Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **M.Sc.I**
FMCC804

8th Semester Regular Examination 2017-18
MATRIX COMPUTATION
BRANCH : M.Sc.I(MC)
Time : 3 Hours
Max Marks : 70
Q.CODE : C306
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1. **Answer the following questions :** **(2 x 10)**
- a) Define flop count with an example.
- b) Define Matrix norm and give an example.
- c) Let M be any $n \times n$ nonsingular matrix and let $A = M^T M$. Then show that A is positive definite.
- d) Calculate total number of Flop count for multiplication of two matrices.
- e) If A and B are lower triangular matrices and AB is defined then show that AB lower triangular.
- f) Write a FORTRAN program for multiplication of a matrix by a vector.
- g) Give examples of sets of two vectors that are orthonormal.
- h) What is SVD? Explain.
- i) What is condition number? Explain briefly.
- j) What is Reflector? Give an example.

Q2. a) Write down a pseudo-code for Cholesky's algorithm and hence calculate Flop count for Cholesky's algorithm. **(5)**

b) Solve $-u''(x) + 4u'(x) - 6u(x) = x$ numerically with boundary conditions $u(0) = 0, u(1) = 0$. **(5)**

Q3. a) Show that the induced norm is a matrix norm. **(5)**

b) Solve by LU decomposition method : **(5)**

$$\begin{bmatrix} 2 & 4 & 2 \\ -2 & -5 & -3 \\ 4 & 7 & 6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -3 \\ 3 \\ -1 \end{bmatrix}.$$

Q4. a) Write a pseudo-code or a FORTRAN program for Gaussian elimination method. **(5)**

b) State and prove Cauchy-Schwarz inequality. **(5)**

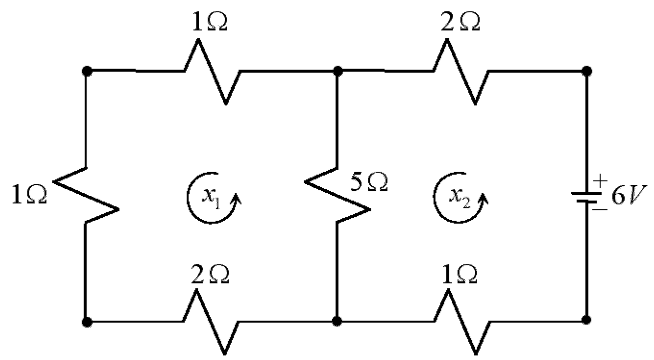
Q5. a) Find a corresponding orthonormal basis to $S = \{(1,2,1), (2,1,1), (1,1,2)\}$ using Gram-Schmidt process. **(5)**

b) Write a pseudo-code or a FORTRAN program for Gram-Schmidt process. **(5)**

Q6. Form the Jacobian of a damped pendulum $\ddot{\theta} + k_1\dot{\theta} + k_2 \sin\theta = 0$, where k_1 and k_2 are positive constants and θ is the angle of the pendulum from its vertical resting position. Show that the equilibrium points $\theta = n\pi$ are asymptotically stable for even n and unstable for odd n. **(10)**

Q7. a) Find the Cholesky factor of a $A = \begin{bmatrix} 16 & 4 & 8 & 4 \\ 4 & 10 & 8 & 4 \\ 8 & 8 & 12 & 10 \\ 4 & 4 & 10 & 12 \end{bmatrix}$, and hence solve the system of equations $Ax = b$ where $x = [x_1\ x_2\ x_3\ x_4]^T$ and $b = [32\ 26\ 38\ 30]^T$. **(5)**

b) Solve for the loop currents : **(5)**



Q8. Using Power method find the greatest eigenvalue of the matrix. **(10)**

$$A = \begin{bmatrix} 9 & 1 \\ 1 & 2 \end{bmatrix}.$$