



COMSATS University Islamabad, Islamabad Campus
Department of Computer Science
Mid Term Exam Fall 2025

Program : BSE
Semester: VII
Subject : Linear Algebra
Teacher: Dr. Tanvir Akbar Kiani

Total Marks: 25
Time Allowed: 80 minutes
Date: 29-10-2025(1400)

Attempt all questions

Q.1 Row reduce the given matrix to reduced echelon form. Circle the pivot positions in the final matrix and in the original matrix, and list the pivot columns.

$$\begin{bmatrix} 1 & 2 & 4 & 5 \\ 2 & 4 & 5 & 4 \\ 4 & 5 & 4 & 2 \end{bmatrix}$$

Q.2 Let $A = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ 1 & -2 & 1 \end{bmatrix}$, let $\mathbf{b} = \begin{bmatrix} 10 \\ 3 \\ 7 \end{bmatrix}$, and let W be the set of all linear combinations of the columns of A . Is $\mathbf{b}$ in W ?

Q.3 Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be the linear transformation that first reflects points through the horizontal x_1 -axis and then reflects points through the line $x_2 = x_1$.

Q.4 Find an LU factorization of the matrix given below.

$$\begin{bmatrix} 3 & 7 & 2 \\ 6 & 19 & 4 \\ -3 & -2 & 3 \end{bmatrix}$$

Q.5 Use determinants to find out if the matrix is invertible.

$$\begin{bmatrix} 2 & 0 & 0 & 8 \\ 1 & -7 & -5 & 0 \\ 3 & 8 & 6 & 0 \\ 0 & 7 & 5 & 4 \end{bmatrix}$$