K24FY1251

First Semester FYUGP Mathematics Examination
NOVEMBER 2024 (2024 Admission onwards)
KU1MDCMAT103 (MATRIX THEORY)
(DATE OF EXAM: 29-11-2024)

Time : 90 min   Maximum Marks : 50

Part A (Answer any 6 questions. Each carries 2 marks)

1. Write the matrix equation corresponding to the system of equations

$$5x + 6y - 3z = 13$$
$$2x - 4z = 0$$
$$5y - 6z = 5$$

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2. Write the matrix equation corresponding to the system of equations

$$5x_1 + x_2 = 3$$
$$2x_1 - 4x_2 = -13$$
$$x_1 - x_2 = 5$$

2

3. Write the augmented matrix of the system of linear equations

$$12x_1 - 4x_2 + x_3 = 13$$
$$-x_1 + 5x_2 - 6x_3 = -11$$
$$7x_1 - x_2 - 6x_3 = 41$$

2

4. Write the augmented matrix of the system of linear equations

$$3x - 7y + 2z = 7$$
$$8x + y - z = -1$$
$$7x - 5y - 2z = 0$$

2

5. Find the row reduced echelon form of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

2

6. Find the Null space of $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

2

1

7. Define an Elementary matrix. Is the given matrix elementary? Justify.

$$\begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

2

8. Give an example of a system of equations in 2 variables having no solution.   2

Part B (Answer any 4 questions. Each carries 6 marks)

9. Write the coefficient matrix and constant matrix of the linear system

$$x_1 - 3x_2 + 5x_3 + 6x_4 = 13$$
$$-x_1 + 8x_2 - 11x_3 + 9x_4 = -1$$
$$6x_1 - 2x_2 + 5x_3 - 7x_4 = -2$$

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10. Write the coefficient matrix, constant matrix and augmented matrix of the linear system

$$x_1 - x_2 + x_3 + x_4 = 1$$
$$-x_1 + x_2 - x_3 + x_4 = -1$$
$$x_1 + x_2 - x_3 + x_4 = 1$$
$$x_1 - x_2 + x_3 - x_4 = -1$$

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11. Use Gaussian elimination to solve the following system of equations:

$$x_1 + 7x_2 + 2x_3 = 1$$
$$2x_1 - 4x_2 - x_3 = 0$$
$$2x_1 - x_2 + x_3 = 2$$

6

12. Find the Null space of $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 0 \\ 2 & 1 & 1 \end{bmatrix}$

6

13. Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 5 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$, if it exists.

6

14. Solve the system of equations:

$$x_1 - 2x_2 + x_3 = 1.$$
$$2x_1 + 3x_2 + 4x_3 = 11,$$
$$3x_1 - x_2 + 2x_3 = 5.$$

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Part C (Answer any 1 question(s). Each carries 14 marks)

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15. (a)Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \end{bmatrix}$

(b)Is the system consistent? If so, find the solution.

$$3x - 2y + 6z = 12,$$
$$3x - 5y + 3z = 1,$$
$$-2x - 5y + 4z = 3,$$
$$x + y + z = 1$$

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16. (a)Find the rank of $A = \begin{bmatrix} 1 & 2 & -1 & 6 \\ 3 & 8 & 9 & 10 \\ 2 & -1 & 2 & 2 \end{bmatrix}$ by reducing to row echelon form.

(b)Solve the system of equations:

$$2x_1 + 3x_2 - x_3 = 7,$$
$$x_1 - x_2 + 4x_3 = 3,$$
$$3x_1 + 2x_2 + x_3 = 10.$$

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