CS972: Assignment 2

May, 2023

Time: 10 days **Maximum Marks**: 50

Question ($5 + 5 + 10 + 15 + 15$ **marks).** Consider the matrix

$$A = \begin{bmatrix} 3 & 2 & 1 \\ 2 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}.$$

1. Do Gaussian elimination on A to convert A into an upper triangular matrix. Show matrices obtained after each step of Gaussian elimination.
2. Do Gaussian elimination on A to convert A into a lower triangular matrix. Show matrices obtained after each step of Gaussian elimination.
3. For which numbers c and d, the matrix B is of rank 2 where

$$B = \begin{bmatrix} 1 & 2 & 5 & 0 & 5 \\ 0 & 0 & c & 2 & 2 \\ 0 & 0 & 0 & d & 2 \end{bmatrix}.$$

4. Compute all eigenvalues and eigenvectors of matrix C where

$$C = \begin{bmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 2 & 0 & 0 \end{bmatrix}.$$

5. Let V be the real vector space spanned by the rows of the matrix A, where

$$A = \begin{bmatrix} 3 & 21 & 0 & 9 & 0 \\ 1 & 7 & -1 & -2 & -1 \\ 2 & 14 & 0 & 6 & 1 \\ 6 & 42 & -1 & 13 & 0 \end{bmatrix}.$$

   Find the basis for V. Tell which vectors $(x_1, x_2, x_3, x_4, x_5)$ are elements of V.