

Assignment 3

Q.1 Use power iterations / inverse iteration / shift to factorize following polynomials.

a) $s^3 + 6s^2 + 11s + 6$.

b) $s^5 + 5.1s^2 + 9.25s^3 + 7.125s^2 + 2.125s + 0.15$

Q.2 Write a program to convert any matrix A to upper Hessenberg matrix H , using Householder matrices. Moreover, A and H must have same eigenvalues.

input \rightarrow matrix $A \in \mathbb{R}^{n \times n}$.

output \rightarrow $Q \rightarrow$ orthogonal matrix
 $H \rightarrow$ Hessenberg matrix (upper)
s.t. $Q^T A Q = H$.

Q.3 Given a matrix

$$A = \begin{bmatrix} 0.8 & 0.1 & 0.05 & 0.05 \\ 0.1 & 0.3 & 0.3 & 0.3 \\ 0.05 & 0.025 & 0.025 & 0.9 \\ 0.1 & 0.2 & 0.3 & 0.4 \end{bmatrix}$$

- (i) Calculate pair of Dominant ^{eigenvalue} eigenvector using ^{power method}.
- (ii) At each iteration calculate the Rayleigh Quotient of estimated eigenvector.
- (iii) Calculate smallest eigenvalue - eigenvector pair.
- (iv) Use QR iteration to obtain Schur form. (perform enough number of iterations)