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Code No: 127FZ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, November /December- 2018

OPERATIONS RESEARCH

(Common to ME, CSE, MCT, AME, MIE, MSNT, AGE)

Time: 3 Hours

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

(25 Marks)

- 1.a) What are the applications of OR in industry? [2]
- b) List the characteristics of OR. [3]
- c) What is assignment problem? [2]
- d) What is the difference between a Transportation and an Assignment problem? Write the situation where an assignment problem can arise? [3]
- e) Give 3 examples of sequencing problem from your daily life? [2]
- f) What are the situations which make the replacement of items necessary? [3]
- g) What is inventory management? [2]
- h) Define competitive game and payoff matrix. State the major limitations of game theory? [3]
- i) Explain briefly the main characteristics of queuing system? [2]
- j) Distinguish between mathematical models and simulation models? [3]

PART-B

(50 Marks)

- 2.a) A firm manufactures headache pills in two sizes A and B. Size A contains 2 grains of aspirin, 5 grains of bicarbonate and 1 grain of codeine. Size B contains 1 grain of aspirin, 8 grains of bicarbonate and 6 grains of codeine. It is found by users that it requires at least 12 grains of aspirin, 74 grains of bicarbonate and 24 grains of codeine for providing immediate effect. It is required to determine the least number of pills a patient should take to get immediate relief. Formulate the problem as a standard LPP. [5+5]
- b) Does the following LPP has a feasible solution?
Max. $z = x_1 + x_2$
Subject to $x_1 - x_2 \geq 0$, $3x_1 - x_2 \leq -3$
Show with the help of a graph.

OR

3. Explain the term 'artificial variable' and its use in linear programming. Solve the below problem by using two phase simplex method:
Minimize. $z = x_1 + x_2$
Subject to
 $2x_1 + x_2 \geq 4$; $x_1 + 7x_2 \geq 7$
 $x_1, x_2 \geq 0$. [10]

4. Solve the travelling –salesman problem given by the following data.
 $C_{12} = 20, C_{13} = 4, C_{14} = 10, C_{23} = 5, C_{34} = 6$
 $C_{25} = 10, C_{35} = 6, C_{45} = 20$, where $C_{ij} = C_{ji}$
 and there is no route between cities i and j if the value for C_{ij} is not shown. [10]

OR

5. An oil corporation has got three refineries P, Q, and R and it has to send petrol to four different depots A, B, C and D. The cost of shipping 1 gal. of petrol and the available petrol at the refineries are given in the table. The requirement of the depots and the available petrol at the refineries are also given. Find the minimum cost of shipping after obtaining an initial solution by VAM. [10]

		Depot				Available
		A	B	C	D	
Refinery	P	10	12	15	8	130
	Q	11	11	9	10	150
	R	20	9	7	18	170
Required		90	100	140	120	

6. We have five jobs each of which must go through the machine A, B and C in the order ABC:

Job.No.	Processing Times (in hours)				
	1	2	3	4	5
Machine A	5	7	6	9	5
Machine B	2	1	4	5	3
Machine C	3	7	5	6	7

Determine a sequence for the jobs that will minimize the total elapsed time. [10]

OR

7. A machine owner finds from his past records that the costs per year of maintaining a machine whose purchase price is Rs. 6,000 are as given below:

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs):	1000	1200	1400	1800	2300	2800	3400	4000
Resale Price	3000	1500	750	375	200	200	200	200

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

8. Two companies A and B are competing for the same product. Their different strategies are given in the following payoff matrix.

		Company A		
		A ₁	A ₂	A ₃
Company B	B ₁	2	-2	3
	B ₂	-3	5	-1

Determine the best strategies for both the players. [10]

OR

- 9.a) Briefly explain the objectives that must be fulfilled by an inventory control system?
 b) Find the optimum order quantity for a product for which the price breaks are as follows:

Quantity	Unit cost (Rs.)
$0 \leq q_1 < 500$	10.00
$500 \leq q_2$	9.25

The monthly demand for a product is 200 units, the cost of storage is 2% of unit cost and the cost of ordering is Rs.350. [4+6]

10. Cars arrive at a petrol pump, having one petrol unit, in Poisson fashion with an average of 10 cars per hour. The service time is distributed exponentially with a mean of 3 minutes. Find a) average number of cars in the system b) average waiting time in the queue. c) average queue length d) the probability that the number of cars in the system is 2. [10]

11. Use Dynamic programming to find the value of

$$\text{Max } z = y_1 y_2 y_3$$

Subject to the constraints:

$$y_1 + y_2 + y_3 = 5$$

$$y_1, y_2, y_3 \geq 0.$$

[10]

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