ESO 208A: Computational Methods in Engineering

Tutorial 7

Eigen value problem

1. 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%.

Eigen values by using similarity transformation

2. Estimate the Eigen values of the following matrix A by using the QR method. Perform maximum of five iterations or stop iterations when the approximate error in Eigen values becomes less than 0.01%.

$$A = \begin{bmatrix} 40 & 1 & 1 \\ 1 & 5 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$