Lab Assessment for Module 3

MA-423 : Matrix Computations   2 November, 2020   S. Bora

Marks: 14

Important instructions:

- **Put all your work in a single folder and submit a link to download it on MS Teams within the declared deadline.**
- **Submitted folder should contain** *only* **the programs written for the purpose of the assessment and other supporting programs that are required for those programs to run. If there are any unnecessary programs in the folder, then upto 2 marks may be deducted from the score of every group member.**
- **Any kind of cheating or copying from internet will result in heavy penalties for every group member.**

1. Modify the code [R] = `refelctqr(A)` written for your lab session via the optimal use of reflectors to [Q, R] = `reflectqr(A)` such that $A = QR$ so that it finds a *full* QR decomposition of a *square* matrix A. If A has size $n \times n$, then the cost of computing *both* outputs should be $\frac{8}{3}n^3 + O(n^2)$ flops. **(6 marks)**

2. A square matrix $A = [a_{ij}]$ is said to be upper Hessenberg if $a_{ij} = 0$ for $i > j + 1$. Modify the code [Q, R] = `refelctqr(A)` so that it finds Q and R for an $n \times n$ upper Hessenberg matrix A in $O(n^2)$ flops. **(5 marks)**

3. Make minimal modifications to the code `A = condmat(n,kappa)` written for the previous assessment to produce the code `A = condmat(m,n,kappa)` that generates a random $m \times n$ real matrix A such that $\kappa_2(A) = kappa$. **(3 marks)**