(14)

Total No of Questions: [12] *SEAT NO. :* [ ]

[Total No. of Pages : 4]

B.E. 2008 (Systems Approach in Civil Engineering)

(Elective - I) (401004)

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 side indicate full marks.*
4) *Use of Calculator is allowed.*
5) *Assume Suitable data if necessary.*

SECTION I

Q1) a) Write a note on applications of System approach in Civil Engineering [06]

b) A company uses three different machines A, B and C to produce two machine parts. Table gives the machine time required for each part, the machining times available on different machines and the profit on each machine part. [04]

Type of Machine	Machining time required for the machine part (min)		Max Time Available (Min)
	I	II	
A	6	3	1500
B	2	5	1000
C	1	1	450
Profit per unit	Rs.20	Rs.50	

Formulate the problem

c) In above problem find the number of parts I and II to be manufactured to maximize the profit by graphical method [08]

OR

Q2) a) Use Big –M Method to maximize $z = 3x_1 - x_2$ [08]

Subject to the Constraints

$$2x_1 + x_2 \geq 2$$

$$x_1 + 3x_1 \leq 3$$

$$x_2 \leq 4$$

b) Write a note on sensitivity analysis [06]

c) What is mean by duality in linear Programming [04]

Q3) a) Write a note on transportation model and solve following transportation problem by using (1)North-west method [16]
(2)Least cost method

	Markets			
	M1	M2	M3	
Warehouses 1	26	23	10	61
Warehouses 2	14	13	21	49
Warehouses 3	16	17	29	90
	52	68	80	200

OR

Q4) a) Write a short note on assignment model [04]
b) Suppose that there are three applications for three jobs and that cost incurred by the applications to fill the job are given in the following table . [06]

	F1	*F2*	*F3*
A	26	23	27
B	23	22	24
C	24	20	23

Each applicant is assigned to only one job and each job is filled by one applicant only. Determine the assignment of applicants to job such that total cost is minimized

c) Consider the assignment problem shown below ,In this problem 5 different jobs are assigned to 5 different operator such that processing time is minimized the matrix entries represent processing time in hours. Find out Total processing time [06]

	Operator				
	O1	*O2*	*O3*	*O4*	*O5*
Job1	10	12	13	12	8
Job 2	7	16	14	14	11
Job 3	13	14	7	9	9
Job 4	12	10	11	13	10
Job 5	8	13	15	11	15

Q5) a) Explain the procedure adopted in the analysis of dynamic programming problems [08]

b) It is proposed to develop hydropower by building dam across 3 possible river site .The total financial resource available is 8 money units. The return function for each of the possible investment given below The available resources is to be allocated optimally to these developments ,Using DP determine the maximum return and give the allocation to various sites. [08]

Resource Allocated	Return From Site		
	1	2	3
0	0	0	0
2	12	14	30
4	75	55	50
6	91	70	70
8	96	80	75

OR

Q6) a) What is dynamic programming ?How it is different from linear programming ,explain with examples. [08]

b) Explain Bellman's principal of optimality and explain by illustrative example how it can be used to solve a multistage decision Problem [08]

SECTION II

Q7) a) Solve by Lagrange Multiplier techniques to Minimize [08]

$z = f(x_1, x_2) = 3x^2_1 + x^2_2 + 2x_1x_2 + 6x_1 + 2x_2$

Subjected to constraints $2x_1 - x_2 = 4$

b) Solve by Lagrange Multiplier techniques to Minimize [08]

$Z = f(x_1, x_2) = -x^2_1 - x^2_2 + 2x_1x_2 + 6x_1 + 8x_2$

Subjected to constraints $4x_1 + 3x_2 = 16$, $3x_1 + 5x_2 = 15$

OR

Q8) a) Minimize $f(x) = 2x^2_1 + 2x_1x_2 + 2x^2_2 - 4x_1 - 6x_2$ Taking $x^0 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ use Newton's method [08]

b) Minimize $f = x^3 - x$ in the interval (0,1) to an accuracy of 0.1% using Fibonacci Method [08]

Q9) a) Explain the assumptions in sequencing problem [04]

b) ABC manufacturing company processes 6 different jobs on two machines A and B. The number of unit of each job and its processing times on A and B are given following table .Find the optimum sequence ,the total minimum elapsed time and idle time for each machine. [12]

Job Number	No. of units of each job	Processing Time	
		Machine A (in Min)	Machine B (in Min)
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	3	14

OR

Q10) a) State advantages of simulations techniques [04]

b) A retailer deals in perishable items, the daily .demand and supply of which are random variable .The past 500 days data show the following [12]

Supply		Demand	
Available (Kg)	Number of days	Available (Kg)	Number of days
10	40	10	50
20	50	20	110
30	190	30	200
40	150	40	100
50	70	50	40

The retailer buys an item at Rs.20 per kg and sell at RS.30 Per kg. If any of the commodity remains at the end of the day .it has no stable value and is a dead loss. Moreover the loss on any unsatisfied demand is Rs.8 per kg. Given the following number :31,18,63,84,15,79,07,32,43,75,81,and 27.Use the random numbers alternately to simulate supply and demand for six year sales.

Q11 a) A firm considering replacement of machine whose cost price is Rs.12,200 and the scrap value is only Rs.200.The operating cost (in rupee)are found from experience as the follows [12]

Year	1	2	3	4	5	6	7	8
Operating Cost	200	500	800	1200	1800	2500	3200	4000

When should be machine replaced

b) Explain how theory of replacement is used in replacement of item whose cost varies with time [06]

OR

Q12 a) Reduce the following game as far as possible and then solve it [12]

		Player B			
		B1	B2	B3	B4
Player A	A1	-1	2	3	0
	A2	-4	-1	-1	0
	A3	-1	1	1	-4
	A4	-4	-1	2	-7

b) State difference between pure strategy and mixed strategy and also explain Two Person Zero –Sum Game [06]