Unique Paper Code : **32355345**

Name of Paper : **Linear Programming and Game Theory (NC)**

Name of Course : **Mathematics: Generic Elective CBCS (LOCF) GE-3**

Semester : **III**

Duration : **3 hours**

Maximum Marks : **75**

Attempt any four questions. All questions carry equal marks.

1. Find all the basic feasible solutions of the following equations

$$2x_1 + 3x_2 + 4x_3 + x_4 = 6$$
$$x_1 + x_2 + 7x_3 + x_4 = 2.$$

   Use Simplex method to find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 5 \end{bmatrix}$.

2. Solve the following linear programming problem using Big-M method

$$\begin{aligned} &Maximize\ z = 2x_1 + 4x_2 + 4x_3 - 3x_4 \\ &Subject\ to\quad 2x_1 + x_2 + x_3 = 4 \\ &\qquad x_1 + 4x_2 + 3x_4 = 6 \\ &\qquad x_1, x_2, x_3, x_4 \geq 0. \end{aligned}$$

3. Let x_0 be feasible solution of primal linear programming problem-lpp and w_0 be a feasible solution of its dual, if the objective values of primal and dual lpp are equal show that x_0 and w_0 are the optimum solutions to the primal and dual lpp respectively.

   Obtain the dual linear program of the following primal linear program:

$$\begin{aligned} &Minimize\ z = -2x_1 + 3x_2 + 5x_3 \\ &Subject\ to\quad -2x_1 + x_2 + 3x_3 + x_4 \geq 5 \\ &\qquad 2x_1 +. \quad x_3 + x_4 = 6 \\ &\qquad x_1 \leq 0, x_2, x_3 \geq 0;\ x_4\ Unrestricted\ in\ sign. \end{aligned}$$

4. Given a transportation problem:

Destinations		P	Q	R	S	Availability
Origin	A	11	9	7	10	120
	B	5	11	9	6	115
	C	4	7	8	6	210
	D	3	12	4	5	105
Requirements		95	115	140	200	

Compare the initial basic feasible solutions for the given transportation problem using

(i) Least Cost Method

(ii) North-West Corner Method

(iii) Vogel's Approximation Method-VAM,

Also find the optimal solution of the transportation problem using VAM for initial basic feasible solution.

5. Solve the following cost minimizing assignment problem:

	I	II	III	IV	V	VI
A	7	3	3	7	6	2
B	5	7	7	5	5	7
C	3	7	9	3	1	6
D	6	7	8	6	9	4
E	5	3	7	5	6	3
F	8	4	8	7	2	2

6. For the following payoff matrix $\begin{bmatrix} 2 & 6 \\ -2 & x \end{bmatrix}$ of a game, show that the game has a saddle point whatever *x* may be. Find the value of this game and determine the saddle point.

Solve the following game graphically:

Player B		
Player A	2	1
	1	0
	0	3
	-2	2