

Total No. of Questions : 10]

SEAT No. :

P4901

[Total No. of Pages :4

[4959] - 1005

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

SYSTEMS APPROACH IN CIVIL ENGINEERING

(2012 Course)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q. 7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explain the applications of Systems Approach in following areas. **[5]**

- i) Production
- ii) Procurement
- iii) Marketing
- iv) Finance
- v) Personnel

b) State whether following functions are convex or concave. **[5]**

- i) $F(x) = x^3 - x^2 - x + 5$
- ii) $F(x) = x^2 \log(x)$

OR

Q2) a) Explain Hessian Matrix and state the conditions for concave and convex function for bivariable problems. **[5]**

b) State the points of differences between Dichotomous Search, Fibonacci and Golden section methods. **[5]**

Q3) a) Explain following notations which represent queuing models. **[5]**

- i) (M/M/1) : (SIRO/∞/∞)
- ii) (M/E/c) : (FCFS/N/∞)

b) Explain the steps in Lagrangian Multiplier technique of optimisation. **[5]**

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OR

- Q4) a)** Find the sequence that minimizes the total elapsed time to complete the following jobs in the order BA. [5]

		Jobs (Processing times in minutes)						
		1	2	3	4	5	6	7
machines	A	12	6	5	11	5	7	6
	B	7	8	9	4	7	8	3

Find total elapsed time.

- b) What is simulation? How can you use Monte Carlo simulation to solve industrial problems? [5]

- Q5) a)** What is Dynamic Programming? Write step by step procedure to solve the general problem by DP approach. [8]

- b) In an investment project, 10 units of money are available for allocation in three investment programmes. The returns are as follows. What is the optimal investment policy? [8]

	Returns											
	0	1	2	3	4	5	6	7	8	9	10	
Investment policy	A	0	5	15	40	62	80	88	90	98	110	115
	B	0	6	18	45	70	83	92	95	100	120	125
	C	0	4	13	42	60	78	85	88	95	100	105

OR

- Q6) a)** What is the need of Dynamic Programming? How is it different from LP? Write some applications of DP. [8]

- b) Find the shortest path from node 1 to node 11 through the network as given below. [8]

Node	Distance	Node	Distance	Node	Distance
1-2	5	3-6	5	5-10	5
1-3	2	3-7	2	6-9	8
1-4	7	3-8	1	6-10	4
2-5	8	4-6	6	7-9	4
2-6	9	4-7	8	7-10	3
2-7	6	4-8	7	9-11	2
3-5	4	5-9	9	10-11	3

Q7) a) Explain the meaning of duality in L.P. What are the advantages of solving a minimization problem by converting it into maximization problem? **[6]**

b) Solve the following by Simplex method. **[6]**

$$\text{Maximize } Z = x_1 + x_2 / 2$$

$$\text{Subject to } 3x_1 + 2x_2 \leq 8$$

$$5x_1 \leq 10$$

$$x_1 + x_2 \leq 8$$

$$-x_1 + x_2 \geq 4$$

$$x_1, x_2 \geq 0$$

c) Solve the following by graphical method **[6]**

$$\text{Minimize } Z = 60x + 40y$$

Subject to

$$3x + 10y \geq 240$$

$$10x + 10y \geq 160$$

$$20x + 60y \geq 480$$

$$x, y \geq 0$$

OR

Q8) a) Solve by using big M method. **[8]**

$$\text{Maximize } Z = 4x_1 + 3x_2 + 5x_3$$

Subject to

$$x_1 + 3x_2 + 2x_3 \leq 10$$

$$2x_1 + 2x_2 + x_3 \geq 6$$

$$x_1 + 2x_2 + 3x_3 = 14$$

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

b) A pharmaceutical company produces two drugs A and B which are sold at a rate of Rs. 9.6 and Rs. 7.8 respectively. The main ingredients are x, y and z and they are required in the following proportions. **[10]**

Drugs	$x\%$	$y\%$	$z\%$
A	50	30	20
B	30	30	40

The total available quantities of different ingredients are 1600 in x , 1400 in y and 1200 in z the cost in Rs. of x, y and z per gm are Rs. 8, Rs.6 and Rs.4 respectively. Estimate the most profitable quantities of A and B to produce, using Simplex method.

- Q9) a)** Determine optimum solution by using VAM method for following transportation problem. Optimise using u-v method. **[10]**

		Destinations					
		1	2	3	4	5	Supply
Origins	A	2	11	10	3	7	6
	B	1	4	7	2	1	10
	C	3	9	4	8	12	9
Demand		4	4	4	7	6	

- b) Assign the jobs to employees to minimize cost. **[6]**

		Employees			
		A	B	C	D
Jobs	1	7	9	3	3
	2	2	6	1	6
	3	6	5	3	4
	4	9	10	7	1
	5	5	2	2	4

OR

- Q10)a)** National Oil company has 3 refineries and 4 depots. Transportation cost per ton, capacities and requirements are as given below. Determine optimum allocation of output. **[8]**

		Capacity				
		D ₁	D ₂	D ₃	D ₄	(tons)
R ₁		5	7	3	10	700
R ₂		8	6	14	13	400
R ₃		12	10	9	11	800
Required		200	600	700	400	

- b) Assign tasks to employees to minimize cost. **[8]**

		Tasks				
		1	2	3	4	5
Employees	A	25	30	70	40	60
	B	10	10	45	40	50
	C	55	40	25	55	40
	D	60	70	10	35	30
	E	30	55	60	20	35

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