Total No. of Questions—12] [Total No. of Printed Pages—4

DEC-2008

[3462]-183

S.E. (Computer) (Second Sem.) EXAMINATION, 2008

COMPUTER ORGANISATION

(COMMON TO I.T.)

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain Von Neumann Architecture. [8]

(*b*) Perform the following division using restoring division algorithm :

Dividend = 1001

Divisor = 0101. [8]

Or

2. (*a*) Represent the following numbers in single precision floating point format : [8]

(*i*) 17.125

(*ii*) 12.5

(*b*) Draw a flowchart and explain the Booth's Algorithm used for signed number multiplication. [8]

P.T.O.

3. (*a*) Draw and explain single bus organization of the CPU. [8]

(*b*) Compare Microprogrammed control *Vs.* Hardwired control. [8]

Or

4. (*a*) Draw and explain with neat diagram microprogrammed control unit. [8]

(*b*) Compare Horizontal *Vs.* Vertical micro-instruction representation. [8]

5. (*a*) Explain the design of ALU using sequential circuits. [8]

(*b*) Write short notes on :

(*i*) Instruction Pipelining

(*ii*) Instruction Types. [10]

Or

6. (*a*) Draw and explain CPU Architecture of INTEL/MOTOROLA Processor. [10]

(*b*) Explain any *four* addressing modes along with *one* example each. [8]

SECTION II

7. (*a*) Compare SRAM *Vs.* DRAM. [6]

(*b*) Write short notes on :

(*i*) Magnetic Disk

(*ii*) EPROM

(*iii*) RAID. [12]

Or

8. (*a*) What are the different cache mapping techniques ? Explain any *one* with neat diagram. [8]

(*b*) Write short notes on :

(*i*) Virtual memory

(*ii*) Cache memory. [10]

9. (*a*) What are the different bus standards used in computers ? Explain any *one* in brief. [8]

(*b*) Write short notes on :

(*i*) Video Displays

(*ii*) Scanners. [8]

Or

10. (*a*) What is DMA ? With a neat block schematic explain how it is used for data transfer. [8]

(*b*) What are the different peripherals used in computers for input/output purpose ? [4]

(*c*) Write a short note on Interrupt Driven I/O. [4]

11. (*a*) Draw and explain closely coupled configuration. [6]

(*b*) Explain briefly the role of :

(*i*) Clock Generator

(*ii*) Bus Controller

in the multiprocessing systems. [10]

Or

12. (*a*) List out different features of RISC processor. [6]

(*b*) What are the different bus allocation schemes used to resolve the bus conflict ? Explain any *one* along with neat diagram. [10]

Total No. of Questions—6] [Total No. of Printed Pages—4

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S.E (Computer) (Second Sem.) EXAMINATION, 2008

COMPUTER GRAPHICS

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*i*) Explain Bresenham's line drawing algorithm. Using Bresenham's algorithm draw line from (1, 1) to (5, 3). [10]

(*ii*) Write short notes on (any *two*) : [8]

(*a*) Joystick

(*b*) Digitizer

(*c*) Touch panels.

Or

(*i*) Explain DDA line drawing algorithm. Using DDA algorithm draw line from (1, 1) to (5, 3). [10]

P.T.O.

(*ii*) Explain why Computer Graphics is emerging as an important field in computer science. [4]

(*iii*) Explain display file interpreter and display processor. [4]

2. (*i*) Explain seed fill algorithm in detail. [8]

(*ii*) Show that the transformation matrix of reflection about a line $y = x$ is equivalent to reflection relative to X-axis followed by anticlockwise rotation of 90°. [8]

Or

(*i*) Explain scanline polygon filling algorithm. [8]

(*ii*) Perform X-shear and Y-shear on a triangle having A(2, 1), B(4, 3), C(2, 3). Consider the constant value $a = b = 2$. [8]

3. (*i*) Explain 2D midpoint subdivision algorithm for line clipping with suitable example. [8]

(*ii*) Describe various operations carried out on the segment. [8]

Or

(*i*) Explain Sutherland-Hodgman algorithm for polygon clipping with suitable example. [8]

(*ii*) Discuss the segment table structure and explain various data structure used to implement the segment table. [8]

SECTION II

4. (*i*) Derive the transformation matrix for perspective projection. [8]

(*ii*) What is the necessity of 3D clipping algorithm ? Explain midpoint subdivision algorithm for 3D clipping. [10]

Or

(*i*) What are the parallel and perspective projection ? Explain various types of parallel and perspective projection. [8]

(*ii*) Obtain the 3D transformation matrices for :

(*a*) Translation

(*b*) Scaling

(*c*) Rotation about Z-axis. [10]

5. (*i*) Explain Painter's algorithm for hidden surface removal. Why is Painter's algorithm a priority algorithm ? [8]

(*ii*) Compare :

(*a*) Gourand and Phong's method of shading

(*b*) RGB and HUS color models. [8]

Or

(*i*) Why is hidden surface algorithm needed ? How does Z-buffer algorithm determine which surface is hidden. [8]

(*ii*) What is halfway vector ? Where is it used ? [4]

(*iii*) Write a short note on visible surface ray tracing. [4]

6. (*i*) What is fractal dimension ? Explain Hilbert's curve and give its Fractal dimension. [8]

(*ii*) Define fractal with examples. Explain the algorithm to draw fractal lines. [8]

Or

(*i*) Write a short note on interpolating polygons. [4]

(*ii*) What is spline ? Give the various methods for specifying spline curve. [4]

(*iii*) Explain Bezier curve with properties. Why are cubic Bezier curves chosen ? [8]

Total No. of Questions—12] [Total No. of Printed Pages—4+1

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S.E. (Comp. Engg.) (Second Semester) EXAMINATION, 2008

DATA STRUCTURES

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare Linear Data Structures implemented using Arrays and using Linked Lists. Comment on their usage. [7]

(*b*) Write pseudo 'C' code for the following operations to be performed on Singly Linked List.

(*i*) Insertion of a node in the beginning.

(*ii*) Insertion of a node at the end.

(*iii*) Insertion of a node between two nodes. [9]

Or

2. (*a*) Explain Boundary Tag Method used in Dynamic Storage Management. [6]

P.T.O.

(*b*) Define node structure to represent a single variable polynomial using Singly Linked List and represent the following polynomials and their sum using the node structure defined by you. Write pseudo 'C' code to add two polynomials and store the result in new Singly Linked List :

P_1 $5x^{12}$ $2x^6$ 3

P_2 $6x^{12}$ $5x^8$ $12x^5$ [10]

3. (*a*) Define the following terms and give *one* example of each :

(*i*) Complete Binary Tree

(*ii*) Binary Search Tree

(*iii*) Inorder Threaded Binary Tree. [6]

(*b*) Write pseudo 'C' code for the following operations :

(*i*) Insertion of a node in Binary Search Tree

(*ii*) Deletion of a node from Binary Search Tree. [8]

(*c*) Prove that maximum number of nodes on level i of a binary tree 2^{i-1}, for $i >= 1$ (Assume root at level 1). [4]

Or

4. (*a*) Construct a binary tree whose preorder and inorder traversals are as follows :

Preorder : A B C D E F G H I

Inorder : B C A E D G H F I

Define node structure for inorder Threaded Binary Tree. Using the node structure defined by you, represent diagrammatically the binary tree constructed by you as inorder Threaded Binary Tree. [9]

(*b*) What are the advantages of Threaded Binary Tree ? Write pseudo 'C' code for preorder traversal of inorder Threaded Binary Tree. [9]

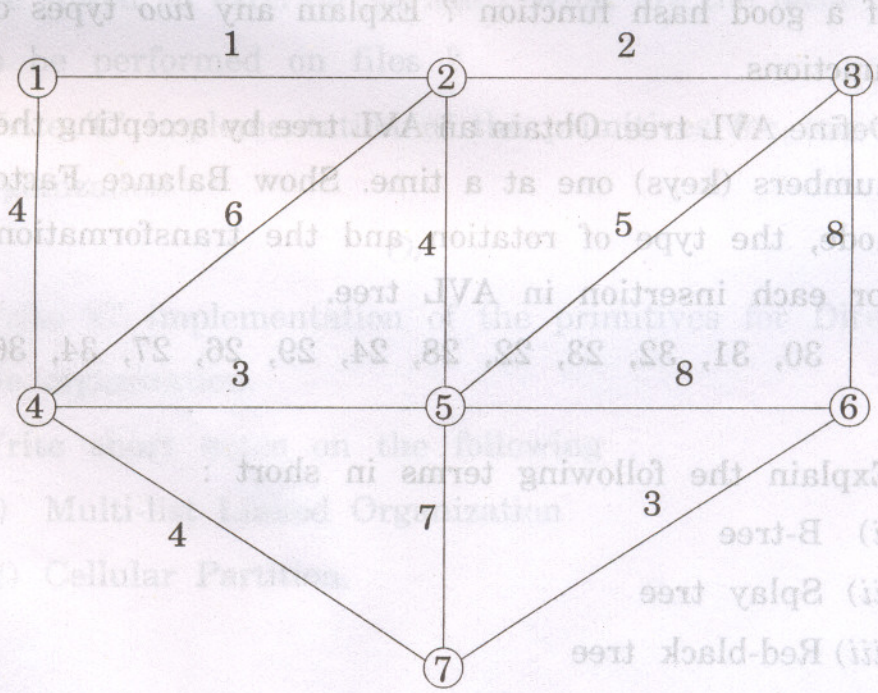
5. (*a*) Explain the following terms in short :

(*i*) Spanning Tree

(*ii*) Minimum Spanning Tree

(*iii*) Eulerian walk. [6]

(*b*) Write an algorithm to get Minimum Spanning Tree for a given graph G = (V, E), where V is the set of vertices and E is the set of edges. What is the time complexity of your algorithm ? Apply your algorithm to get Minimum Spanning tree for the following graph : [10]



Or

6. (*a*) Explain in brief any *three* real world applications of Graph. [6]

(*b*) Write pseudo 'C' code for the shortest paths from a given source vertex V of a graph G = (V, E), where V is the set of vertices and E is the set of edges, to all other vertices in a graph. Apply your algorithm to find shortest paths from vertex 1 to all other vertices in a graph given in **Q. 5(b)**. [10]

SECTION II

7. (*a*) Define Symbol Table. What are the operations to be performed on Symbol Table ? Explain with *one* application each, Static tree table and Dynamic tree table. [8]

(*b*) Explain by means of suitable example linear probing with or without replacement and chaining with or without replacement. [10]

Or

8. (*a*) What is hashing ? Where is it used ? What are the characteristics of a good hash function ? Explain any *two* types of hashing functions. [8]

(*b*) Define AVL tree. Obtain an AVL tree by accepting the following numbers (keys) one at a time. Show Balance Factor of each node, the type of rotation and the transformation required for each insertion in AVL tree.

30, 31, 32, 23, 22, 28, 24, 29, 26, 27, 34, 36 [10]

9. (*a*) Explain the following terms in short :

(*i*) B-tree

(*ii*) Splay tree

(*iii*) Red-black tree

(*iv*) Trie indexing. [8]

(*b*) Define max Heap. Write pseudo 'C' code for the following operations on max heap. Mention the time complexity of each operation.

(*i*) Insertion of an element in max heap

(*ii*) Deletion of maximum element from max heap. [8]

Or

10. (*a*) Construct a splay tree by inserting the following items in the order given into an initially empty splay tree. Draw splay tree after each insertion.

0, 2, 4, 6, 8, 11, 13, 15, 18, 20, 25 [8]

(*b*) Write down pseudo 'C' code to covert given complete binary tree into min heap. Analyze your algorithm for computation time. [8]

11. (*a*) What is a File ? What is a need of a file ? How the files are stored on external storage ? What are the basic operations to be performed on files ? [8]

(*b*) Write 'C' implementation of the primitives for sequential file organization. [8]

Or

12. (*a*) Write 'C' implementation of the primitives for Direct Access file organization. [8]

(*b*) Write short notes on the following :

(*i*) Multi-list Linked Organization

(*ii*) Cellular Partition. [8]

Total No. of Questions—12] [Total No. of Printed Pages—4

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S.E (Computer) (Second Sem.) EXAMINATION, 2008

MICROPROCESSOR INTERFACING TECH.

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain the minimum mode configuration of the 8086 microprocessor. [10]

(*b*) Explain how 20-bit physical address is obtained in 8086 microprocessor. [4]

(*c*) Explain the use of the following signals of 8086 microprocessor.

(*i*) MN/$\overline{MX}$

(*ii*) DT/$\overline{R}$. [2]

P.T.O.

Or

2. (*a*) Why is the 8086 memory divided into even and odd banks? Prepare a table and show the logic levels of A_0 and $\overline{BHE}$ for different types of data transfer. [10

(*b*) State the difference between memory mapped I/O and I/O mapped I/O. [6]

3. Draw the programmers model of the 8086 microprocessor labelling it neatly. How does 8086 convert a logical address into a physical address ? When does it updates the instruction queue ? [16]

Or

4. (*a*) Write a program in 8086 assembly language to convert a two digit BCD number into HEX. Write appropriate comments. [8]

(*b*) What do you mean by Assembler Directives ? Explain the following Assembler Directives with example : [8]

(*i*) Assume

(*ii*) Extrn

(*iii*) Segment

(*iv*) Ends.

5. (*a*) Draw a neat block diagram of 8259 PIC. Explain in brief the use of 8259 PIC. Also draw the flow-chart for the initialization sequence of the 8259 PIC. [10]

(*b*) Explain the following priority modes in brief : [8]

(*i*) Fully nested mode

(*ii*) Rotating priority mode

(*iii*) Special masked mode

(*iv*) Polled mode.

Or

6. (*a*) Draw and explain the block diagram of 8254. Also explain the control word format for 8254 with the help of diagram. [10]

(*b*) Explain operation of 8254 in modes 0, 2 and 4 with the help of timing diagram. [8]

SECTION II

7. (*a*) Explain with a block diagram the programmable peripheral interface 8255. What are the different modes ? Give and explain the format of mode word. [12]

(*b*) What is handshaking ? How is it used to interface the centronix type parallel printer using 8255. [4]

Or

8. (*a*) Explain different input modes and output modes available in 8279. [8]

(*b*) Draw a neat block diagram of the 8251 USART and explain in brief. [8]

9. (*a*) Define the following terms for D/A converters :

(*i*) Resolution

(*ii*) Accuracy

(*iii*) Monotonicity

(*iv*) Conversion time. [8]

(*b*) An 8-bit digital ramp ADC with a 40 mV resolution uses a clock frequency of 2.5 MHz a comparator with V_T = 1 mV. Determine the following values :

(*i*) The digital output for V_{in} = 6.000 V

(*ii*) The digital output for V_{in} = 6.035 V

(*iii*) The maximum and average conversion times for this ADC. [8]

Or

10. (*a*) Discuss different types of force and pressure transducers. [8]

(*b*) Write a note on Data Acquisition System (DAS). [8]

11. (*a*) What are the components of MS-DOS ? Explain the steps by which MS-DOS is loaded after power on. What is PSP ? [12]

(*b*) Explain difference between .EXE and .COM file. [6]

Or

12. (*a*) Explain what is TSR ? Also explain the structure of TSR in detail. [8]

(*b*) Write a assembly language program to display the time on the output device (display device) as a TSR. Write appropriate comments. [10]

Total No. of Questions—12] [Total No. of Printed Pages—8

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S.E. (E & TC/Comp./I.T./Elect./Instru.) EXAMINATION, 2008

ENGINEERING MATHEMATICS—III

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve the following (any *three*) : [12]

(*i*) $\frac{d^2y}{dx^2} - \frac{6dy}{dx} + 9y = e^{3x}\ \text{cosec}^2 x + 5^x$

(*ii*) $\left(D^4 + D^2 + 1\right) y = 36x^2 - 17$

(*iii*) $\left(D^2 + 6D + 8\right) y = e^{e^{2x}}$

(*iv*) $\frac{d^2y}{dx^2} + 9y = 9 \sec 3x \tan 3x$ (by variation of parameters)

(*v*) $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{dy}{dx} + xy = \sin(\log x)$.

P.T.O.

(*b*) An electric current consists of an inductance 0.1 henry, a resistance R of 20 ohms and a condenser of capacitance C of 25 micro-farads. Find the charge q and current i at any time t, given at $t = 0$, $q = 0.05$ coulombs, $i = \frac{dq}{dt} = 0$. [5]

Or

2. (*a*) Solve the following (any *three*) : [12]

(*i*) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = \frac{1}{1 + e^x}$

(*ii*) $\left(D^2 - 4D + 4\right) y = xe^{2x} \sin x$

(*iii*) $\left(D^3 + D\right) y = \sin x + 5e^x$

(*iv*) $\left(D^2 + 9\right) y = \frac{1}{1 + \sin 3x}$ (by variation of parameters)

(*v*) $(x + 3)^2 \frac{d^2y}{dx^2} - 4(x + 3) \frac{dy}{dx} + 6y = x.$

(*b*) Solve simultaneously :

$$\frac{dx}{dt} - 3x - 6y = t^2$$

$$\frac{dy}{dt} + \frac{dx}{dt} - 3y = e^t.$$ [5]

3. (*a*) Find the analytic function whose real part is

$$\frac{\sin 2x}{\cosh 2y - \cos 2x}.$$ [6]

(*b*) Evaluate :

$$\oint \frac{\sin 2z}{\left(z + \frac{\pi}{3}\right)^4} dz$$

where 'C' is $|z| = 2$. [5]

(c) Find the invariant points of the transformation

$$w = \frac{2z - 6}{z - 2}.$$ [5]

Or

4. (a) Show that the transformation

$$w = \frac{z - b}{z + b}$$

maps the right half of the z-plane into the unit circle $|w| < 1$.

(b is a real positive number.) [5]

(b) Evaluate :

$$\int_C \frac{\sin \pi z^2 + \cos \pi z^2 \, dz}{(z-1)^2 (z-2)}$$

where C is the circle $|z| = 3$. [6]

(c) Show that analytic function with constant amplitude is constant. [5]

5. (a) Establish the following relation :

$$e^{-2x} - e^{-3x} = \frac{10}{\pi} \int_0^\infty \frac{\lambda \sin \lambda x}{(9 + \lambda^2)(4 + \lambda^2)} \, d\lambda, \; x > 0.$$ [6]

(b) Solve the following integral equation :

$$\int_0^\infty f(x) \cos \lambda x \, dx = e^{-\lambda}, \; \lambda > 0.$$ [5]

(c) Find the z-transform of (any *two*) : [6]

(i) $f(k) = \left(\frac{2}{3}\right)^{|k|}$ for all k

(ii) $f(k) = \frac{(-3)^k}{k!}$ $k \geq 0$

(iii) $f(k) = 2^k \cosh \alpha k$ $k \geq 0$.

Or

6. (a) Find inverse of z-transformation of any *two* : [8]

(i) $F(z) = \frac{z^2}{\left(z - \frac{1}{4}\right)\left(z - \frac{1}{5}\right)}$ $\frac{1}{5} < |z| < \frac{1}{4}$.

(ii) $F(z) = \frac{z^2}{z^2 + 4}$ $|z| > 2$.

(iii) $F(z) = \frac{z^3}{(z-3)(z-2)^2}$ $|z| > 3$.

(b) Show that the Fourier transform of

$$f(x) = e^{-|x|} \text{ is } \frac{2}{1 + \lambda^2}.$$ [5]

(c) Find $Z(x_k)$ if

$$x_k = \frac{1}{2^k} * \frac{1}{3^k} * \frac{1}{(-5)^k} \quad k \geq 0,$$

by convolution theorem. [4]

SECTION II

7. (*a*) Find the Laplace transforms of (any *two*) : [8]

(*i*) $\dfrac{e^{-3t} \sin 2t}{t}$

(*ii*) $f(t) = \begin{cases} (t-1)^2, & t > 1 \\ 0, & 0 < t < 1 \end{cases}$

(*iii*) $\text{erf}\left(\sqrt{t}\right)$.

(*b*) Evaluate :

$$\int_{-\infty}^{\infty} e^{-t}\, t^2\, \delta'(t-2)\, dt.$$ [4]

(*c*) Solve, using Laplace transform

$$y'' + y = 0, \quad y(0) = 1, \; y'(0) = 2.$$ [4]

Or

8. (*a*) Find inverse Laplace transforms of (any *two*) : [8]

(*i*) $\dfrac{s^3}{s^4 - a^4}$

(*ii*) $\log \dfrac{s^2 + 1}{s^2 + s}$

(*iii*) $\dfrac{s\, e^{-\pi s}}{s^2 - 4s + 29}$.

(*b*) Express the following function in terms of unit step function and hence find the Laplace transform :

$$f(t) = \begin{cases} t + 1, & 0 \le t \le 2 \\ 3, & t > 2. \end{cases}$$ [4]

(*c*) Verify the convolution theorem for $f(t) = e^{at}$, $g(t) = t$. [4]

SECTION II

7. (*a*) Find the Laplace transforms of (any *two*) : [8]

(*i*) $\dfrac{e^{-3t} \sin 2t}{t}$

(*ii*) $f(t) = \begin{cases} (t-1)^2, & t > 1 \\ 0, & 0 < t < 1 \end{cases}$

(*iii*) $\text{erf}\left(\sqrt{t}\right)$.

(*b*) Evaluate : [4]

$$\int_{-\infty}^{\infty} e^{-t}\, t^2\, \delta'(t-2)\, dt.$$

(*c*) Solve, using Laplace transform [4]

$$y'' + y = 0, \quad y(0) = 1, \; y'(0) = 2.$$

Or

8. (*a*) Find inverse Laplace transforms of (any *two*) : [8]

(*i*) $\dfrac{s^3}{s^4 - a^4}$

(*ii*) $\log \dfrac{s^2 + 1}{s^2 + s}$

(*iii*) $\dfrac{s\, e^{-\pi s}}{s^2 - 4s + 29}$.

(*b*) Express the following function in terms of unit step function and hence find the Laplace transform : [4]

$$f(t) = \begin{cases} t + 1, & 0 \le t \le 2 \\ 3, & t > 2. \end{cases}$$

(*c*) Verify the convolution theorem for $f(t) = e^{at}$, $g(t) = t$. [4]

9. (*a*) Prove the following (any *two*) : [8]

(*i*) $\nabla \times \left(\frac{\bar{a} \times \bar{r}}{r^3} \right) = -\frac{\bar{a}}{r^3} + \frac{3}{r^5} (\bar{a} \cdot \bar{r}) \bar{r}$

(*ii*) $\nabla^4 (\log r) = \frac{2}{r^4}$

(*iii*) $\nabla \left[\bar{r} \cdot \nabla \left(\frac{1}{r^n} \right) \right] = \frac{n^2}{r^{n+2}} \bar{r}.$

(*b*) Find directional derivative of $\phi = 4y^2 z - 2xz^3$ at (1, 2, –1) along the line $x - 1 = 2 (y + 1) = z - 2$. [5]

(*c*) If

$$\bar{r} \cdot \frac{d\bar{r}}{dt} = 0,$$

show that $\bar{r}$ has constant magnitude. [4]

Or

10. (*a*) If the directional derivative of

$$\phi = a (x + y) + b (y + z) + c (x + z)$$

has maximum value 12 in the direction parallel to

$$\frac{x - 1}{1} = \frac{y - 2}{2} = \frac{z - 1}{3},$$

find the values of *a*, *b*, *c*. [6]

(*b*) Show that :

$$\bar{F} = \frac{\bar{a} \times \bar{r}}{r^n}$$

is solenoidal field. [5]

(c) Show that :

$$\bar{F} = \frac{1}{r}\left[r^2\,\bar{a} + (\bar{a}\,.\,\bar{r})\,\bar{r}\right]$$

is irrotational. Hence find ϕ such that $\bar{F} = \nabla\phi$. [6]

11. (a) Find the work done in moving a particle from (0, 1, –1) to $\left(\frac{\pi}{2}, -1, 2\right)$ in a force field

$$\bar{F} = \left(y^2 \cos x + z^3\right)\vec{i} + (2y \sin x - 4)\,\vec{j} + \left(3xz^2 + 2\right)\vec{k}.$$ [5]

(b) Evaluate :

$$\iint_S \left(x\,\vec{i} + y\,\vec{j} + z^2\,\vec{k}\right).d\bar{S}$$

where S is the curved surface of the cylinder $x^2 + y^2 = 4$, bounded by the planes $z = 0$ and $z = 2$. [6]

(c) Evaluate :

$$\int_C \left(xy\,dx + xy^2\,dy\right)$$

by Stokes's theorem, where C is the square in xy-plane with vertices (1, 0), (–1, 0), (0, 1), (0, –1). [6]

Or

12. (a) Evaluate :

$$\iint_S \left(\nabla \times \bar{F}\right).\hat{n}\,dS$$

where S is the curved surface of the paraboloid $x^2 + y^2 = 2z$, bounded by the plane $z = 2$, where

$$\bar{F} = 3(x - y)\,\vec{i} + 2xz\,\vec{j} + xy\,\vec{k}.$$ [5]

(*b*) Evaluate :

$$\iint_S \bar{F} \cdot d\bar{S}$$

where

$$\bar{F} = \left(x + y^2\right) \vec{i} + y \vec{j} - 2zx \vec{k}$$

and S is the surface bounded by the planes $x = y = z = 0$ and $x + y + z = 1$. [6]

(*c*) Show that :

$$\bar{E} = -\nabla\phi - \frac{1}{c}\frac{\partial \bar{A}}{\partial t}, \quad \bar{H} = \nabla \times \bar{A}$$

are solutions of Maxwell's equations :

(*i*) $\nabla \times \bar{H} = \frac{1}{c}\frac{\partial \bar{E}}{\partial t}$,

(*ii*) $\nabla \times \bar{E} = -\frac{1}{c}\frac{\partial \bar{H}}{\partial t}$

if

(1) $\nabla \cdot \bar{A} + \frac{1}{c}\frac{\partial \phi}{\partial t} = 0$,

(2) $\nabla^2 \bar{A} = \frac{1}{c^2}\frac{\partial^2 \bar{A}}{\partial t^2}$. [6]