D5BMT2105 (PAGES 3) **Name..............................**

Reg.No...........................

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(Regular/Improvement/Supplementary)

MATHEMATICS

GMAT5B09T: LINEAR PROGRAMMING

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling: 20 Marks)

1. Draw and shade constraint set of the linear programming problem.

   Maximise $f(x,y) = 3x+2y$

$$2x + y \leq 8$$

$$x + 2y \leq 10$$

$$x, y \geq 0$$

2. Define hyperplane in R^3.
3. Label True or False and justify your answer: Any linear programming problem having an unbounded constraint set is unbounded.
4. State canonical maximisation linear programming problem.
5. State the Canonical minimisation linear programming problem represented by the following table.

x	y	-1	
-1	-4	-7	$= -t_1$
-2	-5	-8	$= -t_2$
-3	-6	-9	$= f$

6. State the dual canonical linear programming problem.
   Maximise $f(y_1, y_2) = 2y_1 - y_2$ subject to

$$y_1 - 3y_2 \geq 1$$

$$-y_1 + 2y_2 \leq 2$$

$$y_1, y_2 \geq 0$$

(PTO)

7. Define mixed strategy and pure strategy in matrix games.
8. State True of False: If a canonical minimisation linear programming problem is infeasible, then the dual canonical maximisation linear programming problem is unbounded.
9. Define balanced transportation problem.
10. State Von-Neumann Minimax Theorem.
11. Define transportation algorithm anticycling rules.
12. Balance the following unbalanced assignment problem.

9	7	8	6	8
10	8	7	9	6
9	6	9	7	8
8	9	10	7	6

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling: 30 Marks)

13. Define convex set. Draw and shade an unbounded polyhedral convex set in R^3.
14. State and prove duality equation.
15. Solve the following linear programming problem by geometrical method.

Maximise $f(x,y)= 5x + 2y$ subject to

$$x+3y \leq 14$$

$$2x + y \leq 8$$

$$x , y \geq 0$$

16. Solve the following linear programming problem using simplex algorithm.

Maximise $f(x,y)= 2y - 4y$

$$x+y \geq 3$$

$$x + y \leq 2$$

$$x , y \geq 0$$

17. Solve the non-canonical linear programming problem.

Maximise $f(x,y)= x + 3y$ subject to

$$x+2y \leq 10$$

$$3x + y \leq 15$$

18. Solve

7	2	4	10
10	15	9	20
7	3	5	30
20	10	30	

by using Northwest corner method.

19. Find the Von Neumann value and optimal strategy for each player of the following matrix game.

$$\begin{bmatrix} -3 & 4 & -3 \\ 2 & -3 & 6 \end{bmatrix}$$

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Solve the following linear programming problem using simplex algorithm.
Minimise *f(x,y)*= *-x* - *y* subject to.

$$x+y \leq 2$$

$$y - x \geq 1$$

$$x , y \geq 0$$

21. Solve the following assignment problem by using transportation algorithm and Hungarian algorithm and compare which algorithm is preferable here.

2	1	2
9	4	7
1	2	9

(1 x 10 = 10 Marks)