

# SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY

## VASAD

B. E. Second Semester (All Branch)

Subject: Vector Calculus and Linear Algebra (2110015)

Year 2016-2017

Tutorial: 07

1. Find the eigen values and bases for eigen spaces of given matrices.

$$\begin{bmatrix} 0 & 0 & 2 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & -2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 5 & 6 & 2 \\ 0 & -1 & -8 \\ 1 & 0 & -2 \end{bmatrix}$$

2. If  $A = \begin{bmatrix} 1 & 0 & 0 \\ 5 & 2 & 0 \\ 12 & 15 & 3 \end{bmatrix}$  then find the eigenvalues of  $A^{-1}$  and  $A^5$ .

3. Find the eigen values of  $A^T$ . Is  $A$  invertible ?  $A = \begin{bmatrix} -420 & 1/2 & 576 \\ 0 & 0 & 0.6 \\ 0 & 0 & \sqrt{3} \end{bmatrix}$

4. Find the geometric and algebraic multiplicity of each eigen value of given matrices.

$$\begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix} \quad \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$$

5. Find a matrix  $P$  that diagonalizes  $A$  and determine  $P^{-1}AP$  for given matrices

$$\begin{bmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix} \quad \begin{bmatrix} -1 & 4 & -2 \\ -3 & 4 & 0 \\ -3 & 1 & 3 \end{bmatrix}$$

6. Find a matrix  $P$  that diagonalizes  $A = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$  and hence find  $A^{13}$ .

7. Find the characteristic equation of matrix  $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$  and verify Cayley Hamilton theorem.

8. Using Cayley Hamilton theorem, find  $A^{-1}$ ; where

$$A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$$

9. Find a matrix  $P$  that orthogonally diagonalizes following matrices and determine  $P^{-1}AP$

$$\begin{bmatrix} 2 & -1 & -1 \\ -1 & 2 & -1 \\ -1 & -1 & 2 \end{bmatrix} \quad \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

10. Show that  $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ -3 & 5 & 2 \end{bmatrix}$  is not diagonalizable.