business environment. **[16]**

Q2) Define organisational behaviour (OB) Explain various models of OB and its relevance to face the challenges and oppertunities of over changing business profile. **[16]**

Q3) a) What is personality? What are its determinants? How it influences work behaviour? **[8]**

b) "Perception is a key factor in managerial effectiveness". Analyse. **[8]**

Q4) Explain the following theories of motivation : **[18]**

a) Theory X & Theory Y.

b) Expectancy theory by victor V room.

P.T.O.

SECTION - II

Q5) What is Group Dynamics? Explain how the combination of formal and informal group brings effectiveness in the organisation? **[16]**

Q6) a) List out various leadership skills required to excell in business. **[6]**

b) Define leadership. Critically evaluate contingency theory of leadership. **[12]**

Q7) State and explain organisational system with its various components. Critically analyse design, technology and human factor for the successful organisational functioning. **[16]**

Q8) Define conflict management. What are its various causes? Explain the mechanism of conflict resolution in industry. **[16]**

❖ ❖ ❖ ❖

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1803

[3965]-732 A
M.E. Production (CAD/CAM)
MANUFACTURING SYSTEM DESIGN
(2010 Course) (Elective - III) (511211)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is an automated guided vehicle system? What features distinguish self guided vehicles from conventional AGVs? **[8]**

b) Explain the following with reference to the manufacturing systems : **[8]**

i) Structural aspects.
ii) Transformational aspects.

Q2) a) Exhibit a generic product development process and list out the tasks and responsibilities of the organization for each phage? **[8]**

b) Distinguish between the traditional product development cycle and product development using concurrent engineering with a neat block diagram. **[8]**

Q3) a) What does the term *semi automated station* mean? What are the applications of single station automated cells? **[8]**

b) A machine shop contains many CNC lathes that operate on a semi automatic machining cycle under part program control. A significant number of these machines produce the same part, whose machining cycle time = 2.75 min. One worker is required to perform unloading and loading of parts at the end of each machining cycle. This takes 25 sec. Determine how many machines one worker can service if it takes an average of 20 sec to walk between the machines and no machine idle time is allowed. **[8]**

P.T.O.

Q4) a) Identify and briefly describe the three major categories of mechanized work transport systems used in production lines? **[8]**

b) Explain any one mathematical modeling methodology used for the optimization of multi stage manufacturing system? **[8]**

Q5) Write a short note on any three of the following : **[18]**

a) Modes of production.
b) Mass customization.
c) Criteria for line balancing.
d) Computer aided process planning.

SECTION - II

Q6) a) Explain the following database structures with an example : **[8]**

i) Hierarchical.
ii) Relational.

b) With use of simple sketches, explain two dimensional vision system for inspecting a manufactured part features on a conveyor? **[8]**

Q7) a) Explain the functions of computer control in flexible manufacturing systems? **[8]**

b) Discuss the types of flexibilities and operational issues of flexible manufacturing systems? **[8]**

Q8) a) Name three production situations in which FMS technology can be applied? What is the difference between a dedicated FMS and a random order FMS? **[6]**

b) What is a part family? Explain any two methods for solving the problem of grouping parts into part families? **[10]**

Q9) a) Explain any two simulation modeling tools used in simulation of manufacturing systems? **[10]**

b) Explain the role of databases in manufacturing systems modeling? **[6]**

Q10) Write a short note on any three of the following : **[18]**

a) On-line and Off-line data collection.
b) Design frame work for manufacturing systems.
c) Principles of lean production.
d) Rank order clustering algorithm.



P1804

[3965]-55
M.E. (Mechanical) (Heat Power)
ADVANCED REFRIGERATION AND CRYOGENICS
(2002 Course) (Elective - I) (502109)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A multi-evaporator, pressure regulating valve and single compressor vapour compression refrigeration system working with ammonia. The refrigeration capacity of high temperature evaporator operating at –6.7°C is 5 TR, while it is 10 TR for the low temperature evaporator operating at –34.4°C. The condenser pressure is 10.8 bar. Assuming saturated conditions at the exit of evaporator and condenser, ammonia vapour to behave as an ideal gas with gas constant of 0.4882 kJ/kg K and isentropic index of 1.29 and isentropic compression.

a) Find the required power input to compressor in kW.

b) Find the required power input in kW if instead of using a single compressor and pressure regulating valve, individual compressors are used for the low and high temperature evaporators.

c) Draw schematic diagram and P-h chart for (a) and (b)

d) Comment on result with reference to power input, maximum compressor discharge temperature and volumetric efficiency for (a) and (b).

Use the following data for ammonia :

T, °C	P_{sat}, (kPa)	h_f, (kJ/kg)	hg, (kJ/kg)
–34.4	95.98	44.0	1417
–6.7	331.8	169.1	1455
27.7	1080.0	330.4	1485

[16]

P.T.O.

Q2) a) Explain the effect of condensing temperature, suction temperature, suction superheat and liquid sub-cooling on compressor performance with the help of P-h and T-S chart. **[10]**

b) What is meant by secondary refrigerants? Explain eutectic point and typical applications for the same. **[6]**

Q3) a) Explain design and selection criteria for evaporators. **[8]**

b) Explain the effect of condensing temperature, suction temperature, suction superheat and liquid sub-cooling on compressor performance. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Thermoelectric refrigeration.
b) Boot strap air refrigeration system.
c) Pulse tube refrigeration system.
d) Magnetic cooling.

SECTION - II

Q5) a) Determine the ideal work requirement for the liquefaction of nitrogen beginning at 101.3 kPa and 300 K. From the T-s chart of nitrogen, following property values are given :

h_l = 46.2 J/g at 101.3 kPa and 300 K
h_f = 29 J/g at 101.3 kPa and Sat, Liquid,
s_l = 4.42 J/g K at 101.3 kPa and 300 K
s_f = 0.42 J/g K at 101.3 kPa and Sat, Liquid

Derive the expression you use. **[8]**

b) Explain the different types of compressors and expanders used in liquefaction systems. **[8]**

Q6) Explain the working principle and applications of following refrigeration system : **[18]**

a) Vortex Tube.
b) Thermo-electric.
c) Steam Jet.

Draw the schematic diagrams.

Q7) Write short notes on (any four) : **[16]**

a) Space simulation chamber.
b) Superconducting motors.
c) Cryosurgery system.
d) Effect of low temperature on thermal properties of materials.
e) Claude system.

Q8) a) Explain the working of pre-cooled Linde Hampson gas liquefaction system with neat diagram and thermodynamic analysis. **[8]**
b) Discuss briefly the methods of Gas separation and purification. **[8]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1805

[3965]-504
M.E. (Mechanical) (Heat Power)
CRYOGENIC ENGINEERING
(2008 Course) (Elective - III) (502111)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain Screw impeller volumetric flow meter and oscillating piston volumetric flow meter with appropriate sketches. **[8]**

b) Explain the working of Gifford McMahon Cryorefrigerator with neat diagram. **[8]**

Q2) a) Develop an expression for work requirement per unit mass for an ideal liquefaction system. **[8]**

b) Determine the ideal work requirement for the liquefaction of nitrogen beginning at 1 atm and 300 K. The properties of nitrogen are as follows : **[8]**

Properties of Nitrogen			
Pressure (atm)	Temperature (K)	Enthalpy (J/g)	Entropy (J/g.K)
1.00	300	462	4.42
1.00	Sat. Liquid	29	0.42

Q3) a) Explain with neat sketch any one type of compressor and expander used in cryogenic system. **[8]**

b) Represent Stirling Cycle on P-V and T-s diagram. Develop an expression for C.O.P. of the Stirling Cycle. When used as a liquefier, what is its efficiency? **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Collins Heat Exchanger.
b) Kapitza System.
c) Superconducting devices.
d) Meissner Effect.

SECTION - II

Q5) Explain the difference between high performance vessels and low performance vessels, with a neat sketch. Explain the features of atypical cryogenic storage vessel. Out line the design procedure of outer and inner vessel and support systems. **[16]**

Q6) a) Name and explain the instruments used for measuring strain in cryogenic temperature range. Also discuss the effect of low temperature on strain measurements. **[8]**

b) Explain in detail, what is meant by J-T effect and Inversion Curve. **[8]**

Q7) a) Discuss the statements : **[10]**

i) One of the most critical components in any liquefaction system is the heat exchanger - why?
ii) Heat exchanger effectiveness should be always more than 0.869 - why?

b) Explain the following : **[8]**

i) Vacuum insulation.
ii) Liquid and Vapor Shields.

Q8) Write short note on : **[16]**

a) ^{3}He - ^{4}He Dilution refrigerator.
b) Cryostats.
c) Space Simulation chamber.
d) Cryogenic Valves.



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1807

[3965]-497
M.E. (Mechanical) (Heat Power)
ADVANCED AIR CONDITIONING AND HEATING AND VENTILATION
(2008 Course) (Elective - II) (502105)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Give the typical layout of an auditorium of capacity 350 seats located in a city like Pune where summer outside conditions may be taken as DBT = 40°C and WBT = 28°C. Also calculate the heat load with appropriate assumptions, for air conditioning system to be used for the same. **[18]**

Q2) a) 900 m^3/min of recirculated air at 24°C DBT and 10°C DPT is adiabatically mixed with 400 m^3/min of fresh air at 28°C DBT and 52% RH. Evaluate the enthalpy, specific volume, humidity ratio, final DBT and RH of the mixture. Draw the process on psychrometric chart. **[10]**

b) Desert air cooler is used to cool air from 42°C DBT, 25% RH to 30°C by evaporative cooling. Estimate the volume flow rate of air in m^3/hr and the quantity of water required per hr for cooling capacity of 1.5 TR. **[6]**

Q3) a) A fan has an inlet dust with a diameter of 140 cm and an outlet 90cm × 110 cm. The fan discharges 12000 m^3/hr of air measured at 22°C and at absolute pressure of 770 mm of Hg. The operating static pressures at inlet and outlet are 10 mm of water and 40 mm of water respectively. Find the total pressure difference which the fan creates. **[10]**

b) Discuss the various types of fans and their operating characteristics used in air conditioning. **[6]**

P.T.O.

Q4) Write short notes on (any four) : **[16]**

a) Comfort chart.
b) Solar heat gain.
c) Duct sizing by equal friction method.
d) Forced draft cooling tower.
e) Filters used in air-conditioning.

SECTION - II

Q5) a) Differentiate clearly between direct and indirect evaporative cooling systems. Show the processes on chart. Explain the working of a two stage evaporative cooling system using cooling tower. **[8]**

b) Give a typical layout and explain the design procedure for a 150 TR Central Air Conditioning Plant. List the major equipments and their selection criteria. **[10]**

Q6) Explain with neat sketches the working of the following equipments : **[16]**

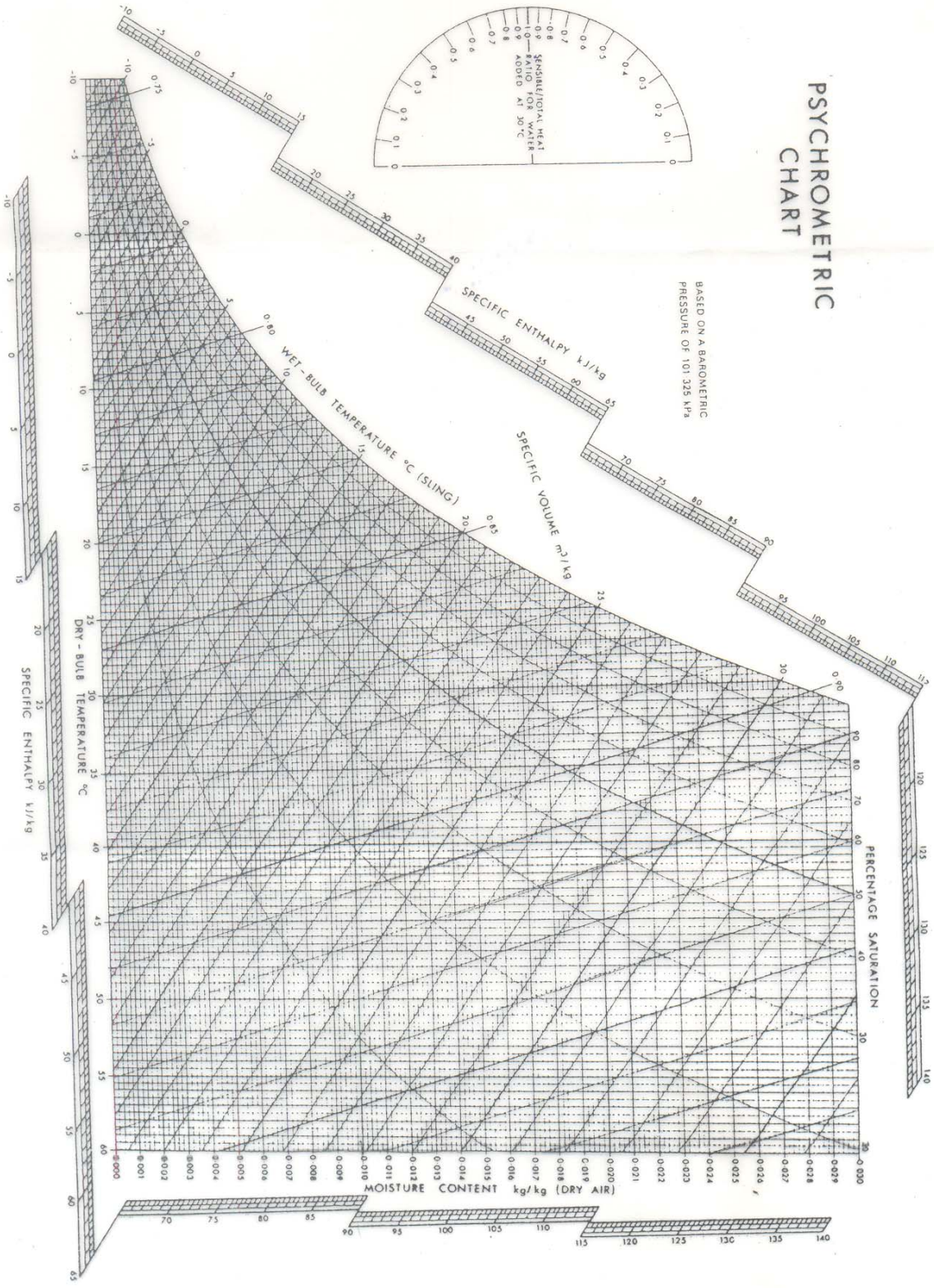
a) Chillers.
b) Condensing units.
c) De-humidifiers.

Q7) a) What is industrial air-conditioning? Enumerate its applications and explicate any of them in detail. **[10]**

b) Define adiabatic efficiency of evaporative coolers. Discuss the working of various types of evaporative coolers used in practice with neat sketches. **[6]**

Q8) Write short notes on (any four) : **[16]**

a) Cycling and sequence controls.
b) CO_2 detector.
c) Air locks, Air curtains and Air Showers.
d) Laminar flow clean rooms.
e) Unitary air conditioning system.


PSYCHROMETRIC CHART
BASED ON A BAROMETRIC PRESSURE OF 101 325 kPa
SENSIBLE/TOTAL HEAT RATIO FOR WATER ADDED AT 30 °C
SPECIFIC ENTHALPY kJ/kg
WET-BULB TEMPERATURE °C (SLING)
SPECIFIC VOLUME m³/kg
DRY-BULB TEMPERATURE °C
SPECIFIC ENTHALPY kJ/kg
PERCENTAGE SATURATION
MOISTURE CONTENT kg/kg (DRY AIR)



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1809

[3965]-496
M.E. (Mech - Heat Power)
INTERNAL COMBUSTION ENGINES
(2008 Course) (502105 (A)) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the general material selection criteria for the components of I.C. Engines. **[8]**

b) Explain : **[8]**

i) Injection timing in Engines.

ii) BMEP and BSFC.

Q2) a) What is meant by mean piston speed? Explain it's importance. **[4]**

b) A four-stroke diesel engine working at sea level where pressure is 1.013 bar and temperature is 17°C, develops a brake power of 280 kW with a volumetric efficiency of 80% at sea level conditions. The engine works at an air-fuel ratio of 18:1 with a specific fuel consumption of 240 gms/kWh. The engine runs at 1800 rpm determine the engine capacity and bmep.

This engine is operated at an altitude of 3 km where ambient conditions are – 23°C and 0.71 bar. A mechanically coupled super charger is fitted to the engine which cosumes 12% of total power developed by the engine. The temperature of air leaving the supercharger is 37°C. Determine the degree of supercharging required to maintain the same brake power of sea level. Assume air-fuel ratio, thermal efficiency and volumetric efficiency remain the same for naturally aspirated and supercharged engine. **[12]**

P.T.O.

Q3) Write short notes on (any three) : **[18]**

a) MPF I.systems.
b) Performance maps of S.I. engines.
c) Precombustion chambers.
d) Heat Release Program.

Q4) a) Discuss air-pollution due to I.C.Engines. **[6]**
b) Describe electronic fuel injection. **[10]**

SECTION - II

Q5) a) What is meant by diesel particulates? What are the methods of controlling the particulate emission. **[6]**
b) Explain : **[10]**

i) Retrof : Hed bio-diesel engines.
ii) Hartridge smoke meter.

Q6) a) Discuss the engine management systems in the recent vehicles. **[8]**
b) What are catalytic converters? How they are helpful in reducing HC, CO and NO_x emissions? **[8]**

Q7) a) Explain Hybrid vehicles with advantages and disadvantages. **[8]**
b) It is desired to use electricity to preheat the catalytic converter on a four-cylinder S.I. engine of 2.8 liter displacement. The pre heat zone of the converter consists of 20% of the total alumina volume. The sp.heat of the ceramic is 765 J/kg K; and the density. $\rho = 3970$ kg/m^3. Energy is obtained from a 24-volt battery supplying 600 amps.

Calculate :

i) Electrical energy needed to heat the preheat zone from 25^{o}C to a light-off temperature of 150^{o}C [kJ].
ii) Time needed to supply this amount of energy [sec]. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Recent trends in I.C. engines.
b) EGR.
c) Euro - III.
d) Various controls and sensors used in modern cars.



Total No. of Questions : 6] **[Total No. of Pages : 2**

P1812

[3965]-612
M.E. (E & TC) (Microwave)
SMART ANTENNAS
(2008 Course) (504225) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) How the following factors influence the performance of mobile communication systems and how application of the antenna arrays can mitigate these problems? Explain. **[25]**

a) Fading Channel.
b) Delay spread.
c) Transmission Efficiency.
d) Co channel Interference.
e) Reduction in Handoff rate.

Q2) Explain with illustrative figures, block diagrams and relevant mathematical expressions, the following antenna arrays. **[25]**

a) Linear Arrays.
b) Phased Arrays.
c) Adaptive Arrays.
d) Smart Antenna.

Q3) What are the different modes in which the antenna arrays can be used in mobile communications systems? Discuss with illustrative diagrams. **[25]**

P.T.O.

SECTION - II

Q4) Draw the beam-forming antenna array structure following cases : **[25]**

a) Narrow band.
b) Two-element delay-and-sum.
c) Structure of a general beam-space processor.
d) Structure of narrow-band beam former using a reference signal.

Q5) Discuss the structure, radiation patterns, advantages, disadvantages, applications of the following smart antenna systems. **[25]**

a) Adaptive.
b) Switched beam.
c) Fixed beam.

Q6) a) How does beam forming is achieved in CDMA for uplink and down link? Explain in detail. **[15]**

b) Discuss the smart antenna applications and their relevance in present wireless communication systems. **[10]**



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1813

[3965]-507
M.E. (Mechanical Engg.) (Heat Power)
COMPUTATIONAL FLUID DYNAMICS
(2008 Course) (Elective - IV) (502112)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Assume suitable data, if required.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.***
4) ***Answer any three questions from each section.***

SECTION - I

Q1) Consider developing flow (entry length) between two parallel plates, separated by a distance h.

a) What are the governing equations in discretised form? **[6]**
b) Present the algorithm for determining pressure (SIMPLE). **[12]**

Q2) Consider quasi-one dimensional compressible flow in a nozzle.

a) Write the simplified governing equations for this case. **[8]**
b) Present the algorithm for solving the continuity equation using Mac Cormack method. **[8]**

Q3) For supersonic flow over a flat plate.

a) Write the full governing equations. **[6]**
b) Present the algorithm for updating u, the x-component velocity. **[10]**

Q4) a) When is relaxation method used. Outline the method with an example. **[6]**
b) What are numerical dissipation and dispersion? Give one example for each. **[6]**
c) If there is a wave with a sudden jump in its amplitude, how will numerical dissipation and dispersion distort the solution. **[4]**

P.T.O.

SECTION - II

Q5) Consider a square ABCD of length l as the control volume in a flow domain :

a) Apply mass conservation. **[6]**

b) Apply momentum equation in terms of momentum flux and shear stress. **[12]**

Assume face and cell centre values are known. Note that the square size is not small.

Q6) Consider one dimensional transient conduction equation :

a) Write the expression for the explicit method. Derive the stability criterion. **[7]**

b) Repeat for 2-dimensions. What will be the stability condition in 2-dimensions? **[9]**

Q7) Write the equation for two-dimensional transient conduction. Present the algorithm for solving it using the Alternating Direction Implicit (ADI) scheme. What is the main advantage of this scheme? **[16]**

Q8) Consider the linear wave equation $u_t + au_3 = 0$.

a) Outline the Lax-Wendroff method to solve this equation. **[6]**

b) What is the order of accuracy? **[6]**

c) What is the stability criterion? **[4]**



Total No. of Questions : 8] **[Total No. of Pages : 3**

P1814

[3965]-639
M.E. (E & TC) (VLSI & Embedded System)
ADVANCED DIGITAL SYSTEM DESIGN
(2008 Course) (504191 (C)) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

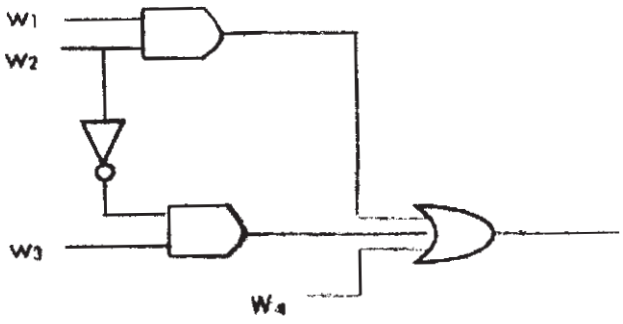
1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written separately.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Describe the design issues of CISC and RISC processors. **[8]**

b) Design a sequential circuit that computes a product of two four bit numbers. **[8]**

Q2) a) Sensitize each path in a given circuit (Figure.1) to obtain a complete set that comprises minimum number of tests. **[8]**



(Figure-1)

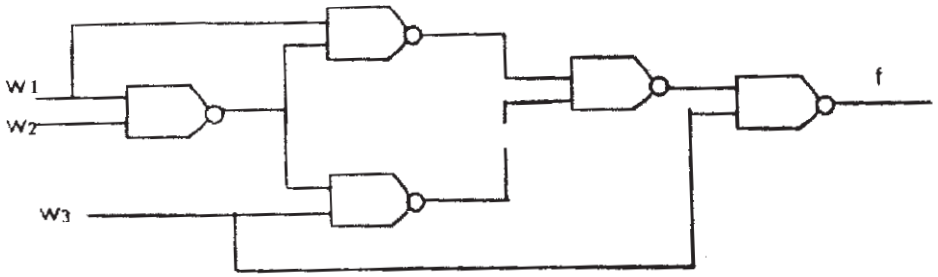
b) For following logic expression find all Static Hazards and design Hazard-Free circuit that realises same logic function. **[8]**

F = WY + W‘Z’ + XY’Z

Q3) a) What are dynamic hazards? What are the causes of dynamic hazards? Give an example and explain. **[8]**

P.T.O.

b) Consider the following circuit (figure.2). Are all single stuck at '0' and stuck at '1' faults in this circuit are detectable? If not explain why? **[8]**



(Figure-2)

Q4) Write notes on <u>any three</u> : **[18]**

a) Address and data path architecture of CPU.

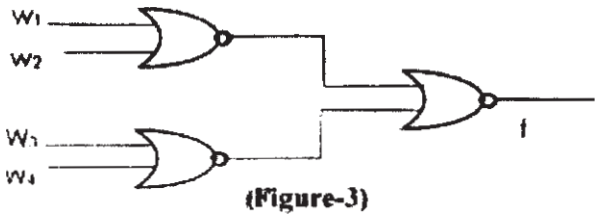
b) Methods to eliminate cross talk.

c) Asynchronous inputs to flip-flop.

d) H tree clock distribution Network.

SECTION - II

Q5) a) Derive a truth table for following circuit (figure.3) to show the coverage of various stuck at '0' and stuck at '1' faults. Find a minimal test set for the following circuit **[8]**



(Figure-3)

b) Explain built in self-test for testing logical circuits and explain BILBO. **[8]**

Q6) a) Write a VHDL code for 64 k × 8 bit SRAM. **[8]**

b) What are major steps to design ATM packet generator? Explain in detail. **[8]**

Q7) a) Explain the following terms in context to large digital system design. **[8]**

i) Reliability.
ii) Failure rate.
iii) Bath tub curve.
iv) MTBF.

b) How to design a circuit to eliminate de-bouncing of a switch? **[8]**

Q8) Write note on <u>any three</u> : **[18]**

a) IEEE 486 bus.

b) Random tests for testing of logic circuits.

c) Design aspects for PCBs.

d) Boundary scan.



Total No. of Questions : 6] **[Total No. of Pages : 3**

P1815

[3965]-472
M.E. (Civil) (Structures)
THEORY OF PLASTICITY
(2008 Course) (501412 (b)) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any two from Section-I and any two from Section-II.***
2) ***Answers to the two Sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive three dimensional constitute relationship for perfectly isotropic, homogeneous and elastic material. Hence derive constitutive relationship for Plane Stress and Plane Stress conditions. **[12]**

b) Write on following from Theory of Elasticity concept. **[13]**

i) Strain Displacement Relationship.
ii) Compatibility Equations.
iii) Displacement and Traction Boundary conditions.

Q2) a) Write a note on plastic behavior in simple tension for mild steel and other metals under monotonic loading, unloading and reloading, and reversed loading. **[12]**

b) Explain following idealized stress-strain behavior models of the material. **[13]**

i) Elastic-Perfectly Plastic Model.
ii) Elastic-Linear Work-Hardening Model.
iii) Ramberg-Osgood Model.

Q3) a) A thin walled steel cylindrical vessel with a diameter D = 500 mm and wall thickness t = 6.5 mm subjected to internal pressure p. The ends of the cylinder are closed. Yield stress of steel is 225 MPa. Determine pressure p at which the cylinder start yielding as per Tresca and von Mises criterion. **[13]**

P.T.O.

b) A plane with line crack of length $2a$ is subjected to biaxial stress at infinity as shown in Fig.Q.3 (b). If the origin is located at crack tip, the stress field can be expressed as per the equation given below. If K_1 is stress intensity factor, determine plastic zone boundary based on Tresca and von Mises criterian. **[12]**

$$\sigma_x = \frac{K_I}{\sqrt{2\pi r}} \cos\left(\frac{\theta}{2}\right)\left[1 - \sin\left(\frac{\theta}{2}\right)\sin\left(\frac{3\theta}{2}\right)\right]$$

$$\sigma_y = \frac{K_I}{\sqrt{2\pi r}} \cos\left(\frac{\theta}{2}\right)\left[1 + \sin\left(\frac{\theta}{2}\right)\sin\left(\frac{3\theta}{2}\right)\right]$$

$$\sigma_{xy} = \frac{K_I}{\sqrt{2\pi r}} \sin\left(\frac{\theta}{2}\right)\cos\left(\frac{3\theta}{2}\right)\cos\left(\frac{\theta}{2}\right)$$

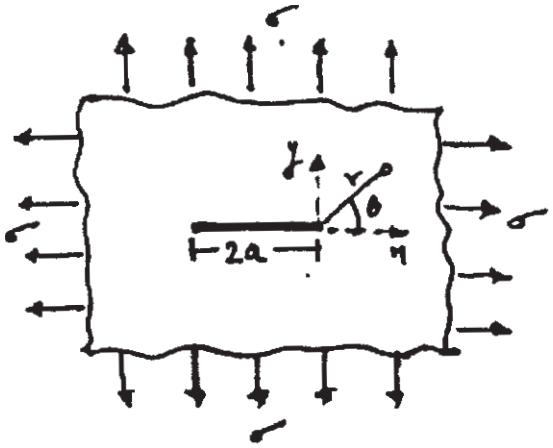


Fig. Q.3(b)

SECTION - II

Q4) a) Discuss the problem of punch indentation in plane strain condition and mention your comments. **[12]**

b) Discuss the problem of bending of notched bar subjected to two equal and opposite pure couple M at the ends. The minimum thickness of the bar is a. Assume plane strain condition. **[13]**

Q5) a) Write in details, the collapse process of simply supported rectangular beam with central point load with stress distribution of the cross section at mid span, spreading of yield zone and load deflection curve. **[16]**

b) State basic assumptions in theory of limit analysis. **[9]**

Q6) a) Define and explain 'Loading Surface' and 'Hardening Rules' and hence explain isotropic hardening. **[8]**

b) Draw and explain yield surfaces for kinematic hardening and mixed hardening of material. **[8]**

c) Derive stress strain equations for von Mises material with the associated mixed hardening rule. **[9]**



Total No. of Questions : 8] **[Total No. of Pages :3**

P1816

[3965]-441

M.E. (Civil) (Hydraulic Engineering)

SYSTEMS TECHNIQUES IN WATER RESOURCE ENGINEERING

(Elective - I) (2008 Course) (501304)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer 3 questions from section - I and 3 questions from section - II.***
3) ***Answer to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following **[4]**

i) Saddle point

ii) Dominance rule

iii) Shadow price and

iv) Annuity

b) Discuss the following assumptions in relation to the Markov chains. **[4]**

i) Finite states.

ii) First - order process.

iii) Stationarity probabilities and

iv) Uniform time periods.

c) Determine the maximum and minimum values of the function **[8]**

$$f(x) = 12x^5 - 45x^4 + 40x^3 + 5$$

Q2) a) Use Fibonacci method to find the maximum of the following function in the range of 0 to 100 to an accuracy of with in 0.1% **[10]**

$$Z = 6x - 0.1x^2$$

Carry out first four iterations.

P.T.O.

b) Write the dual to the following LP problem. **[6]**

Maximize $Z = x_1 - x_2 + 3x_3$

Subject to the constraints

i) $x_1 + x_2 + x_3 \leq 10$

ii) $2x_1 - x_2 - x_3 \leq 2$

iii) $2x_1 - 2x_2 - 3x_3 \leq 6$

$x_1, x_2, x_3 \geq 0$

Q3) a) Give the algorithm of Newton's method. State its specific advantage over steepest gradient technique. **[10]**

b) Use Lagrange multiplier technique to minimize $Z = (x_1 - 1)^2 + x_2^2$

Subject to $x_1^2 + x_2^2 = 8$ **[8]**

Q4) a) Develop a general recursive equation for a forward - moving dynamic programming solution procedure for a single - reservoir operating problem. Define all variables and functions used. **[10]**

b) State principle of optimality. **[2]**

c) Define the following terms. **[4]**

i) Stage

ii) State variable

iii) Decision variable and

iv) Optimal return

SECTION - II

Q5) a) Define slack and surplus variables in linear programming. **[4]**

b) Use Big - M method to solve the following LP problem. **[10]**

Maximize $Z = 3x_1 + 2x_2 + 3x_3$

Subject to $2x_1 + x_2 + x_3 \leq 2$

$3x_1 + 4x_2 + 2x_3 \leq 8$

and $x_1, x_2, x_3 \geq 0$

c) State and explain decomposition principle. **[4]**

Q6) a) Explain the following **[10]**

i) Net present value.

ii) B/C ratio

iii) Internal rate of return

iv) Capital recovery factor and sinking fund factor.

v) Interest rate and discount rate.

b) Explain the procedure of solving sequencing problem of 3 stations and n- jobs. **[6]**

Q7) a) What are the applications of queuing theory in the field of water resource engineering? **[4]**

b) Complete one iteration of the reduced gradient technique for the following NLP problem. **[12]**

Minimize $x_1^2 + 2x_2^2$

Subject to $x_1^2 + x_2^2 = 5$

Use a starting feasible solution $X_0 = \begin{bmatrix} +1.0 \\ -2.0 \end{bmatrix}$

Initial $\alpha = 0.25$ and all termination factors equal to 0.01.

Q8) Write short notes on the following (any 4) **[16]**

a) Sensitivity analysis in LP

b) Interior penalty function and exterior penalty function.

c) Mutually compatible projects and mutually exclusive projects.

d) Graphical method of solving LP problem.

e) Monte - Carlo simulation.

f) Need of systems approach in water resource engineering.

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1817

[3965]-663

M.E. (Electronics) (Digital Systems)

SIGNAL PROCESSING ARCHITECTURES

(2008 Course) (Sem. - I) (504196)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate answer papers.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is fixed point and floating point processing with reference to digital signal processing? How to convert floating point algorithm into fixed point algorithm? Why? **[13]**

b) The signal h[k] and x[k] are equal in length. Consider length L = 1024 and determine **[12]**

i) Number of real FLOPs for a fast linear convolution of h[k] and x[k].

ii) Number of real FLOPs for a direct linear convolution of h[k] and x[k].

Q2) a) Derive and the equations for DIT FFT radix-2 algorithm. Draw the butterfly diagram for the same. Justify how FFT is faster than DFT. **[9]**

b) Suppose the coefficients of an FIR filter of order m = 30 all lie within the range $|b_i| \leq 4$. Assuming they are quantized to N = 12 bits, find an upper bound on the error in the magnitude of the frequency response caused by coefficient quantization. **[9]**

c) Explain different retiming techniques. **[7]**

Q3) a) A 16-bit fixed point representation is used for the values in the range $|x| \leq 8$. **[10]**

i) How many distinct values of x can be represented?

ii) What is the spacing between adjacent values?

ii) How many bits are used to represent the integer part?

iv) How many bits are used to represent the fraction part?

P.T.O.

b) Justify with suitable example how parallel processing reduce the power consumption of a system. **[7]**

c) Write short note on: **[8]**

i) Data flow graph.

ii) Wavelet Transform.

SECTION - II

Q4) a) Describe the important properties of DSP processor and the criteria used for the selection of DSP processor. **[9]**

b) What are important features of TMS320C67XX DSP processor? Draw and explain the block diagram of TMS320C67XX. **[8]**

c) Explain how linear convolution can be implemented on DSP processor with necessary logic and flow chart. **[8]**

Q5) a) Explain how data flow graphs are used to describe multirate systems. **[9]**

b) Explain the architecture of TMS320C54XX. **[8]**

c) The transfer function of analog filter is given below. **[8]**

$$H(s)=\frac{1}{(s+1)(s+1)}$$

i) Find H (z) using impulse variance method.

ii) Calculate H(z) when Fs = 30 sps, & 50 sps respectively.

Q6) a) Explain pipeline operations of TMS320C54XX processors. **[7]**

b) Write short notes on: **[18]**

i) Commercial tool used for development of DSP algorithms.

ii) Blacfin processor.

iii) Wiener filter.



Total No. of Questions : 8] **[Total No. of Pages :3**

P1818

[3965]-723
M.E. (Production) CAD/CAM
TRIBOLOGY AND SURFACE ENGINEERING
(2010 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the Tabor's theory of simple adhesion also state its limitations. **[6]**

b) For adhesive wear prove that the adhesive wear rate is given by

$$Q = \frac{K_v W}{3p}$$

State the underlying theory used for the above relation along with its limitations. **[8]**

c) State the reasons why the rate of abrasive wear is greater than rate of adhesive wear. **[2]**

Q2) a) Explain clearly the following properties of lubricants along with their significance. **[4]**

i) Viscosity index.
ii) Specific density.
iii) Oxidation stability.
iv) Specific Heat.

b) Describe with help of a graph the different regimes in hydrodynamic lubrication. **[4]**

c) The following data is given for a short hydrodynamic journal bearing:

Radial load	=	1200 N
Journal speed	=	2000 r.p.m.
(1/d) ratio	=	0.5
Eccentricity ratio	=	0.65
Radial clearance	=	0.0022 × journal radius
Flow rate of the lubricant	=	3.5 litre/hr

Calculate: **[8]**

i) Diameter of the journal.
ii) Radial Clearance
iii) Dimensions of the bearing.
iv) Minimum oil film thickness and
v) Absolute viscosity of lubricant.

P.T.O.

Q3) a) An air lubricated hydrostatic step bearing has the following details: **[8]**

Shaft diameter	=	155 mm
Recess diameter	=	50 mm
Supply pressure	=	305 kPa
Atmospheric pressure	=	101.3 kPa
Film thickness	=	0.05 mm
Viscosity of air	=	0.02 cP
Recess depth	=	0.45 mm

Determine : i) Volume flow rate of free aire required for the bearing and

ii) Load Carrying capacity.

b) What do you understand by surface topography measurement? Describe any two non contact type methods for measurement of surface topography. **[8]**

Q4) Write short notes on: (any three) **[18]**

a) Pressure Development mechanism in hydrodynamic lubrication.

b) Extreme Pressure Additives.

c) Measurement of Friction.

d) Solid Erosion and Liquid Erosion.

SECTION - II

Q5) a) Discuss the importance of Surface Engineering in service life of a component. Explain clearly the geometrical, mechanical and physico - chemical concepts of a solid surface. **[8]**

b) Explain with necessary analysis and suitable example the use of and steps in mathematical modeling of surface layers. **[8]**

Q6) a) Discuss the size, process and cost considerations for selecting a surface treatment for wear resistance. **[8]**

b) With suitable example discuss and compare the metal - to metal wear characteristics of Electro and Electro - less plating methods. **[8]**

Q7) a) State the metallurgical aspects to be considered while application of Ion Implantation technique of surface modification. **[4]**

b) Discuss the surface reaction in sputter coating. **[4]**

c) With the help of sketches describe the different techniques for application of hard facings by laser fusion. **[4]**

d) Explain any four possible Electron Beam Hardening Configurations. **[4]**

Q8) Write short notes on (Any three) **[18]**

a) Multi layer coating of cutting tools.

b) Selection of coatings for wear and corrosion resistance.

c) PVD and CVD methods for coatings.

d) Spectrum of surface Engineering Processes.

♦♦♦♦

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1819

[3965]-241
M.E. (Instrumentation & Control)
ADVANCED MEDICAL INSTRUMENTATION
(2002 Course) (506116)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question one and Question six is compulsory from section-I & II.***
2) ***Solve any two questions from remaining questions from each section.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the various possible hazards associated with the use of an ESU and safety measures. **[10]**

b) Give the technical reasons for :

Depressive electrode in an ESU should be in good contact with patient active electrode in an ESU should have pointed tip and Passive Electrode is like Pad. **[10]**

Q2) a) Explain the role of telemetry system in medical field. Draw and explain general block schematic of general biotelemetry system. **[8]**

b) Explain conventional heat therapy? Explain high frequency heat therapy concept. **[7]**

Q3) a) What is lithotripsy? Explain ultrasonic lithotripsy method for kidney stone treatment. **[8]**

b) Compare various types of Dialysers. **[7]**

Q4) Discuss various techniques available for counting of various blood cells associated with blood. **[15]**

Q5) Explain the principle of electro surgery. Explain structural and operational details of ESU? Explain various operating parameters for cutting and coagulation. **[15]**

P.T.O.

SECTION - II

Q6) a) i) Explain the principle of MRI. What do you understand by the term 'claustrophobic' related to MRI? **[5]**

ii) Define radio isotopes. Explain why nuclear imaging system uses Artificial Radio nuclides. **[5]**

b) Explain the principle of PET imaging system. Why Nal crystal is popular in nuclear imaging. Which component of PET system makes it costlier system? **[10]**

Q7) What is endoscope? Enlist Various Endoscope types. Draw and explain it with its three major parts. Explain characteristics of endoscopes. **[15]**

Q8) What is EEG? Enlist various illness and diseases for which EEG is effectively used. Explain the EEG 10-20 montage system. Comment on the critical factors in the design and implementation. **[15]**

Q9) a) Define rehabilitation Engineering. Also, Define the terms orthrosis and Prosthesis used in rehabilitation engineering. List out two example of each. **[8]**

b) What is heart lung machine? Explain it with its components? Enlist type of oxygenators used in the same. **[7]**

Q10) a) Describe working of dc defibrillation with neat sketch. Find the energy stored in 25μf capacitor charged to 2200V dc. **[7]**

b) Distinguish between : **[8]**

- External and implanted pacemakers.
- A.C. & D.C. Defibrillator.
- Defibrillator & pacemaker
- Synchronous & asynchronous pacemakers.



Total No. of Questions : 10] **[Total No. of Pages : 3**

P1822

[3965]-530
M.E. (Mechanical-Mechatronics)
DESIGN OF MACHINE ELEMENTS
(2008 Course) (Elective - I) (502804)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table and electronic pocket calculator is allowed.***
5) ***Assume sitable data, if necessary.***

SECTION - I

Q1) a) Explain and state various considerations influencing machine component design. **[6]**

b) What are preferred number series? Establish R10 series. What are applications of preferred number. **[6]**

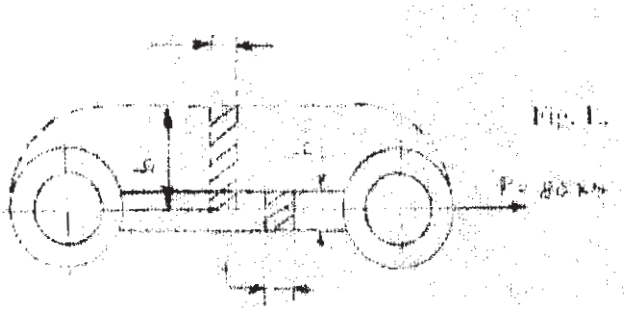
c) Find the maximum deflection of a simply supported beam with a uniformly distributed load by using castigliano's theorem. **[6]**

Q2) a) What do you understand by 'fail - safe' or Safe - fail' design? **[6]**

b) A mild steel link is as shown in Fig.No.1 with cross sectional width = b and thickness = t, where width b is three times thickness t and is to carry a load of 80kN. If the tensile stress in the link is not to exceed 67 N/mm^2.

i) Find the dimensions of the cross-section of the link at the middle of its length.

ii) If the original cross section is replaced with an unsymmetrical section having same thickness 't' and depth equal to b1 as shown by dotted line in the fig. find new depth b1 using same values of permissible stress. **[10]**



P.T.O.

Q3) a) What is ASME code of shaft design. **[6]**

b) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of the solid shaft, the inside diameter of the hollow shaft being half the external diameter. Both the shafts are of the same material and have same length. **[10]**

Q4) A steel shaft is supported on two bearings 900 mm apart. A 750 mm diameter pulley is keyed to the shaft 200 mm to the left, of the left hand bearing. A 300 mm diameter gear is keyed to the shaft 500 mm to the left of the right hand bearing. The pulley receives 7 kW at 210 rpm. 4 kW is taken from the gear and the remaining power is taken from the shaft through a coupling located 150 mm to the right of the right hand bearing. If the shaft diameter is 48 mm, determine the angular deformation of the left end of the shaft with respect to the right end.

Take $G = 80 \times 10^3$ N/mm^2. If the shaft material has yield strength of 580 N/mm^2 and UTS of 770 N/mm^2, determine the factor of safety, neglecting the effect due to bending. Take $K_1 = 1.3$. **[16]**

Q5) Design a pin bush type flexible coupling to connect a pump shaft to a motor shaft transmitting 30 kW at 960 rpm. The overload factor is 20% more than the mean torque. Material properties are :

Allowable shear stress and crushing stress for shaft material = 40N/mm^2 and 80 N/mm^2

Allowable shear stress for CI = 15 N/mm^2

Allowable contact pressure between rubber bush and flange = 0.8 N/mm^2

The material for key and pin are same as that of shaft. **[16]**

SECTION - II

Q6) a) Explain Surging of Springs. **[4]**

b) Derive expression for deflection of helical torsion spring. **[4]**

c) It is required to design compression spring with plain ends for carrying a maximum static force 1000 N. The allowable shear stress and modulus of rigidity of spring material are 400 N/mm^2 and 85 kN/mm^2 respectively. The spring rate is 48 N/mm. Assume spring index 5. Use Wahl factor. Calculate : Wire diameter, Total number of coils. Free length. **[8]**

Q7) A valve spring of IC Engine have following details : **[16]**

Spring load = 75 N, when valve is closed.
Spring load = 95 N, when valve is open.
Mean coil diameter of spring = 30 mm.
Valve lift = 5 mm.

Spring steel has following properties :

Maximum permissible shear stress = 350 N/mm^2.
Modulus of rigidity = 8.4 × 104 N/mm^2.
Spring ends are square and ground.

Design the valve spring and determine : wire diameter, spring index, total number of coils, solid length of spring, free length of spring, pitch of the coil when additional 15% of working deflection is used to avoid complete closing of coils. The available spring wire sizes are 2,3,4,5,6,7,8 and 10 mm diameter.

Q8) a) Explain important physical characteristics of good bearing material. **[4]**
b) Explain different types of antifriction bearings. **[4]**
c) A 80 mm long journal bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and viscosity of the oil is 0.021 kg/m-s at the operating temperature. If the bearing is capable of dissipating 80 J/s, determine the maximum safe speed. **[8]**

Q9) a) Explain : **[6]**

i) Module.
ii) Backlash used in gears.

b) A reciprocating compressior is to be connected to an electric motor with the help of spur gears. The distance between the shafts is to be 500 mm. The speed of the electric motor is 900 rpm and the speed of the compressor shaft is desired to be 200 rpm. The torque to be transmitted is 5000 N-m Taking starting torque as 25% more than the nominal torque. determine.

i) Module and face width of the fears using 20 degree stub teeth.
ii) Number of teetch and pitch circle diameter of each gear. Assume suitable values of velocity factor and Lewis factor. **[10]**

Q10) Write note on : **[18]**

a) Causes of gear tooth failure.
b) Static and dynamic load carrying capacity of bearings.
c) Nipping of leaf springs.



Total No. of Questions : 8] [Total No. of Pages :2

P1824

[3965] - 656
M.E. (E & TC) (Signal Processing)
DIGITAL SIGNAL COMPRESSION
(2008 Course) (Elective - III) (504510)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Generate a ternary Huffman code for a source with a six-letter alphabet and probability model peal) = P(a3) P(a4) = 0.2, peas) = 0.25, P (a6) = 0.1, and P(a2) = 0.05. In this case m = 3, therefore m' is either 2 or 3.

6 (mod 2) = 0, 2 (mod 2) = 0, 3 (mod 2) = 1. **[10]**

b) Give an algorithms for arithmetic coding explain with the help of an example. **[8]**

Q2) a) Explain how to implement optimal quantization in image and speech compression. **[8]**

b) Consider the binary information source and BSC and let p_{bs}=3/4 and p_e=1/3. **[8]**

i) What is the entropy of the source?

ii) How much less uncertainty about the input is there when the output has been observed?

Q3) a) Explain how DPCM predicted error is encoded. **[8]**

b) What is the drawback of forward adaptive prediction? How it can be eliminate in backward adaptive predictor? **[8]**

P.T.O.

Q4) a) Explain with help of diagram of motion compensated video compression. **[8]**

b) Explain the encoding process of LZW algorithm. **[8]**

SECTION - II

Q5) a) Write an algorithm to perform DCT and IDCT over an 8x8 array. Also subdivide a monochrome image into non-overlapping blocks of size 8x8 and apply DCT on each block to obtain the transform coefficients. **[10]**

b) Explain two level image decoding system based on DWT. **[8]**

Q6) a) Write VQ based Lloyd algorithm to compress signal. **[8]**

b) What is fractal? How does it work with help of its algorithm? **[8]**

Q7) a) List various key functions which are been identified by experts from MPEG-4 standard. **[8]**

b) Describe Perceptual coding in MPEG audio. **[8]**

Q8) a) Explain with block diagram H-264 codec. **[8]**

b) Draw and explain the frame structure for layer-3of audio coding. **[8]**



Total No. of Questions : 8] [Total No. of Pages :2

P1825

[3965] - 667
M.E. (Electronics) (Digital System)
MACHINE INTELLIGENCE
(2008 Course) (504198) (Elective - II)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule. Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by soft computing? Discuss the different characteristics of soft computing. **[10]**

b) Describe in detail fuzzy sets and membership functions. What are different set theoretic operations. **[8]**

Q2) a) What is fuzzy reasoning. Discuss in detail the fuzzy reasoning for multiple rules with multiple antecedents. **[8]**

b) Discuss in detail the concept of the extension principle with example. **[8]**

Q3) a) Describe the concept of composition of fuzzy relation. With suitable example explain max-min composition and max-product composition. **[8]**

b) Draw and explain the blcok diagram for fuzzy inference system. **[8]**

Q4) a) What are different gradient based optimization techniques. Explain any one technique in detail. **[8]**

b) What are the steps involved in the system identification. With suitable, describe the least squares method used for the system identification. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain in detail SOM algorithm. Also describe various topologies used for SOM. **[10]**

b) What are RBF networks. Explain various RBF functions. **[8]**

Q6) a) Explain Backpropagation algorithm. **[8]**

b) Explain in detail LVQ. **[8]**

Q7) a) Explain how Hopfield network can be used to solve traveling salesman problem. **[8]**

b) What are different clustering algorithms explain k-means clustering algorithm in detail. **[8]**

Q8) Explain in brief the following : **[16]**

a) Principal Component Analysis (PCA).

b) Use Genetic Algorithm in Game Playing.

c) Multilayer perceptron for solving XOR data problem.

d) Use of neural & fuzzy concepts in control system.



Total No. of Questions : 8] [Total No. of Pages :3

P1828

[3965] - 789
M.E. (Chemical)
ADVANCED REACTION ENGINEERING
(2008 Course) (509111) (Elective - III)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) ***Answers any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) For a duel site mechanism in heterogeneous reaction model, derive expression for the Hinshel wood mechanism and show the concentration profile if reaction kinetic is the governing step? **[16]**

Q2) Find out the mechanism for oxidation of CO over a catalyst. **[17]**

$$2CO + O_2 \Longleftrightarrow 2CO_2$$

All the rates are initial rates

$-r_{CO_2}$ (mol/dm^3 .sec)	0.02	0.035	0.049	0.060	0.196	0.384	0.902	1.653	4.44	5.00	4.44	2.77
C_{CO}(mol/dm^3)	0.01	0.01	0.01	0.01	0.1	0.2	0.5	1.0	5.0	10	20	50
CO_2(mol/dm^3)	1	3	6	9	1	1	1	1	1	1	1	1

Q3) The first-order reaction

$$\mathbf{A \rightarrow B}$$

is carried out in a 20 cm diameter tubular reactor 5.56 m in length. The specific reaction rate is 0.15 min^{-1}. The results of a tracer test carried out on this reactor are shown in following table :

T (min)	0	2	3	7	9	11	13	1 6
C (mg/L)	0	2	8	7	4.5	3.0	1.1	0

Calculate conversion using tanks-in-series model **[16]**

P.T.O.

Q4) Write a Note on (Any Three) : **[18]**

a) Tortuosity factor

b) Dual site mechanism

c) Effectiveness Factor

d) Tank in series model

SECTION - II

Q5) A first order heterogeneous irreversible reaction is taking place within spherical catalyst pellet which is plated with platinum throughout the pellet. The reactant concentration at quarter between the external surface and the center of the pellet is equal to one eighth the concentration of pellet's external surface. The concentration at external surface is 0.01 g mol/dm^3, the diameter is 5 x 10^{-4} cm and the diffusion coefficient is 0.2 cm^2/s. Reaction is :: $A \rightarrow B$

a) What is the concentration of the reactant at distance of 2.5 x 10^{-4} cm in from the external pellet surface. **[16]**

b) To what diameter should the pellet be reduced if the effectiveness factor is to be 0.7?

Q6) Write segregation model for determining non idealities in a mixed flow reactor. The first order reaction

$A \longrightarrow B + C$ occurs in the liquid phase. The RTD function for the reactor in which it is to be carried out is given by

a) $E(t) = 0$ for $0<t<10$,

b) $E(t) = 0.001*(t-10)$ for $10<t<20$,

c) $E(t) = 0.01*(30-t)$ for $20<t<30$,

d) $E(t) = 0$ for $t>30$.

The entering concentration is 50 molar and the specific reaction rate is 0.7 dm^3/mol.sec. What is the conversion after 20 sec in a mixed flow reactor?**[17]**

Q7) Derive the equation of a first-order reaction using the segregation model when the RTD is equivalent to

a) an ideal PFR,

b) an ideal CSTR, and

c) a laminar flow reactor. Compare these conversions with those obtained from the design equation. **[16]**

Q8) Write a Note on (Any Three) : **[18]**

a) Surface Reaction Rate,

b) Nonidealities in a tubular reactor,

c) Two parameter Model

d) Slurry Reactor



Total No. of Questions : 8] **[Total No. of Pages : 2**

P1845

[3965]-693
M.E. (E & TC) (Communication Network)
MOBILE COMPUTING
(2010 Course) (504610) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two section should be written in separate answer books.***
3) ***Figures to right indicate full marks.***

SECTION - I

Q1) a) What do you mean by mobile computing environment? Explain its application areas where mobile computing environment used. **[8]**

b) Discuss the wireless LAN architecture. **[8]**

Q2) a) Discuss various features, architecture and security algorithm used in GSM. **[8]**

b) Explain how GSM system can be enhanced to use a GPRS system? **[8]**

Q3) a) Explain the fundamentals of wireless markup language WML script application? **[8]**

b) What are the advantages and disadvantages of wireless LAN? Under what situation is a wireless LAN desirable over LAN? **[8]**

Q4) Write a short note on : **[18]**

a) MIMO.

b) VOIP.

SECTION - II

Q5) a) Explain GPRS transmission plane protocol architecture? **[8]**

b) Explain application of mobile computing business value behind application development? **[8]**

Q6) a) Discuss 4-G LTE network architecture. **[8]**

b) Explain 1-G mobile telephone technology? **[8]**

P.T.O.

Q7) a) Differentiate 3-G and CDMA. **[8]**

b) Explain case studies of secure mobile application development. **[8]**

Q8) Write a short note on : **[18]**

a) 2-G mobile telephone technology.

b) 802.11.



Total No. of Questions : 10] **[Total No. of Pages : 2**

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[3965]-716
M.E. (Production Engg.)
RESEARCH METHODOLOGIES
(2008 Course) (511112) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to each sections should be written on separate sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain the research process using flow chart. **[8]**
b) Explain the types of research and explain the criteria for good research. **[8]**

Q2) a) Why it is necessary to design a research problem? Explain the techniques involved in defining a research problem. **[8]**
b) Give the important concepts relating to research design. **[8]**

Q3) a) Explain factorial design method for experimentation using suitable example. **[8]**
b) Explain randomization and blocking in experimental design. **[8]**

Q4) a) What are the devices used in data collection in research. **[8]**
b) What is mean by primary and secondary data? Explain the historical methods for data collection. **[8]**

Q5) Write short note on following (any three) : **[18]**

a) Scientific methods for research.
b) Latin Square Design.
c) Random replication design.
d) Meta Analysis.
e) Half factorial design of experiment.

P.T.O.

SECTION - II

Q6) a) Explain the steps in sample design. **[8]**

b) How to determine the sample size for carrying out the test? Also state the characteristics of good sample design. **[8]**

Q7) a) Give the measures of central tendency. **[8]**

b) Explain the process of multiple regression analysis. **[8]**

Q8) a) Explain the process of Analytical Hierarchy Process for multicriteria decision making. **[8]**

b) How the genetic algorithm tool is used for optimizing the decision making criteria and for getting the better result? **[8]**

Q9) a) Explain the significance of report writing. **[8]**

b) Explain the various steps followed while writing a report. **[8]**

Q10) Write short notes on (any three) : **[18]**

a) Chi-square test.

b) TOPSIS.

c) Techniques of interpretation.

d) Graph Theory.

e) Simulated annealing.



Total No. of Questions : 6] **[Total No. of Pages : 3**

P1849

[3965]-42
M.E. (Civil) (Structures)
HIGH RISE STRUCTURES
(2002 Course) (Elective - II) (501510)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat explanatory sketches /diagrams should be drawn at the respective steps in answers.***
4) ***In numerical problems, step by step solution with formulae used, and numerical values substituted must be shown clearly.***
5) ***Answers will be assessed as a whole.***
6) ***Use of Non programmable electronic calculator is permitted.***
7) ***Assume suitable data wherever necessary.***
8) ***Figures to right indicate full marks.***
9) ***Mobile phones and earphone devices are not allowed in Examination Hall.***
10) ***Use of IS 456,800, 802, 875, 1893, 6533 and related IS codes is permitted. However IS Hand books are not allowed.***

SECTION - I

(All designs should follow IS code norms)

Q1) a) Describe various geometric configurations used for transmission line towers, used for 132 kV, 220 kV, and 400 kV single and double circuit patterns. **[12]**

b) What do you understand by a 2° , 10° and 45° type transmission line tower? **[5]**

c) Specify the loading conditions for a double circuit tower under broken wire conditions. **[8]**

Q2) a) Describe various types of foundation systems used to support transmission line towers. **[7]**

P.T.O.

b) System of forces acting at the base of a leg of a transmission line tower is given below.

	Load type	Normal Condition	Broken wire Condition
i)	Down ward Vertical Force	600 kN.	800 kN
ii)	Up ward vertical Force by wind/ Earth quake	500 kN.	580 kN
iii)	Shear Force at Base.	15 kN	32 kN
iv)	Moment along conductor direction.	30 kNm	60 kNm
v)	Moment in direction Transverse to conductor	Nil	40 kNm.

Assuming suitable foundation data parameters, design a suitable foundation. **[18]**

Q3) a) A 45° transmission line tower has its four legs at base level at corners of a 5 m. Square. In a height of 15 m, the tower tapers to a dimension, where the legs are at the corners of a 2.5 m square. Horizontal members connect the legs at respectively 5 m, 4 m, 3 m, and 3 m from the base. Suggest a suitable lacing system to keep the slenderness ratio of the leg members within limits specified in IS code. **[15]**

b) A most for a radio station is 12 m in height from base block to top. The most is supported by three cables connected to top. At base, the cables are anchored at corners of an equilateral triangle with sides of 8 m length. Using typical wind loading, calculate the size of the supporting cables. Use suitable other data as required. **[10]**

SECTION - II

(All designs should follow IS code norms)

Q4) A steel chimney is 40 m in height above the base block. It has an outer diameter of 4 m. The chimney has a lining of refractory bricks. 200 mm thick and with a density of 18 kN per cu.m. The lining is supported on collars which transfer weight of the lining to the steel walls. The design wind pressure upto first 12 m height is 1000 N per sq.m and linearly increases to 1500 N per sq.m at top. Design proper plate thickness for the chimney and its connection to the concrete foundation block. **[25]**

Q5) A concrete chimney 40 m. in height above the base block has a uniform circular section upto top with its internal diameter of 4.5 m. Assuming suitable other data, design thickness and other details for the chimney. **[25]**

Q6) a) Discuss the effect of temperature variation on the design of steel and Rcc chimneys **[10]**

b) For a thirty storey concrete building with a floor height of 4 m at each level, specify details of cross bracing, shear walls etc to reduce the effects of earth quake. **[10]**

c) Write a short note on **[5]**

i) Panel zone and

ii) P - Δ effect.

