JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, March - 2017
OPERATIONS RESEARCH
(Common to ME, AME)

Time: 3 Hours

Max. Marks: 75

Answer any Five Questions
All Questions Carry Equal Marks

1.a) Solve the following LPP using graphical method.

$$Max\ Z = 8x_1 + 6x_2$$

Subject to constraints $2x_1 + x_2 <= 72$

$x_1 + 2x_2 <= 48$, where $x_1, x_2 >= 0$

b) Solve the following LPP using 2-phase simplex method.

$$Max\ Z = 4x_1 + 3x_2$$

Subject to constraints $3x_1 + 4x_2 <= 6$

$5x_1 + 6x_2 >= 15$, where $x_1, x_2 >= 0$ [7+8]

2.a) Solve the following transportation problem by finding IBFS using VAM and test for optimality?

	D1	D2	D3	D4	Supply
O1	23	27	12	14	10
O2	13	12	20	51	40
O3	22	28	12	32	53
Demand	20	35	25	41	

b) Solve the following traveling salesperson problem. [8+7]

TO

		I	II	III	IV	V
	I	∞	6	12	6	4
FROM	II	6	∞	10	5	4
	III	8	7	∞	11	3
	IV	5	4	11	∞	5
	V	5	2	7	8	∞

3.a) Write Jonson's procedure for determining an optimal sequence for processing N items on two machines. Give justification of the rule used in the procedure.

b) The cost of a new machine is Rs.5000. The maintenance cost of nth year is given by $Rn=500(n-1)$; n=1,2.... . Assuming that the money value will not change with time, after how many years will it be economical to replace the machine by new one? [8+7]

4.a) Consider the following pay-off matrix and determine the optimal strategy.

B

		I	II	III
A	I	6	9	4
	II	5	10	7
	III	9	8	9

b) A and B play game in which each has three coins 5p, 10p and 20p. Each selects a coin without the knowledge of the others choice. If the sum of the coins is an odd amount, A wins B's coin. If the sum is even, B wins A's coin. Find the best strategy for each player and the value of the game [7+8]

5. Trains arrive at the yard every 20 minutes and the service time is 40 minutes. If the line capacity of the yard is limited to 6, find: a) The probability the yard is empty. b) The average number of trains in the system. [15]

6.a) The annual demand for an automobile component is 36,000 units. The carrying cost is Rs. 0.5/unit/year. The ordering cost is Rs. 25/- per order and the shortage cost is Rs. 15/unit/year. Find the optimal values of.. i) Economic Order Quantity ii) Maximum Inventory c) Cycle time d) No. of orders.

b) The demand for an item is 6000 units per year. Its production rate is 1000 units per month. The carrying cost is Rs. 550/- /unit/year and the setup cost is Rs. 2000/- per set-up. The Penalty cost is Rs. 1000/- per unit per year. Find out i) Economic Order Quantity ii) Number of orders per year iii) Time between two consecutive orders. [7+8]

7.a) The owner of a chain of four grocery stores has purchased six crates of fresh strawberries. The estimated probability distribution of potential sales of the strawberries before spoilage differ among the four stores. The following table gives the estimated total expected profit at each store, when it is allocated various number of crates.

No. of crates	Stores			
	1	2	3	4
0	0	0	0	0
1	4	2	6	2
2	6	4	8	3
3	7	6	8	4
4	7	8	8	4
5	7	9	8	4
6	7	10	8	4

For administrative reasons, the owner does not wish to split crates between stores. However he is willing to distribute zero crates to any of his stores. Find the allocation of 6 crates into 4 crates so as to maximize the expected profit. Use dynamic programming approach.

b) An electric item has three components in series. So the reliability of the system is equal to the product of the reliabilities of the three components, i.e., $T = r_1 r_2 r_3$. It is a known fact that the reliability of the system can be improved by providing standby units at extra cost. The details of costs and reliabilities for different number of standby units or each of the components of the system are summarized in table. The table capital budgeted for this purpose is Rs 8. Determine optimal number of standby units such that total reliability of the system is maximized. [8+7]

N. of Standby units	Component 1		Component 2		Component 3	
	Cost (Rs.)	Reliability	Cost (Rs.)	Reliability	Cost (Rs.)	Reliability
1	1	0.70	3	0.85	2	0.85
2	2	0.85	4	0.95	3	0.92
3	3	0.95	6	0.98	5	0.97

8.a) Explain about different types of simulations in detail.

b) Discuss on simulation languages with respect to implementation and compatibility. [7+8]

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