Brac University
Assignment 5
Spring 2025

1. A linear system is described by the following equations:

$$x1 + 6x2 + 2x3 = 10$$
$$3x1 + 2x2 + x3 = 6$$
$$4x1 + 5x2 + 2x3 = 9$$

Based on these equations, answer the questions below.
(a) [1.5 marks] From the given linear equations, identify the matrices A, x and b such that the linear system can be expressed as a matrix equation.
(b) [3 marks] Construct the Frobenius matrices F(1) and F(2) from this system.
(c) [1.5 marks] Compute the unit lower triangular matrix L.
(d) [4 marks] Now find the solution of the linear system using the LU decomposition method. Use the unit lower triangular matrix found in the previous question.

2. A linear system is described by the following equations:

$$6x2 + 2x3 = 10$$
$$3x1 + 2x2 + x3 = 6$$
$$4x1 + 5x2 + 2x3 = 9$$

Based on these equations, answer the questions below.
(a) [1.5 marks] From the given linear equations, identify the matrices A, x and b such that the linear system can be expressed as a matrix equation.
(b) [1.5 marks] Examine if the matrix A has any pivoting problem? Explain why or why not?
(c) [4 marks] Write down the Augmented matrix, Aug(A), from the given linear system, and evaluate the upper triangular matrix U. Note that you have to show the row multipliers mij for each step as necessary.
(d) [3 marks]Using the upper triangular matrix found in the previous question, compute the solution of the given linear system by Gaussian elimination method.