

21/9/23

## Syllabus

- ① Eigen Values and Eigen vectors of a real matrix - characteristic equation - Properties of eigen values and eigen vectors - Cayley Hamilton theorem - Diagonalisation of matrices by orthogonal transformation - reduction of quadratic form to canonical form by orthogonal transformation - Nature of Quadratic form /

### \* PART - A (2marks)

1 to 10 (each 2 question - 1 Unit) (20 marks)

### \* PART - B

11) a)  $\vec{v}$  Eigen  
ii)  $\vec{v}$  (key)

11) b) R.F.

12 to 15

Question Pattern

## MATRIX

1) a system of  $(m, n)$  arranged in a rectangular arrangement along  $(m)$  rows and  $(n)$  columns are bounded by the brackets or parenthesis is called  $(m \times n)$  matrix.

General form:

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} & \dots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \dots & a_{2n} \\ a_{m1} & a_{m2} & a_{m3} & \dots & a_{mn} \end{pmatrix}$$

Types of matrix:

i) A matrix having single row is called



A row matrix.

Eg:  $A = [1 \ 2 \ 3]$

ii) A matrix having single column is called column matrix.

Eg:  $B = \begin{bmatrix} a \\ b \end{bmatrix}$

iii) A matrix having equal no of rows and columns are called square matrix.

Eg:  $C = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

iv) In a matrix give all the elements are zeros <sup>then it</sup> is called null matrix.

Eg:  $D = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

v) In a square matrix all the elements are zero except main diagonal elements then it is called diagonal matrix.

Eg:  $E = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$

vi) A square matrix all the <sup>diagonal</sup> elements are equal is called scalar matrix. (other elements are zero)

Eg:  $F = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

vii) In a square matrix all the diagonal elements must be equal to one <sup>(1)</sup> and remaining elements are zero (0) then it is called unit or identity matrix.

Eg:  $G = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad (I)$

### viii) Upper triangular matrix

In a square matrix below the leading diagonal elements are zeros (0) then it is called upper triangular matrix.

$$\text{Eg : } \begin{bmatrix} 1 & 2 & -3 \\ 0 & 4 & 5 \\ 0 & 0 & -7 \end{bmatrix}$$

### ix) Lower triangular matrix

In a square matrix above the leading diagonal elements are zeros (0) then it is called lower triangular matrix.

$$\text{Eg : } \begin{bmatrix} 6 & 0 & 0 \\ 7 & 1 & 0 \\ 8 & -11 & 3 \end{bmatrix}$$

### x) Transpose of the matrix

In a square matrix interchanging rows and columns are called Transpose. ( $A^T$ ).

$$\text{Eg : } A = \begin{bmatrix} 3 & 7 \\ 0 & 5 \end{bmatrix} \quad A^T = \begin{bmatrix} 3 & 0 \\ 7 & 5 \end{bmatrix}$$