The LNM Institute of Information Technology
Jaipur, Rajsthan

Math-II (2014-15), Quiz-I: Section-B

Name: Roll No:

Time: 15 Minutes Maximum Marks: 10

Q1. Find the inverse of the following matrix by using Gauss-Jordan method: [05 Marks]

$$\begin{bmatrix} 2 & 1 & 1 \\ 4 & -6 & 0 \\ -2 & 7 & 2 \end{bmatrix}.$$

Sol. Consider the augmented matrix

$$\begin{bmatrix} 2 & 1 & 1 & 1 & 0 & 0 \\ 4 & -6 & 0 & 0 & 1 & 0 \\ -2 & 7 & 2 & 0 & 0 & 1 \end{bmatrix}.$$

By applying Gauss-Elimination method we get the following upper triangular form:

$$\begin{bmatrix} 2 & 1 & 1 & 1 & 0 & 0 \\ 0 & -8 & -2 & -2 & 1 & 0 \\ 0 & 0 & 1 & -1 & 1 & 1 \end{bmatrix}.$$

Then applying Gauss-Jordan method we get the following matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 3/4 & -5/16 & -3/8 \\ 0 & 1 & 0 & 1/2 & -3/8 & -1/4 \\ 1 & 0 & 0 & -1 & 1 & 1 \end{bmatrix}$$

and hence,

$$A^{-1} = \begin{bmatrix} 3/4 & -5/16 & -3/8 \\ 1/2 & -3/8 & -1/4 \\ -1 & 1 & 1 \end{bmatrix}.$$

Q2. Find the column space of the matrix $\begin{bmatrix} 1 & 0 & 1 & 2 \\ 3 & 2 & 7 & 1 \\ -1 & 1 & 1 & 0 \end{bmatrix}$. Determine a basis for the column space and hence find the column rank. [05 Marks]

Sol. Column space of matrix $A = \text{Span}\{C_1, C_2, C_3, C_4\} = C(A)$, where C_1, C_2, C_3 and C_4 are column vectors of A.

The row reduced echelon form of the matrix A is $\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = B$.

Matrix A is row equivalent to row-reduced matrix B. Leading columns of B are first, second and fourth column of B. The corresponding column vectors C_1, C_2 and C_4 of matrix A form a basis for $C(A)$.

Therefore, the column rank $= 3$.