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R-15

Code: 5G571

IV B.Tech. I Semester Supplementary Examinations October 2020

Operations Research
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

UNIT-I

1. Use two-phase method to solve the following Linear Programming Problem.

$$\begin{aligned} \text{Max } Z &= 3X_1 - X_2 \\ \text{subject to } 2X_1 + X_2 &\geq 2 \\ X_1 + 3X_2 &\leq 2 \\ X_2 &\leq 4 \\ \text{and } X_1, X_2 &\geq 0 \end{aligned}$$

14M

OR

2. A firm manufactures two products A and B, both of which have to be processed on two machines M₁ and M₂. Product A require 4 hours each on both machines, while product B requires 6 hours on machine M₁ and 2 hours on machine M₂. The available hours on machines M₁ and M₂ are 24 and 16 respectively. The profit/unit is estimated as Rs. 100 for product A and Rs. 125 for product B. Formulate LPP and Determine the quantity of each product to be produced in order to maximize the profit using Graphical method?

14M

UNIT-II

3. Find the sequence that minimizes the total elapsed time required to complete the following jobs on machines M1, M2, and M3.

	A	B	C	D	E	F
M1	8	3	7	2	5	1
M2	3	4	5	2	1	6
M3	8	7	6	9	10	9

14M

OR

4. A steel company has three open hearth furnaces and five rolling mills. The transportation costs (rupees per quintal) for shipping steel from furnaces to rolling mills are given in the following table:

	M ₁	M ₂	M ₃	M ₄	M ₅	Supply
F ₁	4	2	3	2	6	8
F ₂	5	4	5	2	1	12
F ₃	6	5	4	7	7	14
Demand	4	4	6	8	8	

What is the optimal shipping schedule?

14M

UNIT-III

5. Solve the game whose payoff matrix is given below

		Player B		
		I	II	III
Player A	I	1	3	11
	II	8	5	2

14M

OR

6. A factory has a large number of bulbs, all of which must be in working condition. The mortality of bulbs is given in the following table: If a bulb fails in service, it cost Rs.3.50 to replace; but if all the bulbs are replaced at a time it costs Rs.1.20 each. Find the optimum group replacement policy

Week	1	2	3	4	5	6
Proportion of bulbs	0.10	0.15	0.25	0.35	0.12	0.03

UNIT-IV

7. A fertilizer company distributes its products by trucks that are loaded at its only loading station. Both, company trucks and contractor's trucks are used for this purpose. It was found that on an average, every 5 minutes one truck arrived and the average loading time was 3 minutes. Out of these trucks 40 per cent being to the contractor's. Determine:

- The probability that a truck has to wait.
- The waiting time of a truck that waits.
- The expected waiting time of the contractor's trucks per day.

14M

OR

8. Find the optimal order quantity of a product for which the price breaks are as follows:

Quantity (Units)	Price per Unit (Rs)
$0 < Q_1 < 500$	10.00
$200 \leq Q_2 < 750$	9.25
$750 \leq Q_3$	8.75

The monthly demand of the product is 250 units. The storage cost is 2 % of the unit cost and the cost of ordering is Rs 350.

14M

UNIT-V

9. Solve following Linear Programming Problem using Dynamic Programming.

$$\text{Maximize } Z = 3X_1 + 5X_2$$

$$\text{subject to } X_1 \leq 4$$

$$X_2 \leq 6$$

$$3X_1 + 2X_2 \leq 18$$

$$X_1, X_2 \geq 0$$

14M

OR

10. Define Simulation? How do you apply the simulation technique to solve inventory problems?

14M
