D 110211 **(Pages : 3)** **Name.....**

Reg. No.....

FIFTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2024

Mathematics

MTS 5B 08—LINEAR PROGRAMMING

(2020 Admission onwards)

Time : Two Hours Maximum : 60 Marks

Section A ((Short Answer Type)

All questions can be answered.
Each question carries 2 *marks.*
Ceiling 20 *Marks.*

1. Draw the set of points (x, y) satisfying the constraints

   $2x + y \leq 8,\ x + 2y \leq 10,\ x \geq 0, y \geq 0.$

2. Write the canonical maximization linear programming problem.
3. Define a convex subset of $\mathbb{R}^2$. Also draw a convex set and a non-convex set in $\mathbb{R}^2$.
4. Let S be a convex set in $\mathbb{R}^2$. Define an extreme point of S.
5. Consider the canonical maximum tableau below :

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

   State the canonical maximization linear programming problem represented by the tableau above.

6. Write the canonical slack maximization linear programming problem.
7. State Von-Neumann Minimax Theorem.
8. What is complementary slackness of a dual canonical linear programming problem ?

Turn over

9. What is the basic feasible solution of a balanced transportation problem ?

10. Define hyper plane and closed half-space of $\mathbb{R}^n$.

11. What is the mixed strategy of a matrix game ?

12. What is the general balanced assignment problem ?

Section B (Paragraph/Problem Type)

All questions can be answered.
Each question carries 5 *marks.*
Ceiling 30 *marks.*

13. Solve graphically : Maximize $f(x, y) = 30x + 50y$ subject to

$2x + y \leq 8,\ x + 2y \leq 10, x \geq 0, y \geq 0.$

14. State Duality Theorem.

15. Solve the transportation problem given below :

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

16. Solve the assignment problem given below :

38	21	34
41	14	36
28	20	25

17. Write the simplex algorithm for Maximum Tableau's.

18. Find the von Neumann value and the optimal strategy for each player in the matrix games below :

$$\begin{bmatrix} -1 & 1 & -1 & 2 \\ -1 & -1 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$$

19. What is a two-person zero-sum matrix game ?

Section C (Essay Type)

Answer any **one** *of the following questions.*
The question carries 10 *marks.*

20. Solve the canonical linear programming problem using simplex algorithm to the minimum tableau given below :

x_1	20	25	300
x_2	40	20	500
-1	1000	800	0
	$= t_1$	$= t_2$	$= g$

21. Solve the following maximization problem :

Maximize $f(x, y) = x + 3y$ subject to
$x + 2y \leq 10,\ 3x + y \leq 15,\ x \geq 0,\ y$ is unconstrained.

(1 × 10 = 10 marks)