Total No. of Questions : 11]

SEAT No. :

P4835

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B.E. (Civil) (Semester - I)

SYSTEMS APPROACH IN CIVIL ENGINEERING

(2008 Pattern) (Elective - I)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q. 2, Q.3or Q. 4, Q. 5, Q.6 or Q. 7, Q. 8 or Q.9, Q. 10 or Q.11.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of Calculator is allowed.***
4) ***Assume Suitable data jf necessary.***

Q1) A) Write at least five application areas of Linear Programming. **[5]**

B) A company sells two different products A and B. the company makes a profit of Rs 40 and Rs 30 per unit respectively on the two products. The products are produced by a common production process and sold in two different markets. The production process has a capacity of 30,000 manhours; It takes 3 hours to produce a unit of product A and 1 hour to produce a unit of product B. It is found that the maximum units that can be sold for product A and Bare 8,000 and 12,000 respectively. Formulate the above as LP problem. **[5]**

C) Solve the above problem using graphical method. **[6]**

OR

Q2) A) Solve the following problem using Big M method **[8]**

Maximize $Z = 2x_1 + 3x_2 + 4x_3$

Subject to

$3x_1 + x_2 + 4x_3 \leq 600$

$2x_1 + 4x_2 + 2x_3 \geq 480$

$2x_1 + 3x_2 + 3x_3 = 540$

$x_1 \geq x_2, x_3 \geq 0$

P.T.O.

B) State which of the following functions are convex or concave **[8]**

i) $F(x) = x_1^2 + x_2^2$

ii) $F(x) x_1^2 + 4x_1x_2 + x_2^3$

Q3) A) Explain the degeneracy in transportation problem. **[6]**

B) Solve the following assignment problem to minimize assignment cost. **[6]**

	J1	J2	J3	J4
A1	25	27	15	11
A2	20	25	16	17
A3	22	24	18	15
A4	29	25	19	20
A5	28	22	20	19

C) Solve following transportation problem using row minima and column minima method. **[6]**

		Destination				
		D1	D2	D3	D4	
Origins	O1	12	16	12	10	200
	O2	08	09	12	11	300
	O3	12	11	10	09	150
	O4	08	15	12	05	250
	Demand	300	300	100	200	supply

OR

Q4) A) Write the steps followed in VAM method **[6]**

B) Explain how following variations in transportation problem are solved by giving suitable examples **[12]**

i) Unbalanced transportation, problem

ii) Maximization problem

iii) No allocation in a particular cell

Q5) A) What are the applications of Dynamic Programming? **[8]**

B) Find the longest path from 1-12 through the network given below **[8]**

i-j	distance	i-j	distance	i-j	distance
1-2	5	3-8	10	6-11	7
1-3	4	4-5	8	7-9	4
1-4	2	4-6	9	7-10	10
2-5	8	4-7	6	7-11	6
2-6	10	4-8	4	8-9	12
2-7	5	5-9	8	8-10	5
2-8	7	5-10	4	8-11	2
3-5	6	5-11	3	9-12	7
3-6	3	6-9	5	10-12	3
3-7	8	6-10	2	11-12	6

Q6) A) Define Fibonacci numbers. Describe Fibonacci method of one dimensional optimization problems. **[8]**

B) write the steps used in steepest descent method of minimization **[8]**

OR

Q7) A) find the optima of the function **[8]**

$f(x) = x_1^2 + x_2^2 - 16$

B) Describe the Langragian multiplier technique in detail **[8]**

Q8) A) A firm is engaged in both shipping and receiving activities. The arrival distribution of trucks is found to be Poisson with arrival rate 3 trucks per hour. The service time distribution is exponential with unloading rate of 4 trucks per hour. Determine. **[8]**

i) Expected number of trucks in a queue

ii) Expected Waiting time of the truck in the queue

iii) Probability that the loading and unloading dock and workers will be idle.

B) Give any two applications of sequencing model. Explain the process, in detail. **[8]**

OR

Q9) A) A bakery shop keeps a stock of cakes. Daily demand based on past experience is as given below. **[10]**

daily demand	0	15	25	35	45	50
probability	0.01	0.15	0.20	0.50	0.12	0.02

consider following sequence of random numbers

48, 78, 09, 51, 77,15, 14,68,09

Using the sequence, simulate the demand for next 10 days.

Fihd the stock situation if the owner of the bakery decides to make 35 cakes every day

Also, estimate the daily average demand for the cakes on the basis of this simulated data.

B) Define a queue and explain the various queue disciplines. **[6]**

Q10)A) Discuss the algebraic method of solving 2×2 games by taking suitable example. **[9]**

B) Explain how the theory of replacement is used in replacement of items whose maintenance cost varies with time **[9]**

OR

Q11)A) How the concept of dominance used in simplifying the solution of a rectangular game? Explain the rules. **[9]**

B) A firm is thinking of replacing a particular machine whose cost price is Rs 12,200. The scrap price of this machine is only Rs 200. The maintenance costs are found to be as follows. Determine when the firm should get the machine replaced. **[9]**

year	1	2	3	4	5	6	7	8
maintenance cost (Rs)	220	500	800	1200	1800	2500	3200	4000