

D 130229

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Name.....

Reg. No.....

**FIFTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION  
NOVEMBER 2025**

Mathematics

MTS 5B 08—LINEAR PROGRAMMING

(2020 Syllabus)

Time : Two Hours

Maximum : 60 Marks

**Section A (Short Answer Type)**

*All questions can be answered.*

*Each question carries 2 marks.*

*(Ceiling 20 marks)*

- The equation of the line segment joining  $(2, 1)$  and  $(5, 7)$  is \_\_\_\_\_.
- Define a hyperplane in  $\mathbb{R}^2$ .
- Convert the linear programming problems given below to canonical form :

Maximize  $f(x, y) = -x - 2y$  subject to  
 $2x - y \geq 10$   $3y - x \leq 8$ ,  $x \geq 0, y \geq 0$ .

- Draw and shade a convex subset of  $\mathbb{R}^2$  having no extreme points.
- Consider the canonical maximum tableau below :

$x$	$y$	$-1$	
3	1	5	$= -t_1$
-7	1	8	$= -t_2$
4	9	13	$= f$

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

**Turn over**

6. Write the basic solution of the linear programming problem given below :

Maximize  $f(x, y) = 200x + 150y$  subject to  
 $x + 2y \leq 11$ ,  $2x + 2y \leq 30$ ,  $2x + 2y \leq 25$   $x \geq 0, y \geq 0$ .

7. Write the canonical slack minimization linear programming problem.  
 8. State Von-Neumann Minimax Theorem.  
 9. What is complementary slackness of a dual canonical linear programming problem ?  
 10. What is balanced transportation problem ?  
 11. What is the pure strategy of a matrix game ?  
 12. What is a basic feasible solution of a transportation problem ?

**Section B (Paragraph/Problem Type)**

*All questions can be answered.*

*Each question carries 5 marks.*

*(Ceiling 30 marks)*

13. Show that the linear programming problem :

Maximize  $f(x, y) = 3x + 2y$  subject to  
 $2x - y \leq -1$ ,  $x - 2y \geq 0$ ,  $x \geq 0, y \geq 0$ .

is infeasible.

14. Solve the linear programming problem graphically :

Maximize  $f(x, y) = 5x + 2y$  subject to  
 $x + 3y \leq 14$ ,  $2x + y \leq 8$ ,  $x \geq 0, y \geq 0$ .

15. Apply the simplex algorithm to the maximum tableau given below :

$x_1$	$x_2$	$-1$	
2	1	8	$= -t_1$
1	2	10	$= -t_2$
30	50	10	$= f$

16. Solve the unconstrained problem :

Maximize  $f(x, y) = x + 3y$  subject to  
 $x + 2y \leq 10$ ,  $-3x - y \leq -15$ .

17. A tableau of the balanced assignment problem is given below :

1	0	0
0	1	0
1	0	1

Find a permutation set of zeros.

18. Solve the assignment problem given below :

38	21	34
41	14	36
28	20	25

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

**Section C (Essay Type)**

Answer any **one** of the following question.

The question carries 10 marks.

20. Solve the transportation problem by using Vogel Advanced-Start Method :

	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	
W <sub>1</sub>	2	1	2	40
W <sub>2</sub>	9	4	7	60
W <sub>3</sub>	1	2	9	10
	40	50	20	110

Turn over

21. A company wishes to assign five of its workers to five different jobs. The rating of each worker with respect to each job on a scale of 0 to 10 is given by the following table :

	$J_1$	$J_2$	$J_3$	$J_4$	$J_5$
$W_1$	5	4	2	8	5
$W_2$	7	6	4	6	9
$W_3$	5	5	3	3	2
$W_4$	4	3	5	5	4
$W_5$	3	6	4	10	2

If the company wishes to maximize the total rating of the assignment, find the optimal assignment plan and the corresponding maximum total rating.

(1 × 10 = 10 marks)