

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks!)

Answer ALL questions

ALL questions carry EQUAL marks

(10 x2 = 20)

- 1 Define Transpose of a Matrix.
- 2 Define Symmetric Matrix.
- 3 Define Singular and Non-singular Matrices.
- 4 Define Minors.
- 5 Define Inverse of Matrix.
- 6 Define Rank of Matrix.
- 7 State the Cayley-Hamilton theorem.
- 8 Explain the characteristic vectors.
- 9 Define a vector as a linear combinations of vectors.
- 10 Define a Quadratic forms.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5x5= 25)

- 11 a If A is a Hermitian matrix, show that iA is skew Hermitian.

OR

b If $A = \begin{bmatrix} 3 & \\ & 1 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 4 \\ 2 & 1 \end{bmatrix}$ Verify that $(AB)' = B \cdot A'$

- 12 a Find the value of determinant

$$A = \begin{vmatrix} 1 & 3 & 4 \\ 2 & -1 & 3 \\ 2 & 1 & 2 \end{vmatrix}$$

OR

- b Explain the system of non-homogeneous linear equations- Cramer's rule.

- 13 a Explain Echelon form of a matrix.

OR

b Find the rank of matrix $\begin{vmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ 1 & 3 & 4 & 1 \end{vmatrix}$

- 14 a Determine the eigen values of matrix.

$$A = \begin{bmatrix} a & h & g \\ 0 & b & 0 \\ 0 & c & c \end{bmatrix}$$

OR

- b If A and B are two square matrices of the same order, then AB and BA have the same characteristic roots.

Cont...

15 a Define Orthogonal matrix. Show that if A is Hermitian and P orthogonal, then $P^{-1}AP$ is symmetric.

OR

b Show that the matrix are not similar to diagonal matrices,

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

SECTION - C (30 Marks)

Answer any **THREE** Questions

ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Show that the $AB \sim BA = 5B$, if

$$A = \begin{pmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{pmatrix} \text{ and } B = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$$

17 Solve the following by Cramer's rule

$$x - y + z = 6, \quad x + y + z = 6, \quad x - y + z = 2$$

18 Find the inverse of the given matrix by reducing it to normal form.

$$A = \begin{pmatrix} 2 & 1 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{pmatrix}$$

19 Determine the characteristic roots and characteristic vectors of the matrix.

$$A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$$

20 Reduce the quadratic forms in three variables to real canonical form and find its rank and signature.

$$x^2 - 2y^2 + 3z^2 - 4yz + 6zx$$

Z-Z-Z

END