

Five Year Integrated M.Sc. Examination, 2017

Semester - VI

Course: MT-3-6-3A (Old)

(Mathematics: Numerical Linear Algebra)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin.

Answer *any four* questions.

1. a) Compute flop count in Gaussian elimination for solving $Ax = b$ where A is a $n \times n$ matrix.
b) Define condition number. Show that $\kappa(A) = \kappa(A^{-1})$. 5+(2+3)=10
 2. a) Find pseudo inverse of $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \end{pmatrix}$.
b) Show that Householder matrix is both orthogonal and symmetric. 5+(2+3)=10
 3. Define block matrix. Find the determinant of block matrix $\begin{pmatrix} A & B \\ C & D \end{pmatrix}$ by considering the triangular decomposition. 3+(4+3)=10
 4. Define singular value decomposition. For the matrix $A = \begin{pmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{pmatrix}$ find the singular value decomposition. Find also the singular values of AA^T . 2+5+3=10
 5. a) Compare the Cholesky's method, Dolittle's method and Crout's method.
b) Define band matrix. Prove that if A is positive definite, then A is non-singular. 5+(2+3)=10
 6. a) Find LU decomposition of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & -4 & 6 \\ 3 & -9 & -3 \end{pmatrix}$. Hence solve $Ax = b$, where $x = [x_1, x_2, x_3]^T$ and $b = [5, 18, 6]^T$.
b) Define symmetric positive definite matrix. (6+2)+2=10
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