

FIFTH SEMESTER UG INTERNAL EXAMINATION, SEPTEMBER 2025

Open Course in Mathematics

MTS5D03 – LINEAR MATHEMATICAL MODELS

Malabar Christian College, Calicut

Time :One Hour

Maximum: 30 Marks

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|--------|-----------------|-----------|--|-------------|
| Name: | Marks Scored | Section A | | Total Marks |
| Class: | | Section B | | |
| | | Section C | | |

Section A

(Answer any 5 questions, each question carries 2 marks)

- Find the slope of the line passing through $(-3,5)$ and $(2,-4)$.
- Find an equation of the line passing through $(3,-7)$ and has slope $m = \frac{5}{4}$.
- Find k so that the line through $(4,-1)$ and $(k,2)$ is parallel to $2x + 3y = 6$.
- Graph $x - 2y = -1$.
- Let $A = \begin{bmatrix} -2 & 4 \\ 0 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -6 & 2 \\ 4 & 0 \end{bmatrix}$, then find $-4A + 5B$.
- State the dual problem for linear programming problem:
 Maximize $4x_1 + 3x_2 + 2x_3$
 Subject to : $x_1 + x_2 + x_3 \leq 5$
 $x_1 + x_2 \leq 4$
 $2x_1 + x_2 + 3x_3 \leq 15$
 With $x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$

- Find the transpose of matrix $\begin{bmatrix} 1 & 11 & 15 \\ 0 & 10 & -6 \\ 4 & 12 & -2 \\ 1 & -1 & 13 \\ 2 & 25 & -1 \end{bmatrix}$

Section B

(Answer any 2 questions, each question carries 5 marks)

- Graph the feasible region for $x + 3y \leq 6$ and $2x + 4y \geq 7$.
- Using the inverse of the coefficient matrix solve the linear system
 $2x - 3y = 4$ and $x + 5y = 2$

10. Use simplex method solve

$$\text{Maximize } z = 8x_1 + 10x_2 + 7x_3$$

$$\text{Subject to : } x_1 + 3x_2 + 2x_3 \leq 10$$

$$x_1 + 5x_2 + x_3 \leq 8$$

$$\text{With } x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$$

Section C

(Answer any 1 Question, each question carries 10 marks)

11. Find the inverse of $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & -2 & -1 \\ 3 & 0 & 0 \end{bmatrix}$

12. Use simplex method, find the solution

$$\text{Minimize } w = 3y_1 + 2y_2$$

$$\text{Subject to : } y_1 + 2y_2 \geq 10$$

$$y_1 + y_2 \geq 8$$

$$2y_1 + y_2 \geq 12$$

$$\text{With } y_1 \geq 0, y_2 \geq 0$$