SEMESTER I

THEORY

Title: Calculus-I

Limits of a function in one variable

Functions in one variable and its graphs, techniques of building new functions from old, rational functions and the exponential functions.

Limits of functions in one variable using ε-δ definition, rules of finding limits, Sandwich theorem.

Continuity of functions in one variable. Graphical representation of continuity of a real valued function. Continuity of a real valued function over an interval. Intermediate value property.

Derivative of a function in one variable

Derivative of a real valued function at a point. Geometric interpretation of a derivative of a real valued function at a point. Chain rule, implicit differentiation. Linear Approximations.

Successive Differentiation, Leibnitz Theorem for n-th order derivative. L'Hospital's Rule

Mean Value Theorems: Roll's Theorem, Lagrange's Mean Value Theorem, Cauchy Mean Value Theorem.

Taylor series of functions such as sin, cosine and the hyperbolic functions.

Local extrema, absolute extrema, stationary points. Increasing and decreasing functions.

Main References:

1. Calculus: Early Transcendentals (Stewart's Calculus Series) – James Stewart.
2. Calculus and Analytic Geometry - G.B. Thomas and R. L. Finney, Addison-Wesley.
3. Tom Apostol, Calculus Volume 1, One variable calculus with an introduction to Linear Algebra, Second Edition, Wiley Publications.

Additional References:

1. Sudhir. R. Ghorpade and Balmohan V. Limaye, A Course in Calculus and Real Analysis, Springer International Edition.
2. Schaum's outline of Theory and Problems of Differential and Integral Calculus.