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Total No. of Pages : 03

Total No. of Questions : 08

M.Tech. (CAD/CAM) (Sem.-1)

OPTIMIZATION TECHNIQUES

Subject Code : ME-507

M.Code : 23511

Time : 3 Hrs.

Max. Marks : 100

**INSTRUCTIONS TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

1. Solve the following L.P. problem using Big-M method.

$$\text{Maximize } Z = 2x_1 + 3x_2 + 4x_3$$

$$\text{Subjected to } 3x_1 + x_2 + 4x_3 \leq 600$$

$$2x_1 + 4x_2 + 2x_3 \geq 480$$

$$2x_1 + 3x_2 + 3x_3 = 540$$

$$x_1, x_2, x_3 \geq 0$$

2. Use two-phase simplex method to :

$$\text{Maximize } Z = 3x_1 + 2x_2 + 4x_3$$

$$\text{Subjected to } 5x_1 + 7x_2 + 4x_3 \leq 7$$

$$-4x_1 + 7x_2 + 5x_3 \geq -2$$

$$3x_1 + 4x_2 - 6x_3 \geq 29/7$$

$$x_1, x_2, x_3 \geq 0$$

3. Explain the following in the context of transportation problem
  - a. Stepping stone method
  - b. Modified distribution method

4. Using the following cost matrix, determine optimal job assignment and the associated cost :

		Jobs				
		1	2	3	4	5
Machinists	A	10	3	3	2	8
	B	9	7	8	2	7
	C	7	5	6	2	4
	D	3	5	8	2	4
	E	9	10	9	6	10

5. A drug manufacturing concern has ten medical representative working in three sales areas. The profitability for each representative in three sales area is as follows :

No. of Representative		0	1	2	3	4	5	6	7	8	9	10
Profitability (thousand in rupees)	Area 1	15	22	30	38	45	48	54	60	65	70	70
	Area 2	26	35	40	46	55	62	70	76	83	90	95
	Area 3	30	38	44	50	60	65	72	80	85	90	85

Determine the optimum allocation of medical representative in order to maximize the profit. What will be the optimum allocation if the number of representative available at present is only six?

6. Semi-finished components arrive at a workstation of an assembly line at an average rate of Rs. 2 per minute, poisson distributed. A machine is to be installed at this workstation for the specific operation. Three alternative machines P,Q and R are available. The characteristics of the machine are given below. Whenever a component is idle, awaiting the machine to get free, the cost is estimated at Rs.18 per minute. Using the concept of single channel queue system and considering all relevant costs, recommend the machine that would be the best for this work station.

Machine	P	Q	R
Fixed Costs (Rs/Minute)	36	60	90
Variable Costs (Rs/minute)	18	15	8
Processing rate (Units/minutes)	3	6	12

7. An inventory manager wishes to determine (a) the expected (mean) demand of a particular item, and (b) the record lead time. This information is needed to determine, how far in advance, to record, before the stock level is reduced to zero. However the probability distribution for lead time and demand per day is given as under :

<b>Lead Time (days)</b>	1	2	3	<b>Demand/Day</b>	1	2	3	4
<b>Probability</b>	0.5	0.3	0.2	<b>Probability</b>	0.1	0.3	0.4	0.2

Simulate the problem for 10 days, to estimate the demand during lead time. When the orders should be planned? Assume replenishment level as 4 units. Random numbers 22,17,08,49,29,57,05,10,81,75, 45,37,28,87,56,15,41.

8. Write short note on :
- Sensitivity analysis
  - Generation of Random numbers

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**