LAHORE UNIVERSITY OF MANAGEMENT SCIENCES
Department of Electrical Engineering

EE212 Mathematical Foundations for Machine Learning and Data Science
Quiz 02

Name: _____

Campus ID: _____

Total Marks: 10
Time Duration: 15 minutes

Question 1 (3 marks)

Suppose A, B, and C are matrices that satisfy $A + BB^T = C$. Determine which of the following statements are necessarily true. (There may be more than one true statement.)

(a) BB^T is square and invertible if B has independent columns.

(b) A, B, and C have the same number of rows.

(c) B is a tall matrix.

Question 2 (2 marks)

The following system of linear equations can be expressed in the form $Ax = y$, which type of inverse exists for A? Explain your answer in 1-2 lines.

$$3x_1 + x_2 = y_1$$
$$3x_2 = y_2$$
$$4x_1 + x_2 = y_3$$
$$-x_1 - x_2 = y_4$$

Question 3 (2 marks)

For a system of linear equations $Ax = y$, the inverse of A exists and is given by:

$$X = \begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \end{bmatrix}$$

If $y = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$ Give solution x for the system of linear equations.

Question 4 (3 marks)

For a wide matrix A, choose one of the responses always, never, or sometimes for each of the statements below. 'Always' means the statement is always true, 'never' means it is never true, and 'Sometimes' means it can be true or false, depending on the particular values of the matrix or matrices.

which of the following statements are true.

    a. Left inverse exists.

    b. Right inverse exists.

    c. All rows are linearly independent.

    d. All columns are linearly independent.