

# Assignment#2

## Elimination Method

1. Solve to solve the following equations using **Gauss Elimination Method**:

$$10x_1 - 7x_2 + 3x_3 + 5x_4 = 6$$

$$-6x_1 + 8x_2 - x_3 - 4x_4 = 5$$

$$3x_1 + x_2 + 4x_3 + 11x_4 = 2$$

$$5x_1 - 9x_2 - 2x_3 + 4x_4 = 7$$

1. Solve to solve the following equations using **Gauss Elimination Method with Partial Pivoting & Complete Pivoting** strategies, comment on the result.

$$x + 2y - 12z + 8v = 27$$

$$5x + 4y + 7z - 2v = 4$$

$$-3x + 7y + 9z + 5v = 11$$

$$6x - 12y - 8z + 3v = 49$$

2. Write the *pseudo-code* of **Gauss-Jordan Method** to solve the linear system  $AX = B$ .  
 3. Solve to solve the following equations using **Gauss-Jordan Method**:

$$10x_1 - 7x_2 + 3x_3 + 5x_4 = 6$$

$$-6x_1 + 8x_2 - x_3 - 4x_4 = 5$$

$$3x_1 + x_2 + 4x_3 + 11x_4 = 2$$

$$5x_1 - 9x_2 - 2x_3 + 4x_4 = 7$$

4. Using **Gauss-Jordan Method**, find the inverse ( $A^{-1}$ ) of the matrices:

a.  $\begin{bmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix}$

b.  $\begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 1 & 1 \end{bmatrix}$

c.  $\begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$

5. Use **Matrix Inversion Method** to solve the following equations:

$$2x_1 - x_2 + 4x_3 = 10, 2x_1 + 5x_2 - x_3 = 7, x_1 + 2x_2 + 10x_3 = -7$$

6. Solve the following system of equations using **LU Factorization Method**:

$$5x_1 + 2x_2 + 3x_3 = 31, 3x_1 + 3x_2 + 2x_3 = 25, x_1 + 2x_2 + 4x_3 = 25$$

7. Solve the following system of equations using **Doolittle Decomposition Method**:

$$x - 3y + 10z = 3, -x + 4y + 2z = 20, 5x + 2y + z = -12$$

8. Solve the following system of equations using *suitable iterative method*:

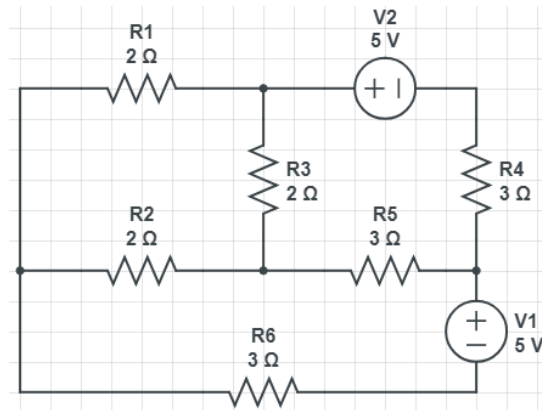
$$20x + y - 2z = 17, 3x + 20y - z = -18, 2x - 3y + 20z = 25$$

9. Solve the system of equations for currents  $I_1, I_2, I_3$  using **Gauss Elimination** or **Gauss Jordan Method**.

$$R_6 * I_1 + R_5 * (I_1 - I_2) + R_2 * (I_1 - I_3) = V_1$$

$$R_4 * I_2 + R_3 * (I_2 - I_3) + R_5 * (I_2 - I_1) = V_2$$

$$R_1 * I_3 + R_2 * (I_3 - I_1) + R_3 * (I_3 - I_2) = 0$$



### Iterative Method

- Solve the following system of equations using
  - Gauss-Jacobi Iteration Method**, correct to 3-decimal places
  - Gauss-Seidel Iteration Method**, correct to 5-decimal places & comment on the result.

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$

$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$

$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$

$$-x_1 - x_2 - 2x_3 + 10x_4 = -9$$

- Apply **Gauss-Seidel Iterative Method** to solve the following linear equations, correct to 2-decimal places.

$$10x + y - z = 11.19$$

$$x + 10y - z = 28.08$$

$$-x + y + 10z = 35.61$$

### Eigen Value & Eigen Vector using Power Method

- Find the *Largest Eigen Value* & corresponding *Eigen Vector* using **Rayleigh's Power Method**.

a.  $\begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$

b.  $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 1 & 2 & -1 \end{bmatrix}$

c.  $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$

- Obtain by **Power Method**, the numerically *dominant Eigen Value* & *Eigen Vector* of the matrix.

a.  $\begin{bmatrix} 1 & 4 & 4 \\ 4 & 1 & 8 \\ 4 & 8 & 1 \end{bmatrix}$

b.  $\begin{bmatrix} 1 & 4 & -1 \\ 4 & 2 & 5 \\ -1 & 5 & 10 \end{bmatrix}$

c.  $\begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$

- Write an *algorithm* & *pseudo-code* to determine the dominant *Eigen Value* and corresponding *vector* of a square using Power Method.

- Find the *Smallest Eigen Value* & corresponding *Eigen Vector* using **Inverse Power Method**.

a.  $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 1 \end{bmatrix}$

b.  $\begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 2 \\ 1 & 3 & 3 \end{bmatrix}$