ESO 208A: Computational Methods in Engineering

Tutorial 5

Indirect methods for solving system of linear equations

1. Solve the following system of linear equations using Jacobi and Gauss-Seidel methods. Use initial guess as zero for all the variables and compare the number of iterations required to achieve approximate relative error less than 0.1%.

$$\begin{aligned} 6x - 2y + z &= 11 \\ -2x + 7y + 2z &= 5 \\ x + 2y - 5z &= -1 \end{aligned}$$

Eigen value problem

2. Find the maximum and minimum Eigen values and corresponding Eigen vectors of the matrix A by using the Power method.

$$A = \begin{bmatrix} 3 & 2 & 3 \\ 2 & 6 & 6 \\ 3 & 6 & 3 \end{bmatrix}$$

The inverse of the matrix is given as

$$A^{-1} = \begin{bmatrix} 0.3750 & -0.2500 & 0.1250 \\ -0.2500 & 0.0000 & 0.2500 \\ 0.1250 & 0.2500 & -0.2917 \end{bmatrix}.$$

Use initial guess vector as $\boldsymbol{x}_0 = \begin{bmatrix} 1 & 1 & 1 \end{bmatrix}^{\mathrm{T}}$ for both the cases and perform iterations until approximate relative error in Eigen values is less than 0.1%.