



UNIT I

Part C

LEVEL I QUESTIONS

1. Find the Eigen values and Eigen vectors of $\begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -3 & -2 & 0 \end{pmatrix}$.
2. Find the Eigen values and Eigen vectors of $\begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$.
3. Find the Eigen values and Eigen vectors of $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$.
4. Verify Cayley Hamilton theorem for the matrix $\begin{pmatrix} 1 & -2 & 3 \\ 2 & 4 & -2 \\ -1 & 1 & 2 \end{pmatrix}$.

Level II Questions

1. Reduce the quadratic form $2x_1^2 + 5x_2^2 + 3x_3^2 + 4x_1x_2$ to canonical form through orthogonal transformation and find its nature.
2. Reduce the quadratic form $2x_1x_2 + 2x_3x_2 + 2x_1x_3$ to canonical form through orthogonal transformation and find its rank, index, signature and nature.
3. Reduce the quadratic form $3x^2 - 3y^2 - 5z^2 - 2xy - 6yz - 6zx$ to canonical form through orthogonal transformation and find its rank, index, signature and nature.
4. Reduce the quadratic form $10x_1^2 + 2x_2^2 + 5x_3^2 - 4x_1x_2 + 6x_3x_2 - 10x_1x_3$ to canonical form through orthogonal transformation and find its rank, index, signature and nature.
5. Show that the matrix $\begin{pmatrix} 1 & -1 & 1 \\ 0 & 1 & 0 \\ 2 & 0 & 3 \end{pmatrix}$ satisfies its own characteristic equation. Find the inverse matrix.
6. Using Cayley – Hamilton Theorem find A^{-1} , if $A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$.
7. Verify Cayley Hamilton theorem and find A^{-1} and A^4 if $A = \begin{pmatrix} 2 & 0 & -1 \\ 0 & 2 & 0 \\ -1 & 0 & 2 \end{pmatrix}$.

Level III Questions

1. Use Cayley Hamilton theorem to find the value of the matrix $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ if $A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$.
2. The Eigen vectors of a 3×3 real symmetric matrix A corresponding to the Eigen values 2,3,6 are $(1,0,-1)^T, (1,1,1)^T, (-1,2,-1)^T$ respectively. Find the matrix A.
3. If the Eigen values of $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$ are 0,3,15. Find the Eigen vectors of A and diagonalize the matrix A.