20U507 (Pages: 2) Name: ……..…….……..

Reg. No: …….

FIFTH SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2022

(CBCSS-UG)

CC20U MTS5 D03 - LINEAR MATHEMATICAL MODELS

(Mathematics – Open Course)

(2019 Admission - Regular)

Time: 2 Hours Maximum: 60 Marks

Credit: 3

Section A

Answer ***all*** questions. Each question carries 2 marks.

1. Find the slope of the line passing through (2,3) and (3,5) in slope intercept form.
2. Find the slope of the line parallel to $6x - 3y = 12$.
3. Graph the line $y = -3$
4. Give an example for two matrices A and B for which AB ≠ BA
5. Find the values of the variables in the equation $\begin{bmatrix} 3 & 4 \\ -8 & 1 \end{bmatrix} = \begin{bmatrix} 3 & x \\ y & z \end{bmatrix}$
6. Compute $\begin{bmatrix} 6 & 8 \\ -1 & 9 \end{bmatrix} + \begin{bmatrix} 11 & 5 \\ 6 & 1 \end{bmatrix} - \begin{bmatrix} 2 & 11 \\ 31 & 4 \end{bmatrix}$
7. Verify that the matrices $\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$ and $\begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix}$ are inverses of each other.
8. Graph the linear inequality $x + y \leq 2$.
9. Restate the following linear programming problem by introducing slack variables

   Maximize Z = $3x_1 + 2x_2 + x_3$,

   Subject to, $2x_1 + x_2 + x_3 \leq 150$,

   $2x_1 + 2x_2 + 2x_3 \leq 200$,

   $2x_1 + 3x_2 + 3x_3 \leq 320$

   $x_1, x_2, x_3 \geq 0$.
10. Find the transpose of the matrix $\begin{pmatrix} 1 & 3 & 5 \\ 6 & 8 & -2 \\ 0 & -8 & 7 \end{pmatrix}$
11. Form an L.P.P for the following problem.

    “A 4-H member raises only goats and pigs. She wants to raise no more than 16 animals, including no more than 10 goats. She spends $25 to raise a goat and $75 to raise a pig, and she has $900 available for this project. Each goat produces $12 in profit and each pig $40 in profit. How many goats and how many pigs should she raise to maximize total profit?”.

12. State the dual for the linear programming problem

Maximize Z=$2x_1 + 7x_2 + 4x_3$

Subject to $x_1 + x_2 + x_3 \leq 5$,

$x_1 + x_2 \leq 4$,

$2x_1 + x_2 + 3x_3 \leq 15$,

$x_1, x_2, x_3 \geq 0$

(Ceiling: 20 Marks)

Section B

Answer ***all*** questions. Each question carries 5 marks.

13. Use the echelon method to solve the system of equations $4x + y = 9$, $3x - y = 5$.
14. Solve the system of equations by using the inverse of the coefficient matrix if it exists

$$2x + 5y = 15, \qquad x + 4y = 9$$

15. Maximize $Z = 5x + 2y$, subject to $4x - y \leq 16$, $2x + y \geq 11$, $x \geq 3$, $y \leq 8$.
16. Find the $maximum$ value of the objective function $Z = 3x + 4y$

Subject to $2x + y \leq 4$, $-x + 2y \leq 4$, $x, y \geq 0$

17. Compute A^{-1} for $A = \begin{pmatrix} 1 & 3 & 0 \\ 0 & 2 & -1 \\ 1 & 0 & 2 \end{pmatrix}$
18. Graph the linear inequality $y - 2x \leq 4$, $y \geq 2 - x$, $x, y \geq 0$.
19. Draw the feasible region for the given L.P.P

$Minimize\ Z = 2x + 4y$

Subject to $x + 2y \geq 10$,

$3x + y \geq 10$,

$x, y \geq 0$

(Ceiling: 30 Marks)

Section C

Answer any ***one*** question. The question carries 10 marks.

20. Solve by writing the dual of the problem

$Minimize\ W = 3y_1 + 2y_2$

Subject to $y_1 + 2y_2 \geq 10$, $y_1 + y_2 \geq 8$, $2y_1 + y_2 \geq 12$, $y_1, y_2, y_3 \geq 0$

21. Use the Gauss-Jordan method to solve the system.

$$x + 2y - z = 0$$
$$3x - y + z = 6$$
$$-2x - 4y + 2z = 0$$

(1 × 10 = 10 Marks)

****