Code No: 155CQ

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, September - 2021
OPERATIONS RESEARCH
(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1. Solve the following LPP using graphical method: [15]
Maximize $z = 6x_1 + x_2$
Subject to the constraints $2x_1 + x_2 \geq 3$
$x_1 - x_2 \geq 0$
and $x_1, x_2 \geq 0$

2. Solve the following LPP using Big M method [15]
Minimize $z = 5x_1 + 3x_2$
Subject to the constraints $2x_1 + 4x_2 \leq 12$
$2x_1 + 2x_2 = 10$
$5x_1 + 2x_2 \geq 10$
and $x_1, x_2 \geq 0$

3. Find optimal solution to the given transportation problem by using MODI method. [15]

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	

4. Solve the following Assignment problem using Hungarian method. The matrix entries represent the processing time in hours. [15]

		Operator				
		1	2	3	4	5
Job	1	10	12	15	12	8
	2	7	16	14	14	11
	3	13	14	7	9	9
	4	12	10	11	13	10
	5	8	13	15	11	15

5. Use graphical method to minimize the time needed to process the following jobs on the machines. Also calculate the total time elapsed to complete both the jobs. [15]

Job 1	Sequence	A	B	C	D	E
	Time (hrs)	2	6	5	4	7
Job 2	Sequence	C	B	D	A	E
	Time (hrs)	6	5	7	4	8

6. A large computer has 2000 components of identical nature which are subjected to failure as per the probability distribution given below:

Week end :	1	2	3	4	5
Probability of failure :	0.10	0.25	0.50	0.80	1.00

If the cost of individual replacement per unit Rs. 3 and for group replacement per unit is Re. 1, assess which of the replacement would be economical and when? [15]

7.a) Explain in detail what constitutes ordering cost and carrying cost. With help of graph, show how they behave with increase in order quantity.

b) A dealer supplies the following information with regards to a product is dealing with:

Annual demand:	10,000 units
Ordering cost:	Rs 10 per order
Inventory carrying cost:	20% of the unit value of the item
Price per unit:	Rs 20

Determine economic order quantity, number of orders placed and total yearly cost. [6+9]

8. A distance network consists of 11 nodes which are distributed as shown in the following table. Find the shortest path from node 1 to node 11 and the corresponding distance. Use dynamic programming problem. [15]

Arc	Distance	Arc	Distance
1-2	8	5-8	12
1-3	7	5-9	7
1-4	1	6-9	9
2-5	5	7-9	6
3-5	9	7-10	13
3-6	2	8-11	4
3-7	8	9-11	2
4-7	10	10-11	15

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