30. Mathematics (General)

B.A./B.Sc. Mathematics General-I **Total Mark: 100**

Appendix 'A'

(Outlines of Tests)

Calculus (Differential and Integral Calculus) : 100 Marks

Appendix 'B'

(Syllabi and Courses of Reading)

Calculus (Differential and Integral Calculus) 100 Marks

Note: Attempt six questions by selecting two questions from Section I, two questions from Section II, one question from Section III and one question from section IV.

Section-I (4/12)

Preliminaries:

- Real numbers and the real line
- Functions and their graphs
- Shifting and scaling graphs
- Solution of equations involving absolute values
- InequalitiesLimit and

Continuity:

- Limit of a function, left hand and right hand limits, Theorems of limits (without proofs)
- Continuity, Continuous functions

Derivatives and its Applications:

- Differentiate functions
- Differentiation of polynomial, rational and transcendental functions
- Intermediate value theorem, Rolle's theorem (without proofs)
- Mean value theorems and applications (without proofs)
- Higher **derivatives,** Leibniz's theorem (without proofs)
- L'Hospitals Rule
- Application of Taylor's and Maclaurin's theorem with their remainders

Section-II (4/12)

Integration and Definite Integrals:

- Techniques of evaluating indefinite integrals
- Integration by substitutions, Integration by parts

- Change of variable in indefinite integrals
- Definite integrals, Fundamental theorem of calculus
- Reduction formulas for algebraic and trigonometric integrands
- Improper integrals, Gamma functions
- Numerical integration

Plane **Analytic Geometry:**

- Conic section and quadratic equations
- Classifying conic section by eccentricity
- Translation and rotation of axis
- Properties of circle, parabola, ellipse, hyperbola Polar coordinates, conic sections in polar coordinates
- Graphing in polar coordinates
- Tangents and normal, pedal equations, parametric representations of curves

Section-III (2/12)

Applications of Integration:

- Asymptotes.
- Relative extrema, points of inflection and concavity
- Singular, poirts, tangents at the origin
- Graphing of Cartesian and polar curves
- Area under the curve, area between two curves
- Arc length aid intrinsic equations
- Curvature, radius and cent
- re of curvature
- Involute and volute, envelope

Section-IV (2/12)

Functions of Several Variables and Multiple Integrals:

- Limit and continuity of a function of two variables
- The partial derivative, Computing partial derivatives algebraically
- The second-order partial derivative
- Tangent planes and normal lines
- Maxima and minima of a function of two variables
- Double integral in rectangular and polar form
- Triple integral in rectangular, Cylindrical and spherical coordinates
- Substitution in multiple integrals

Recommended Books:

1. Thomas, Calcuus, 11th Edition. Addison Wesley Publishing Company, 2005
2. H. Anton, I. Bevens, S. Davis, Calculus, 8th Edition, John Wiley & Sons, Inc. 2005
3. Hughes-Hallett Gleason, McCallum, et al, Calculus Single and Multivariable, 3rd Edition John Wiley & Sons, Inc. 2002.
4. Erwin, Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 2004
5. C.H. Edward and E.D Penney, Calculus and Analytics Geometry, Prentice Ball, Inc 1988
6. E. W. Swokowski, Calculus and Analytic Geometry, PWS Publishers, Boston Massachosetts, 1983.