Linear Algebra
Summer Final Exam **Total: 80 Marks**

For Students who have missed Midterm Exam

Note:

- *If your student ID is e.g. 14589 then ID1 = 1 , ID2 = 4, ID3 = 5 etc*
- *Submission time 25-09-2020 before 6:00 pm (3 Hrs)*

Question No: 1 **10 marks**

Solve the system of equations that corresponds to this augmented Matrix

$$\begin{bmatrix} 1 & -3 & 4 & -ID2 \\ 3 & -7 & 7 & -ID4 \\ -4 & 6 & -1 & ID3 \end{bmatrix}$$

Question No: 2 **20 marks**

a) Find Inverse of a Matrix

$$\begin{bmatrix} ID3 & -1 & 0 \\ 0 & 1 & ID3 \\ 1 & 1 & 0 \end{bmatrix}$$

b) Find an echelon form for the below matrix using row operations

$$\begin{bmatrix} 1 & ID3 & 8 \\ 2 & ID4 & -1 \\ -3 & 0 & 0 \\ 1 & -ID3 & 16 \end{bmatrix}$$

Question No: 3 **10 marks**

Find the eigenvalues of A

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 4 & -17 & 8 \end{bmatrix}$$

Question No. 4 **10 marks**

Find a matrix P that diagonalizes the below matrix

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

Question No. 5 **10 marks**

Evaluate det(A)

$$\boldsymbol{A} = \begin{bmatrix} \mathbf{0} & \mathbf{1} & \mathbf{5} \\ \mathbf{3} & \mathbf{-6} & \mathbf{9} \\ \mathbf{2} & \mathbf{6} & \mathbf{1} \end{bmatrix}$$

Question No. 6 **20 marks**

What are the four main things we need to define for a vector space? Which of the following is a vector space over R? For those that are not vector spaces, modify one part of the definition to make it into a vector space.

a. V = { 2 x 2 matrices with entries in R}, usual matrix addition, and

$$k.\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} ka & b \\ kc & d \end{pmatrix} for\ k \in R$$

b. V = {Polynomials with complex coefficients of degrees ≤3}, with usual addition and scalar multiplication of polynomials.