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**8th SEMESTER** **B. Tech. (MC)**

**MID SEMESTER EXAMINATION** **(March 2019)**

## MC 404: Matrix Computation

**Time: 1:30 Hours** **Max. Marks: 25**

**Note:** All questions are compulsory.

1. Consider the following floating point number system.
   Base $\beta = 2$, length of mantissa $m = 3$ and range of exponent $\{-1,0,1,2\}$. Find all the decimal numbers which can be represented by this system. [5]
2. Explain ill conditioning of a matrix. Let $A = \begin{bmatrix} 0.1a & 0.1a \\ 1 & 1.5 \end{bmatrix}$. Determine $a$ suc that $cond(A)$ is minimized. Use the maximum norm. [5]
3. Consider the following system of equations.
   $$0.0030x_1 + 59.14x_2 = 59.17$$
   $$5.291x_1 - 6.130x_2 = 46.78$$
   Solve the system using Gaussian elimination and use four digit arithmetic with rounding. Is it a good approaximation to the exact solution? If no, then why it so and demonstrate how can you get a good approaximation? [5]
4. Find the Cholesky decomposition of the matrix $A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 1 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. Hence, fir $A^{-1}$. Write two limitations of Cholesky decomposition. [5]
5. Find the QR factorization of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ and use th factorization to solve the least squares problem $Ax = \begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix}^T$. [5]

**~All the Best~**