The LNM Institute of Information Technology
Jaipur, Rajsthan

MATH-II ■ Assignment 2

Q1. Apply Gauss elimination method to solve the following system:

$$\begin{aligned} 2x + y + z &= 5 \\ 4x - 6y &= -2 \\ -2x + 7y + 2z &= 9. \end{aligned}$$

Q2. Use row reduction method to find the rank of the following matrices:

(a) $\begin{bmatrix} 4 & 3 \\ -8 & -6 \\ 16 & 12 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 5 & 8 \\ 3 & 2 & 9 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 2 & -3 \\ 2 & 0 & 5 \\ -3 & 5 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 21 & -3 & 17 & 13 \\ 46 & 11 & 52 & 14 \\ 33 & 48 & 71 & -23 \end{bmatrix}$

Q3. Consider the following linear non-homogenous system:

$$\begin{aligned} x + y + z &= 5 \\ 2x + 3y + 5z &= 8 \\ 4x + 5z &= 2. \end{aligned}$$

(a) Find the row rank of the corresponding coefficient matrix A and augmented matrix $[A\ b]$, where b is the right hand side vector. What can we say about the existence of the solution for the given system.

(b) Apply Gauss Jordan method to find the solution.

(c) Find a sequence of elementary matrices $E_1, \dots, E_k$ such that $E_k \dots E_1 A = I$.

(d) Find A^{-1} by the help of Part (c).

Q4. Find inverse of the following matrices by using Gauss-Jordan mathod:

(a) $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & 0 & 4 \\ 0 & 2 & 0 \\ 6 & 0 & 1 \end{bmatrix}$

Q5. Show that the space of all real (respectively complex) matrices is a vector space over $\mathbb{R}$ (respectively $\mathbb{C}$) with respect to the usual addition and scalar multiplication.

Q6. Let $S=$ The set of all $n \times n$ skew hermitian matrices. check whether S is a real (or complex) vector space under usual addition and scalar multiplication of matrices.

Q7. In $\mathbb{R}$, consider the addition $x \oplus y = x + y - 1$ and $a \cdot x = a(x-1) + 1$. Show that $\mathbb{R}$ is a real vector space with respect to these operations with additive identity 1.