Name of Course	: **CBCS B.Sc. (H) Mathematics**
Unique Paper Code	: **32357611**
Name of Paper	: **DSE-4 Linear Programming and Theory of Games**
Semester	: **VI**
Duration	: **3 hours**
Maximum Marks	: **75 Marks**

Attempt any four questions. All questions carry equal marks.

Q.1 Solve the following LPP by Big-M method and verify your answer by finding all the existing basic feasible solutions:

Maximize $Z = x_1 - x_2 - x_3$

Subject to $x_1 + x_2 + x_3 \geq 2$

$2x_1 - x_2 + x_3 = 3$

$x_1, x_2, x_3 \geq 0$

Q.2 Obtain the inverse of the following matrix by using simplex method

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$$

Verify your answer by matrix multiplication.

Q.3 Verify for the following Linear Programming Problem that dual of dual is primal. Also using complementary slackness theorem solve both primal and dual problems.

Maximize $Z = x_1 + x_2$

Subject to

$x_1 + 2x_2 \leq 5$

$2x_1 + x_2 \geq 0$

$x_2 \leq 3$

$x_1, x_2 \geq 0.$

Q.4 For the following cost minimization transportation problem find initial basic feasible solutions by using North West Corner rule, Least cost method and Vogel's approximation method. Compare the three solutions:

Destination / Source	A	B	C	D	E	Supply
I	16	16	13	22	17	50
II	14	14	13	19	15	60
III	19	19	20	23	15	50
IV	12	10	15	8	12	50
Demand	30	20	70	30	60	

Also find the optimal basic feasible solution of above problem using UV- method.

Q.5 Solve the cost minimization assignment problem:

Man / Job	I	II	III	IV	V
A	2	3	5	5	6
B	4	5	7	7	8
C	7	8	8	10	9
D	3	5	3	6	5
E	4	3	5	2	1

Does this problem has more than one solution? If yes, then find any FOUR possible solutions.

Q. 6 Show that the following rectangular game does not have any saddle point.

$$\begin{bmatrix} 2 & 3 & 4 & 5 \\ 12 & -6 & 3 & 0 \\ 4 & 0 & 2 & 1 \\ 0 & 4 & 3 & 4 \\ 6 & -1 & 3 & -2 \end{bmatrix}$$

Solve it by graphical method by reducing its size using dominance principle.