CSE 330: Spring 2024
Assignment-5 [CO4]
Total Marks: 20

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

$$x_1 + 6x_2 + 2x_3 = 10$$
$$3x_1 + 2x_2 + x_3 = 6$$
$$4x_1 + 5x_2 + 2x_3 = 9.$$

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:

$$6x_2 + 2x_3 = 10$$
$$3x_1 + 2x_2 + x_3 = 6$$
$$4x_1 + 5x_2 + 2x_3 = 9.$$

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 m_{ij} 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 backward substitution method.