

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

$$\begin{aligned}x_1 + x_2 + 2x_3 &= 9 \\ 3x_1 + 2x_2 + 5x_3 &= 22\end{aligned}$$

and also show that the set  $S = \{(x, y) \mid xy \geq 1, x \geq 0, y \geq 0\}$  is convex.

2. Use two-phase method to solve the following linear programming problem

$$\text{Maximize } z = 2x_1 - x_2 + x_3$$

subject to

$$x_1 + x_2 - 3x_3 \leq 8$$

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

$$2x_1 + 3x_2 - x_3 \geq 4$$

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

3. Find the dual of the following problem and by solving the dual using big M-method show that the following linear programming problem has unbounded solution.

$$\text{Maximize } z = 4x_1 + 3x_2$$

subject to

$$5x_1 - 2x_2 \leq 6$$

$$3x_1 + x_2 \geq 1$$

$$x_1, x_2 \geq 0.$$

4. Solve the following cost minimization problem

	$D_1$	$D_2$	$D_3$	$D_4$	$D_5$	
$O_1$	9	11	13	18	16	110
$O_2$	15	13	18	11	9	150
$O_3$	15	21	7	11	14	190
$O_4$	14	20	8	6	13	200
	100	180	60	120	190	

5. A company has six jobs to be processed by six machines. The following table gives the Number of hours taken by the machines for the different jobs. If any job can be done by any machine, assign the machines to jobs so as to minimize the total machine hours.

		Jobs					
		I	II	III	IV	V	VI
Machines	1	10	23	59	12	20	28
	2	44	79	73	51	64	49
	3	42	29	92	38	46	34
	4	75	43	28	50	40	33
	5	37	12	58	23	26	19
	6	41	57	54	32	18	29

6. By the notion of dominance, reduce the following game to  $2 \times 4$  game and then solve it graphically

$$\begin{bmatrix} 8 & 15 & -4 & -2 \\ 19 & 15 & 17 & 16 \\ 0 & 20 & 15 & 5 \end{bmatrix}$$