MMDSE-4.5

Sl.No. :

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Fourth Semester M.Sc. Degree Examination, October - 2025

(CBCS) (SLM Scheme)

MATHEMATICS

Operations Research

Time : 3 Hours **Max. Marks : 80**

Instructions : 1) Answer any five questions.

2) All questions carry equal marks.

Q1) a) Describe some applications of Linear Programming Problems. **[6]**

b) A furniture manufacturing company plans to make 2 products of chairs and tables from its available resources which consist of 400 board feet mahogany timber and 450 man hours and labor. It knows that to make chair requires 5 board feet and 10 man hours and yields a profit of rupees 45 while each table users 20 board feet and 15 man hours and has a profit of Rs. 80. The problem is to determine how many chairs and tables the company can make keeping with in its resources constrains, so that it maximizes the profit. Illustrate the formulation of LPP in detail. **[6]**

c) Write the steps involved in solving LPP using simplex algorithm. **[4]**

Q2) a) Solve by using big-M method : Max : $Z = -2x_1 - x_2$ **[10]**

Subject to constraints : $x_1 + 2x_2 \leq 2000$

$x_1 + x_2 \leq 1500$

$x_1 + 2x_2 < 4$ and $x_1 \geq 0$, $x_2 \geq 0$

b) Write the simplex algorithm to solve the LPP. Briefly explain the technical terms used. **[6]**

Q3) a) Illustrate the rules of formulation of the dual of a given LPP. **[6]**

b) Describe the steps involved in Gomory's All Integer Programming Algorithm to solve integer programming problem. Illustrate with an example. **[10]**

Q4) a) Describe the mini-max and max-mini principle for mixed strategy in game theory. **[4]**

b) Solve (3 × 3) game by the simplex method of linear programming whose payoff matrix is given below : **[12]**

3	–1	–3
–3	3	–1
–4	–3	3

Q5) a) State and prove the necessary and sufficient condition for the existence of a feasible solution to the transportation problem. **[6]**

b) Write the algorithm of Row-Minimum method. Determine IBFS to the following Transportation problem using row minimum method. **[10]**

	d_1	d_2	d_3	Availability
O_1	50	30	220	1
O_2	90	45	170	3
O_3	250	200	50	4
Requirements	4	2	2	

Q6) a) If we have a feasible solution for a TP consisting of $m + n - 1$ independent allocations, and if numbers u_i and v_j satisfying $c_{rs} = u_r + v_s$ for each occupied cell (r, s), then prove that the evaluation d_{ij} corresponding to each empty cell (i, j), is given by $d_{ij} = c_{ij} - (u_i + v_j)$. **[8]**

b) A department head has four subordinates and four tasks have to be performed subordinates differ in efficiencies and tasks differ in this entry difficulty. Each man would take to perform each task has given in the effectiveness matrix how the task should allocated to each person so as to minimize total man hours? **[8]**

		Subordinates			
		1	2	3	4
Tasks	A	8	26	17	11
	B	13	28	4	26
	C	38	19	18	15
	D	19	26	24	10

Q7) a) If in a que the arrivals are completely random, then prove that the probability distribution of number of arrivals in a fixed time-interval follows a poison distribution. **[10]**

b) Describe the classifications of queuing models. **[6]**

Q8) a) Use Wolfe's method to solve the quadratic programming problem: **[10]**

$$\text{Maximize } Z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2;$$

Subject to the constraints : $x_1 + 2x_2 \leq 2$ and $x_1, x_2 \geq 0$

b) Describe the method of formulation of dynamic programming problems. **[6]**

