

MID TERM EXAMINATION, SEMESTER II, 2024
DEPT. MATH., COLLEGE OF SCIENCE, KSU
MATH: 107 FULL MARK: 25 TIME: 90 MIN.

Q1. [5] Find the values of δ for which the following linear system of equations

$$\begin{aligned} x + y + z + t &= 4 \\ x + \delta y + z + t &= 4 \\ x + y + \delta z + (3 - \delta)t &= 6 \\ 2x + 2y + 2z + (\delta - 5)t &= 6 \end{aligned}$$

has (i) no solution (ii) infinitely many solutions.

Q2.(a) [4+3=7] If

$$A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$$

Find $A + A^T + A^{-1}$.

(b) If the inverse of $2A$ is

$$\begin{bmatrix} 2 & -2 \\ -3 & 5 \end{bmatrix}$$

Find the matrix A .

Q3 [5] For the following linear system of equations:

$$\begin{aligned} x - z &= 6 \\ x + y + z &= -3 \\ -x + y &= 12 \end{aligned}$$

Find the inverse of the coefficient matrix by using elementary row operations, then find the solution of the given system.

Q4. [4] Evaluate the determinant of the matrix by reducing the matrix to row echelon form

$$A = \begin{bmatrix} 1 & 3 & 1 & 5 & 3 \\ -2 & -7 & 0 & -4 & 2 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 2 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

Q5. [4] Use Cramer's rule to solve the following linear system of equations:

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