ST. PAUL'S CATHEDRAL MISSION COLLEGE

DEPARTMENT OF MATHEMATICS

Subject-CC-2

(Basic Algebra (Group-C))

Second Semester

Instruction: Answer all the questions with clear handwriting and submit to the respective teacher within 20 days from the date provided below

Assignment-1 **Date: 24.04.2025**

1. Find the row reduced echelon form of the following matrix:

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 6 \\ 1 & -5 & 3 & 2 \\ 2 & 1 & 4 & 6 \end{pmatrix}$$

2. Find the rank of the following matrix:

$$\begin{pmatrix} 2 & 2 & 4 & 6 & 0 \\ 3 & 3 & 8 & 8 & 2 \\ 1 & 2 & 3 & 1 & 4 \\ 2 & 1 & 0 & 1 & 2 \end{pmatrix}$$

3. Find the rank of the following matrix:

$$\begin{pmatrix} 1 & 3 & 7 & 1 & 2 \\ 4 & 0 & 5 & 2 & 9 \\ 3 & 3 & 4 & 7 & 4 \\ 0 & 0 & 6 & 6 & 3 \end{pmatrix}$$

4. Solve(if possible) of the following system of linear equations.

$$\begin{aligned} 2x + y + 3z &= 10 \\ x + y + z &= 6 \\ x - 5y + 3z &= 23 \end{aligned}$$

5. Examine the solvability of the system of equations and solve(if possible).

$$\begin{aligned} x + y + z &= 1 \\ 2x + y + 2z &= 2 \\ 3x - 2y + 3z &= 5 \end{aligned}$$

6. Find the solution of the system of equations in rational numbers.

$$\begin{aligned} x + 4y + z &= 0 \\ 4x + y - z &= 0 \end{aligned}$$

7. Determine the conditions for which the system of equations has (a) unique solution, (b) no solution and (c) infinite solutions.

$$\begin{aligned} x + \ y + \ z &= \quad b \\ 2x + \ y + 3z &= b + 1 \\ 5x + 2y + az &= \quad b^2 \end{aligned}$$

8. Determine k so that the following set is linearly dependent in R^3

$$\{(k, 1, 1), (1, k, 1), (1, 1, k)\}$$

9. Examine linear dependence of the set of vectors $\{(1, -1, 2, 4), (2, -1, 5, 7), (-1, 3, 1, -2)\}$ in R^4.

10. Examine whether the column vector

$$\begin{pmatrix} 3 \\ 6 \\ 9 \end{pmatrix}$$

is a linear combinations of the column vectors of the matrix

$$\begin{pmatrix} 2 & 1 & 4 \\ 3 & 2 & 6 \\ 2 & -1 & 2 \end{pmatrix}$$

or not.