Total No. of Questions : 11]

SEAT No. :

P1910

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B.E. (Civil)

SYSTEMS APPROACH IN CIVIL ENGINEERING

(2008 Pattern) (Elective - I) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) What are the industrial applications of Linear Programming? **[4]**

b) Describe various models of optimizations used in Systems Approach. **[6]**

c) A firm produces three products. These products are processed on three different machines. The time required to manufacture one unit of each of the three products and the daily capacity of the three machines are given in the table below. **[6]**

Machine	Time per unit (minutes)			Machine capacity (min/day)
	Product 1	Product 2	Product 3	
M1	2	3	2	540
M2	4	2	1	570
M3	2	5	4	550

It is required to determine the daily number of units to be manufactures for each product. The profit per unit for product 1, 2 and 3 is Rs. 40, Rs. 30 and Rs. 50 respectively. Formulate the LP model that will maximize the daily profit.

OR

Q2) a) Explain the duality and sensitivity analysis as applicable in linear programming problems. **[6]**

P.T.O.

b) Minimize $x_0 = x_1 - 3x_2 + 2x_3$ **[10]**

Subject to

$3x_1 - x_2 + 2x_3 \geq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1 \geq, x_2, x_3 \geq 0$

Q3) a) How will you define transportation model? Explain its application. **[6]**

b) Solve following transportation problem using least cost method and North-West corner 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

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

	J1	J2	J3	J4	J5
A1	10	5	9	18	11
A2	13	9	6	12	15
A3	3	2	4	14	10
A4	11	6	8	17	8

OR

Q4) a) Give the steps in u-v method of optimization in transportation problem. **[6]**

b) Optimize the transportation cost of following problem using row minima and column minima method. **[6]**

		D1	D2	D3	Available
Origins	O1	3	8	5	5
	O2	5	5	3	8
	O3	7	6	9	7
	O4	4	9	5	14
	required	7	9	18	

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

	J1	J2	J3	J4
A1	5	8	4	9
A2	4	9	10	4
A3	8	9	7	8
A4	9	5	4	2

Q5) a) What is Dynamic Programming? Write step by step procedure to solve a general problem by DP approach. **[6]**

b) Find the shortest path from 1-12 through the network given below. **[10]**

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) What are global optima and local optima? Explain with the help of neat diagrams. **[8]**

b) Explain the steps followed in Golden section method of one dimensional optimization problems. **[8]**

OR

Q7) a) Differentiate between Fibonacci method and Dichotomous method. **[8]**

b) Find the optima of the function. **[8]**

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

Q8) a) Define a queue and explain the various queue disciplines. **[6]**

b) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are given as. **[10]**

job	1	2	3	4	5	6	7
A	12	9	3	15	10	11	15
B	10	3	8	10	12	2	13

Determine the sequence of these jobs that will minimize total elapsed time. Find the elapsed time and idle time of machines and jobs.

OR

Q9) a) Explain following in context of sequencing problems. **[8]**

i) Total elapsed time and idle time

ii) Processing order

b) What is Simulation? What are the advantages and limitations of Simulation? **[8]**

Q10)a) Write a detailed note on Games theory. Include applications and limitations of Games theory. **[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. **[8]**

b) A fleet owner finds from his past records that the costs per year of running a truck whose purchase price is Rs. 6000 are as given below.**[10]**

Year	1	2	3	4	5	6	7
running cost	1000	1200	1400	1800	2300	2800	3400
resale value	3000	1500	750	375	200	200	200

Determine at what age is the replacement due.