Stat-113: Linear Algebra

100 Marks: 03 Credits

Number of Class: 35-40

Vectors: Addition and Scalar Multiplication. Vector Product. Geometrical Interpretation of Vector. Linear Dependence and Independence. Vector Space. Basis and Dimension. Sub-space. Cauchy-Schwarz Inequality, Triangle Inequality, Linear Transformations, Properties of Linear Transformations.

Matrices: Definition of Matrix, Basic Operations and their Properties, Different Types of Matrices: Square, Identity, Scalar, Diagonal, Null, Symmetric, Skew-symmetric, Orthogonal, Unitary, Hermitian, Skew-Hermitian, Idempotent, Nilpotent and Involuntary, Random, Variance-covariance and Correlation, Product, Kronecker Products, Partitioned Matrices, Matrix Products as Linear Combinations, Transpose of Matrix, Trace of Matrix.

Rank and Inverse Matrix: Rank and Elementary Transformations of Matrices, Related Theorems of Ranks, Diagonal Reduction of Matrix, Adjoint, Inverse, Generalized Inverse of Matrix, Properties of Inverse, Matrix Inequalities and Maximization, Canonical and Normal form of Matrix, Linear Function of Matrices, Integration of Matrices, Elementary matrices.

Determinant: Meaning Properties of Determinant, Determinant by Cofactor Expansion, Minors, Cofactors, Adjoints, Combinatorial Approach to Determinant, Evaluating Determinant by Row Reduction.

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Eigenvalues and Eigenvectors: Definition of Eigenvalues and Eigenvectors, Diagonalization, Orthogenal Diagonalization.

Characteristic Value Problem and Quadratic Form: Characteristic Value Problem, Similarity, Characteristic Roots and Vectors of Matrix, Theorems of Characteristic Roots and Vectors: Caley-Hermilton Theorem, Finding Square Root of Square Matrix, System of Linear Equation, Spectral Decomposition, Solving Linear System by Factorization, Classification and Identification of Quadratic Forms, Diagonalization of Quadratic Forms, Reduction of Quadratic Forms, Related Theorems, Derivatives of Quadratic Form with Respect to Vector.

Text

1. Aitken, A.C. (1982): *Determinant and Matries*, Oliver and Boyd, London.
2. Anton, H. and Rorres, C. (2005): *Elementary Linear Algebra*, 9th edition, John Wiley and Sons, New York.

References

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1. Ali, M. I.: *Matrix Algebra*, Latest edition.
2. Gupta, S.S. (1987): *An Introduction to Matrices*, Sultan Chand and Co., New Delhi.
3. Hadley, g. (1993): *Linear Algebra*, 6th rep., Narosa, New Delhi.
4. Lipschutz, S. (1981): *Schaum's Outline of Theory and Probability of Linear Algebra*, McGraw-Hill, Singapore.

5. Narayan, S. (1985): *A Texbook of Matrices*, 8th edition, Sultan Chand and Co., New Delhi.