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P 1335

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Eighth Semester

Mechanical Engineering

ME 436 — OPERATIONS RESEARCH

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the general methods to solve operations research models?
2. How do you identify infeasibility in LPP from the simplex table?
3. Write the linear programming model form of 3 × 3 assignment problem.
4. What is use of dummy activities in constructing project network?
5. Derive the EOQ formula for the purchase model without shortages
6. What are the assumptions of fixed order quantity system?
7. Define Kendall's notation to specify the queuing system.
8. What do you mean by Jockeying?
9. Define pure and mixed strategies.
10. What are the types of decisions?

PART B — (5 × 16 = 80 marks)

11. (a) A toy company manufactures two types of doll, a basic version-(doll A) and a deluxe version-(doll B). Each type of doll B takes twice as long to produce as one of type A, and the company would have time to make a maximum of 2,000 per day. The supply of plastic is sufficient to produce 1,500 dolls per day of both A and B. The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes a profit of Rs.3 and Rs.5 per doll, respectively on doll A and B, then how many of each doll should be produced per day in order to maximize the total profit. Formulate this problem as LPP and solve.

Or

- (b) Five salesmen are to be assigned to five territories. Based on the past experience, the following table shows the annual sales (in rupees lakhs) that can be generated by each salesman in each territory. Find the optimum assignment.

Salesman	Territory				
	T_1	T_2	T_3	T_4	T_5
S_1	26	14	10	12	9
S_2	31	27	30	14	16
S_3	15	18	16	25	30
S_4	17	12	21	30	25
S_5	20	19	25	16	10

12. (a) A company has three plants at locations A, B and C, which supply to warehouses located at D, E, F, G and H. monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units respectively. Unit transportation costs (in Rs.) are given below. Determine an optimum distribution for the company in order to minimize the total transportation cost.

		To				
		D	E	F	G	H
From	A	5	8	6	6	3
	B	4	7	7	6	5
	C	8	4	6	6	4

Or

- (b) Consider the details of a distance network as shown below:

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

- (i) Construct the distance network.
(ii) Find the minimum spanning tree.

13. (a) Determine a decision rule, using the basic purchasing Economic Order Quantity model for an annual demand of 6000 units, ordering cost of Rs. 600 per order and carrying cost of 18 percent per year. Price per unit is a function of order size. The basic price is Rs. 20.00 per unit. This price is in effect for all orders of less than 2,000 units. Orders for 2,000 or more but less than 4,000 units may be purchased for Rs.15 per unit. Orders for 4,000 or more units may be purchased for Rs. 9 per unit.

Or

- (b) A particular item has an annual demand of 9000 units. The carrying cost is Rs. 2 per unit per year. The ordering cost per order is Rs. 90.
- (i) Find the EOQ
 - (ii) Determine the number of orders to be placed per annum.
 - (iii) If the purchase price per unit is Re. 0.50, what is the total cost per year?
 - (iv) If the lead time is two months and the safety stock is 1000 units, what is the reorder point?
14. (a) On an average 96 patients per 24-hour day require the service of an emergency clinic. Also on average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue to $1/2$ patient?

Or

- (b) In the production shop of a company, the breakdown of the machines is found to be poisson distributed with an average rate of 3 machines per hour. Breakdown time at one machine costs Rs. 40 per hour to the company. There are two choices before the company for hiring the repairmen. One of the repairmen is slow but cheap and the other fast but expensive. The slow-cheap repairman demands Rs. 20 per hour and will repair the broken down machines exponentially at the rate of 4 per hour. The fast-expensive repairman demands Rs. 30 per hour and will repair machines exponentially at an average rate of 6 per hour. Which repairman should be hired?

15. (a) Solve the following game by simplex method of linear programming.

	1	2	3
1	3	-1	-3
2	-3	3	-1
3	-4	-3	3

Or

- (b) A computer contains 10,000 resistors. When any one of the resistors fails, it is replaced. The cost of replacing a single resistor is Rs. 10 only. If all resistors are replaced at the same time, the cost per resistor would be reduced to Rs.3.50. the percent surviving by the end of month t is as follows :

Month (t) :	0	1	2	3	4	5	6
% surviving at the end of month :	100	97	90	70	30	15	0

What is the optimum plan?