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Roll No.

MCA-301

M. C. A. (Third Semester) EXAMINATION, June, 2008
COMPUTER ORIENTED OPTIMIZATION TECHNIQUES
(MCA-301)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt all questions by selecting (a) and (b) or (c) and (d) parts from each question. All questions carry equal marks.

1. (a) What is operations research ? Discuss the significance and scope of operations research. 8
(b) Solve the L. P. P. 12
Maximize :

$$z = x_1 + x_2 + x_4$$

Subject to the constraints :

$$x_1 + x_2 + x_3 + x_4 = 4$$

$$x_1 + 2x_2 + x_3 + x_5 = 4$$

$$x_1 + 2x_2 + x_3 = 4$$

$$x_1, x_2, x_3, x_4, x_5 \geq 0$$

Find out all the optimal basic feasible solutions using Big-M method.

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Or

(c) Write an algorithm and draw a flowchart for Simplex method. 8

(d) Find the dual of the following LPP : 12

Minimize :

$$x_1 + 2x_2 \geq 20$$

$$3x_1 + 2x_2 \geq 50$$

x_1, x_2 are non-negative integers.

2. (a) Solve the following assignment problem and find optimal solution : 10

Employee	Task			
	1	2	3	4
1	5	8	8	6
2	4	6	5	8
3	6	10	7	4
4	9	9	7	3

(b) Use dynamic programming to show that : 10

$$\sum_{i=1}^n p_i \log p_i$$

Subject to the constraints :

$$\sum_{i=1}^n p_i = 1 \text{ and } p_i > 0$$

is maximum where $p_1 = p_2 = \dots = p_n = \frac{1}{n}$.

Or

- (c) Obtain an optimal solution to the transportation problem in which cells contain the transportation cost in rupees : 12

Plants		W_1	W_2	W_3	W_4	W_5	Available
	P_1	7	6	4	5	9	40
	P_2	8	5	6	7	8	30
	P_3	6	8	9	6	5	20
	P_4	5	7	7	8	6	10
Required		30	30	15	20	5	100 Total

- (d) Write and explain algorithm for processing n jobs through 3 or more machines. 8
3. (a) Explain the importance of CPM and PERT in the management of projects. 8
- (b) Obtain the critical path and project duration for the following PERT network. Also obtain total and free float for each activity. 12

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- (b) Patients arrive at a clinic according to a Poisson distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is exponential with mean rate 20 per hour : 10

- (i) Find the effective arrival rate at the clinic.
(ii) What is the expected waiting time until a patient is discharged from the clinic ?

Or

- (c) Discuss the queuing model $M|M|S : N|FCFS$. 10
(d) At a service centre customers arrive at the rate of 10 per hour and are served at the rate of 15 per hour. Their arrival follows Poisson distribution and service is exponentially distributed. Find the average length and average waiting time in the system. 10

5. (a) Discuss the costs associated with inventory. 10
(b) A company has a demand of 12000 units/year for an item and it can produce 2000 such items per month. The cost of one set up is Rs. 400 and the holding cost/unit/month is Rs. 0.15. Find the optimum lot size and the total cost per year, assuming the cost of one unit as Rs. 4. Also find the maximum inventory and total time. 10

Or

- (c) Derive the economic lot size model in which demand rate is uniform, production rate is finite and lead time is zero. 10
(d) The demand for an item is deterministic and constant over time and it is equal to 600 units per year. The per unit cost of the item is Rs. 50 while the cost of placing

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an order is Rs. 5. The inventory carrying cost is 20% of the cost of inventory per annum and cost of shortage is Re. 1 per unit per month. Find the optimal ordering quantity when stockouts are permitted. If the stockouts are not permitted, what would be the loss to the company ?

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