

ME 512 OPERATIONS RESEARCH

Duration: 3Hours

Maximum : 100 Marks

Answer all the questions

Part-A

(10 X 2 = 20 Marks)

1. What is feasibility region in an LP problem?
2. State the characteristics of a standard LPP form.
3. What is the objective of sequencing problems?
4. What is a dummy activity?
5. Give the EOQ formula for purchasing model without shortage.
6. What is safety stock?
7. Define Markov chain.
8. What do you understand from Kendal's notation?
9. Define Saddle point.
10. Write notes on multivariable search techniques.

Part-B

(5 X 16 = 80 Marks)

11. Consider the LPP

$$\text{Max } Z = 2x_1 + x_2 + 4x_3 - x_4$$

Subject to:

$$x_1 + 2x_2 + x_3 - 3x_4 \leq 8$$

$$-x_2 + x_3 + 2x_4 \leq 0$$

$$2x_1 + 7x_2 - 5x_3 - 10x_4 \leq 21$$

$$\text{and } x_1, x_2, x_3, x_4 \geq 0$$

Solve the LPP and discuss the effect of change of C_1 to 1. Also discuss the effect of change of (C_3, C_4) to $(3, 4)$ (16)

12.a.i. Construct the network for the project whose activities are given below and compute the total, free and independent float of each activities and hence determine the critical path and the project duration. (12)

Activity	0-1	1-2	1-3	2-4	2-5
Duration (in weeks)	3	8	12	6	3
Activity	3-4	3-6	4-7	5-7	6-7
Duration (in weeks)	3	8	5	3	8

ii. Write short notes on minimal spanning tree models. (4)

(Or)

b. The data for a small PERT project is as given below where 'O' represents optimistic time, 'M' most likely time and 'P' pessimistic time estimates (in days) of the activities A, B, ..., J, K:

	A	B	C	D	E	F	G	H	I	J	K
O:	3	2	6	2	5	3	3	1	4	1	2
M:	6	5	12	5	11	6	9	4	19	2	4
P:	15	14	30	8	17	15	27	7	28	9	12

precedence relationship A, B, C can start immediately.

$A \leq D, I$; $B < G, F$; $D < G, F$; $C < E$; $E < H, K$; $F < H, K$; $G, H < J$.

(16)

13.a.i. A company has a demand of 15,000 units/year for an item and it can produce 2200 such items per month. The cost of one setup is Rs.430 and the holding cost/unit/month is Rs.0.25 Find the optimum lot size, maximum inventory, manufacturing time and total time. (10)

ii. Write detailed notes on various types of inventories. (6)

(Or)

b. Find the optimal quantity for a product where the annual demand for the product is 500 units. The cost of storage per unit per year is 8% of the unit cost and the ordering cost per order is Rs.175.00. The unit costs are given below.

Quantity	Unit Cost (Rs)
$0 \leq Q_1 \leq 500$	25
$500 \leq Q_2 < 1500$	24.80
$1500 < Q_3 < 3000$	24.60
$3000 < Q_4$	24.40

(16)

14.a.i. Trucks arrive at a petrol bunk, having a single petrol pump, in Poisson fashion with an of 12 trucks per hour. The service time is distributed exponentially with a mean of 3.5 minutes. Find the average number of trucks in the system, average waiting time in the Queue, the average Queue length and also the probability that the number of trucks in the system is 3 (12)

ii. Distinguish transient state and steady state with suitable examples. (4)

(Or)

b.i. A car park contains 5 cars. The arrival of cars is Poisson at a mean rate of 10 per hour. The length of time each car spends in the car park is negative exponential distribution with mean of 2 hours. How many cars are in car park on average? (12)

ii. Write short notes on Simulation. (4)

15.a. For the payoff matrix given below, decide optimum strategies for A and B.

	A	
	1	2
B	1 200	80
	2 110	170

(16)

(Or)

b. The following failure rates have been observed for certain items.

End of month :	1	2	3	4	5
Probability of failure till date :	0.1	0.3	0.55	0.85	1.00

The cost of replacing an individual item is Rs.1.25. The decision is made to replace all items simultaneously at fixed intervals and also replace individual items as they fail. If the cost of group replacement is 50 paise, What is the best interval for group replacement. At what group replacement per item, would a policy of strictly individual replacement become preferable to the adopted policy. (16)