University of Peradeniya

Faculty of Engineering

Department of Engineering Mathematics

NUMERICAL METHODS (EM 215)

Solutions to system of linear equations

Assignment 1(SLE)

1) Consider the system of linear equations given by,

$$\begin{aligned} x_1 + 2x_2 - 12x_3 + 8x_4 &= 27 \\ 3x_1 + 4x_2 + 7x_3 - 2x_4 &= 4 \\ -3x_1 + 7x_2 + 9x_3 + 5x_4 &= 11 \\ 6x_1 - 12x_2 - 8x_3 + 3x_4 &= 49 \end{aligned}$$

Solve the above system using,

(a) Gaussian elimination.

(b) Gaussian elimination with partial pivoting.

2)) Consider the system of linear equations given by,

$$\begin{aligned} 2x_1 - 3x_2 + 4x_3 - x_4 &= 6 \\ x_1 + x_2 - 6x_3 + 3x_4 &= 8 \\ 3x_1 - x_2 + 2x_3 + x_4 &= 10 \\ 2x_1 + 4x_2 - 2x_3 - 3x_4 &= -19 \end{aligned}$$

Solve the above system using PLU decomposition.

3) Consider the system of linear equations given by,

$$\begin{aligned} 5x_1 + 10x_2 + 3x_3 + x_4 &= 6.7 \\ 6x_1 + 7x_2 + 20x_3 - x_4 &= 5.8 \\ 12x_1 + 2x_2 + 3x_3 - 30x_4 &= 4.3 \\ 15x_1 - x_2 + x_3 + x_4 &= 2.1 \end{aligned}$$

Construct a computer program to find the solution to the above system using,

(a) Jacobi method.

(b) Gauss-Seidel method.

and hence find the solution in parts (a) & (b).

Note: You may use Python/ Matlab to construct the computer program.