R17

Code No: 842AD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA II Semester Examinations, December - 2019
OPERATIONS RESEARCH

Time: 3hrs   Max.Marks:75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1.a) Write a short notes on Characteristics of Operation Research.   [5]
  b) Define the following terms in the context of sequencing problem
      i) Total elapsed time   ii) Idle time, processing order.   [5]
  c) Write about the customer behavior in the queue.   [5]
  d) Define inventory. What are the advantages and disadvantages of having Inventories?   [5]
  e) Define i) Pure strategy ii) Mixed Maxmin principle, saddle point, value of the game.
                                                                                       [5]

PART - B

5 × 10 Marks = 50

2. a) A small manufacturer employs 5 skilled men and 10 semi-skilled men for making a product in two qualities : a deluxe model and an ordinary model. The production of a deluxe model requires 2- hour work by a skilled man and a1-hour work by a semi-skilled man. The ordinary model requires 2-hour work by a skilled man and 3-hour work by a semi-skilled man. According to worker union's rules, no man can work more than 8 hours per day. The profit of the deluxe model is Rs. 1000 per unit and that of the ordinary model is Rs. 800 per unit. Formulate a linear programming model for this manufacturing situation to determine the production volume of each model such that the total profit is maximizing.

  b) Solve the following LP problem graphically
          Minimize $Z = 45 X_1 + 55 X_2$
      Subject to $X_1 + 2 X_2 \leq 30$
                          $2X_1 + 3 X_2 \leq 80$
                          $X_1 - X_2 \geq 8$
                          X_1 and $X_2 \geq 0$.   [10]

OR

3. A company has three cement factories located in cities 1, 2, 3 which supply cement to four projects located in towns 1, 2, 3, 4. Each plant can supply 6, 1, 10 truckloads of cement daily respectively and the daily cement requirements of the projects are respectively 7, 5, 3, 2 truck loads. The transportation costs per truck load of cement (in hundreds of rupees) from each plant to teach project site are as follows:

		Project sites			
		1	2	3	4
Factories	1	2	3	11	7
	2	1	0	6	1
	3	5	8	15	9

Determine the optimal distribution for the company so as to minimize the total transportation cost.   [10]

4. Find the sequences that minimizes the total elapsed time required to complete the following tasks. Each task is processed in any two of the machines A, B and C in any order   [10]

		Task						
		1	2	3	4	5	6	7
Machine	A	12	6	5	3	5	7	6
	B	7	8	9	8	7	8	3
	C	3	4	11	5	2	8	4

OR

5. A fleet owner finds from his past records that the costs per year of running a truck whose purchase price is Rs. 6000 are as given below:

Year	1	2	3	4	5	6	7	8
Running costs (in Rs.)	1500	1600	1800	2100	2500	2900	3400	4000
Resale value (in Rs.)	3500	2500	1700	1200	800	500	500	500

Determine at what age is the replacement due?   [10]

6. Arrival rate of telephone calls at a telephone booth are according to Poisson distribution with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be, with mean 3 minutes.

a) Determine the probability that a person arriving at the booth will have to wait.

b) Find the average queue length that is formed from time to time.

c) The telephone company will install a second booth when convinced that an arrival would aspect to have to wait at leave four minutes for the phone. Find the increase in flow rate of arrivals which will justify a second booth.

d) What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free?   [10]

OR

7. The arrival rate of customers at a banking customer follows Poisson distribution with a mean of 45 per hour. The service rate of the counter clerk also follows Poisson distribution with a mean of 60 per hour.
    a) What is the probability of having 0 customer in the system?
    b) What is the probability of having 5 customers in the system?
    c) What is the probability of having 12 customers in the system?
    d) Find L_q, L_s [10]

8. The demand of a bought out item in a store is 12,000 units per year. The carrying cost is Rs. 2 per unit per year and the ordering cost is Rs. 600 per order. The storage cost is Rs. 10 per unit per year. Find the EOQ and the corresponding number of orders per year, the maximum inventory.   [10]

OR

9. A manufacturer of engines is required in purchase 2,400 castings per year. The requirements are assumed to be fixed and known. The manufacturer is given a lower price for quantity purchased within certain ranges. The problem is to determine the optimal purchase quantity. Time period T = 12 months, total demand R = 2, 400 units, I = 2%, K_{11} = Rs. 10 for $0 \leq q < 500$, K_{12} = Rs. 925 for $q \geq 500$.   [10]

10. Solve the following game by using the principle of dominance: [10]

Player B

		I	II	III	IV	V	VI
	1	4	2	0	2	1	1
Player A	2	4	3	1	3	2	2
	3	4	3	7	-5	1	2
	4	4	3	4	-1	2	2
	5	4	3	3	-2	2	2

OR

11. An oil company has 8 units of money available for exploration of three sites. If oil is present at a site, the probability of finding it depends upon the amount allocated for exploiting the site, as given below

Units of money allocated

	0	1	2	3	4	5	6	7	8
Site 1	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.0
Site 2	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.8	1.0
Site 3	0.0	0.1	0.1	0.2	0.3	0.5	0.8	0.9	1.0

The probability that the oil exists at sites 1,2 and 3 is 0.4, 0.3 and 0.2 respectively. Find the optimal allocation of money.   [10]