Reg. No ..... Name **25U676**

B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025

SEMESTER 6 : MATHEMATICS

COURSE : **19U6CRMAT13 : OPERATIONS RESEARCH (EL)**

(Regular 2022 Admission and Supplementary 2021/2020/2019 Admissions)

Time : Three Hours Max. Marks: 75

PART A

Answer any 10 (2 marks each)

1. Find an initial solution using NWCR

	A	B	C	
1	2	1	3	10
2	4	5	7	25
3	6	0	9	25
4	1	3	5	30
	20	20	15	

2. What are the different types of method to find the initial solution of transportation problem.
3. Define Surplus variable.
4. If there are m rows and n columns in a transportation problem, what is the number of occupied cells.
5. Find an initial solution of the transportation problem.

	A	B	C	D	Supply
U	19	30	50	10	7
V	70	30	40	60	9
W	40	8	70	20	18
Demand	5	8	7	14	

6. When does a solution become degenerate.
7. Find value of the game and optimum strategies for the payoff matrix; $\begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}$
8. Define Maximin principle.
9. What is the standard form of LPP?
10. Identify whether the feasible region formed by the constraints x+y≤4, 3x+3y≥18, x≥0, y≥0 is bounded or unbounded.
11. Find the dual of

$$\begin{aligned} \text{Maximize} \quad & z = 2x_1 + 3x_2 \\ \text{Subject to} \quad & 5x_1 + 7x_2 \leq 35 \\ & 4x_1 + 9x_2 \leq 36. \end{aligned}$$

x_1, x_2 are non negative .

12. Consider an LPP with m constraints and n variables, then what is the number of basic variables.

(2 x 10 = 20)

PART B

Answer any 5 (5 marks each)

13. Briefly explain two phase method.
14. Solve using graphical method

$$\begin{aligned} \text{Minimize} \quad & 4x_1 + 5x_2 \\ \text{subject to} \quad & x_1 + 4x_2 \geq 5 \\ & 3x_1 + 2x_2 \geq 7, 3x_1 + x_2 \geq 2 \\ & x_1, x_2 \geq 0, \end{aligned}$$

15. Construct the first two simplex table of the LPP

$$\begin{aligned} \text{Max} \quad & x_1 + x_2 \\ \text{subject to} \quad & x_1 + x_2 \leq 1 \\ & 2x_1 + 1x_2 \leq 6 \\ & x_1, x_2 \geq 0 \end{aligned}$$

16. Prove that the dual of the dual is primal.
17. Use rule of dominance to reduce the payoff matrix $\begin{bmatrix} 3 & -2 & 4 \\ -1 & 4 & 2 \\ 2 & 2 & 6 \end{bmatrix}$
18. Briefly explain the General Mathematical Model of Transportation problem.
19. Explain the algorithm to solve Assignment problems.
20. Write the standard form of primal and dual.

(5 x 5 = 25)

PART C

Answer any 3 (10 marks each)

21. Find the value of game with the given payoff $\begin{bmatrix} 3 & -2 & 4 \\ -1 & 4 & 2 \\ 2 & 2 & 6 \end{bmatrix}$
22. Obtain an optimal solution using MODI method for the following transportation problem.

	A	B	C	D	Supply
U	19	30	50	10	7
V	70	30	40	60	9
W	40	8	70	20	18
Demand	5	8	7	14	

23. Solve using VAM

	A	B	C	
1	2	1	3	10
2	4	5	7	25
3	6	0	9	25
4	1	3	5	30
	20	20	15	

24. Explain the algorithm of Simplex method.

(10 x 3 = 30)