SRM Institute of Science and Technology

Kattankulathur

Department of Mathematics
21MAB101T - Calculus and Linear Algebra
Unit 1 - Matrices

Tutorial Sheet

S. No.	Questions
PART-A	
1.	Find the Eigenvalues and Eigenvectors of the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.
2.	Find the Eigenvalues and Eigenvectors of the matrix $A = \begin{bmatrix} -2 & 2 & 3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.
3.	Using Cayley-Hamilton theorem, find A^{-1} where $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$.
4.	Diagonalise the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ by an orthogonal transformation.
5.	Find the Eigenvalues of the matrix $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$. Hence form the matrix whose Eigenvalues are $\frac{1}{6}$ and -1.
PART-B	
1.	Verify Cayley-Hamilton theorem and hence find A^4, where $A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.
2.	Reduce the quadratic form $3x_1^2 + 2x_2^2 + 3x_3^2 - 2x_1x_2 - 2x_2x_3$ into a canonical form by an orthogonal reduction, and hence find the rank, index, signature, and nature of the quadratic form.
3.	Reduce the quadratic form $2x_1^2 + x_2^2 + x_3^2 + 2x_1x_2 - 2x_1x_3 - 4x_2x_3$ into a canonical form by an orthogonal reduction, and hence find the rank, index, signature, and nature of the quadratic form.