Mathematics - I

UNIT I: Sequences, Series and Mean value theorems:
Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.
Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree
Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT III: Linear differential equations of higher order
Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type eax, sin ax, cos ax, polynomials in xn, eax V(x) and xnV(x) – Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation
Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: Multiple integrals

Double and Triple integrals – Change of order of integration – Change of variables.

Applications: Finding Areas and Volumes.