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MATHEMATICS - I

UNIT I - MATRICES

Matrix introduction- Types of matrix, Applications of matrices. **Characteristic equation** – Example problems. **Eigenvalues and Eigenvectors** – Eigenvalues, Eigenvectors, Problems on non symmetric matrices with non repeated eigenvalues, Problems on non symmetric matrices with repeated eigenvalues, Problems on symmetric matrices with non repeated eigenvalues, Problems on symmetric matrices with repeated eigenvalues, Properties of Eigenvalues and Eigenvectors, Example problems. **Cayley Hamilton Theorem**- Example problems. **Diagonalisation of a matrix** - Modal and spectral matrices, Example problems. **Reduction of Quadratic form to Canonical form** – Transformations, Fundamental theorem on quadratic forms, Example problems. **Index and signature of real qudratic form** - Nature of quadratic form, Example problems.

UNIT II - SEQUENCES AND SERIES

Sequences and series– Sequences, Operation on sequences, Convergence, divergence and oscillation of a sequence, Example problems. **Infinite series** - Properties of series, Necessary condition for convergence of a series, Series with positive terms, Example problems. **Comparison test** - Example problems. **Integral test** - Example problems. **D'Alembert's ratio test** - Example problems. **Alternating series** - Example problems. **Absolute and conditional convergence** - Example problems.

UNIT III - APPLICATIONS OF DIFFERENTIAL CALCULUS

Curvature in cartesian coordinates– Curvature. **Radius of curvature in cartesian coordinates** - Example problems, Cartesian formula for radius of curvature, Example problems. **Radius of curvature in parametric coordinates** - Example problems. **Radius of curvature in polar coordinates** - Example problems. **Circle of curvature** - Chord of curvature through the origin, Example problems. **Evolute** - Example problems. **Envelopes** - Method of finding the envelope, Elimination in the case of a quadratic in the parameter, Two parameters connected by a relation, Example problems. **Evolute as the envelope of normal** - Example problems.

UNIT IV - DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES

Function of Several variables– Limit, Continuity, Example problems. **Partial derivatives** - Example problems. **Total derivatives** - Example problems. **Differentiation of an implicit functions** - Example problems. **Jacobians and their properties** – Jacobian, Two important properties of Jacobian, Chain rule for Jacobian, Standard Jacobians, Example problems. **Taylor‘s series for functions of two variables** - Example problems. **Maxima and minima** - Maxima and Minima of functions of two variables, Extremum and Saddle point, Methods of finding extrema of f(x , y), Example problems. **Lagrange‘s method of undetermined multipliers** - Example problems.

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UNIT V - MULTIPLE INTEGRALS

Double Integrals - Evaluation of double integrals, Double integrals (Cartesian Form), Evaluation of double integrals (Region is given), Evaluation of double integrals (Polar form), Example problems.**Change of order of integration** - Example problems.**Change of variables in double integrals (Cartesian to polar)** - Example problems.**Areas by double integration (Cartesian and polar)** - Example problems.**Triple integrals** - Triple integrals (Cartesian form), Triple integral (Region is given), Example problems.**Volumes by triple integration (Cartesian and polar)** - Change cartesian to cylindrical co-ordinates, Change cartesian to spherical coordinates, Example problems.