Minor Test (October 2019)

MCAC-103

MATHEMATICAL TECHNIQUES FOR COMPUTER SCIENCE APPLICATIONS

Duration: 1 hour

Max. Marks: 15

Q1 For what value of c and d do matrices A have rank 2? (1 marks)

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

Q2 Find row reduced echelon form for the given matrix A. Determine rank of the matrix. (2.5 marks)

$$A = \begin{bmatrix} 2 & -2 & 4 \\ 4 & 1 & -2 \\ 6 & -1 & 2 \end{bmatrix}$$

Q3 What is nullspace and column space? Write vector $\begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$ as linear combination of vectors (3 marks)

$$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \\ 1 \end{bmatrix} \begin{bmatrix} 2 \\ 0 \\ 4 \end{bmatrix}$$

Q4 Find basis for nullspace of A, where $A = \begin{bmatrix} 2 & 4 & 6 & 8 \\ 1 & 3 & 0 & 5 \\ 1 & 1 & 6 & 3 \end{bmatrix}$ (3 marks)

Q5 Is {a,b,c} basis for subspace W of R^3. If yes, construct orthogonal basis for W. (3 marks)

$$a = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}, b = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, c = \begin{bmatrix} 1 \\ 0 \\ 4 \end{bmatrix}$$

Q6 What are eigenvalues and eigenvectors of matrix A and A^2, where (2.5 marks)

$$A = \begin{bmatrix} 6 & 2 \\ 4 & 8 \end{bmatrix}$$