EEE583-NUMERICAL ANALYSIS I

Midterm Exam 2-TAKEHOME PART

This is due three weeks. (Due date: Friday, May 20th, 2022).
Submit your work to me as a hard copy.
If you do not submit your work within three weeks, it will be graded to a zero.
This takehome part will be 50% of overall second midterm grade.

For all the questions below, please include Matlab codes on your solutions and run your M-files to obtain the results of your algorithm.
Do not write the codes and execution results by hand. Take screenshots for each.

1-(25p) Develop your own M-file to solve the following system of linear equations by Gauss-Jordan method with partial pivoting.

$3x_1 + 4x_2 - 2x_3 + 2x_4 = 2$

$4x_1 + 9x_2 - 3x_3 + 5x_4 = 8$

$-2x_1 - 3x_2 + 7x_3 + 6x_4 = 10$

$x_1 + 4x_2 + 6x_3 + 7x_4 = 2$

2-(25p) Develop your own M-file to determine the LU factorization of a square matrix without partial pivoting. That is, develop a function that is passed the square matrix and returns the triangular matrices [L] and [U]. Test your function by using it to solve the system below.

$7x_1 + 2x_2 - 3x_3 = -12$

$2x_1 + 5x_2 - 3x_3 = -20$

$x_1 - x_2 - 6x_3 = -26$

Confirm that your function is working properly by verifying that [L][U] = [A] and by using the built-in function lu.

3-(25p) Develop your own M-file for Gauss Seidel iterative technique to find approximate solutions to

$10x_1 - x_2 + 2x_3 = 6$

$-x_1 + 11x_2 - x_3 + 3x_4 = 25$

$2x_1 - x_2 + 10x_3 - x_4 = -11$

$3x_2 - x_3 + 8x_4 = 15$

starting with $x = [0 \;\; 0 \;\; 0 \;\; 0]^T$ and iterating until ε_a is less than $\varepsilon_s = 0.1\%$.

4-(25p) Develop your own M-file to implement the golden-section search algorithm to locate the maximum of the following function

$f(x) = -x^4 - 2x^3 - 8x^2 - 5x$

starting with $x_l = -2$ and $x_u = 1$ and iterating until ε_a is less than $\varepsilon_s = 1\%$.