

LAHORE UNIVERSITY OF MANAGEMENT SCIENCES
Department of Electrical Engineering

EE212 Mathematical Foundations for Machine Learning and Data Science
Quiz 04

Name: _____

Campus ID: _____

Total Marks: 10

Time Duration: 15 minutes

Question 1 (2 marks)

For a square invertible matrix $A \in \mathbf{R}^{n \times n}$, show that the eigenvalues are non-zero. A brief justification is sufficient.

Question 2 (3 marks)

We know that the eigenvalues of the symmetric matrix $A \in \mathbf{R}^{n \times n}$ are real. Show that the eigenvalues of a positive definite symmetric matrix are non-negative.

Question 3 (2 marks)

The three of the eigenvalues of the following matrix are 8, 32 and 0. Determine the fourth eigenvalue of the matrix.

$$\begin{bmatrix} 16 & 0 & 16 & 0 \\ 20 & 8 & 4 & 0 \\ 6 & 0 & 6 & 20 \\ 10 & 0 & 10 & 12 \end{bmatrix}$$

Question 4 (3 marks)

If λ is an eigenvalue of the matrix $A \in \mathbf{R}^{n \times n}$, prove that $\lambda + 1$ is an eigenvalue of $A + I$.