

**30. Mathematics (General)**

**B.A./B.Sc. Mathematics General-II**

**Total Mark: 100**

**Appendix 'A'**  
**(Outlines of Tests)**

Mathematical Methods: (Geometry, Infinite Series, Complex Numbers, Linear Algebra, Differential Equations) : 100 Marks

**Appendix 'B'**  
**(Syllabi and Courses of Reading)**

**Mathematical Methods: (Geometry, Infinite Series, Complex Numbers, Linear Algebra, Differential Equations)** **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)**

**Complex Numbers**

- Complex Numbers and their properties
- Polar form, argand diagram, separating into real and imaginary parts
- De Moivre's theorem and its applications
- Elementary functions: circular, logarithmic, hyperbolic, exponential functions
- Series solution by using complex numbers

**Sequence and Series**

- Sequences, Infinite series, Convergence of sequence and series
- The integral test, Comparison tests, Ratio test, Root test
- Alternative series, Absolute and conditional convergence
- Power series, Interval and radius of convergence

**Section-II (4/12)**

**Vectors**

- Introduction to vector algebra
- Scalar and vector product
- Scalar triple product and vector triple product
- Applications to geometry
- Vector equation of a line and plane
- Partial derivatives of vector point functions
- Scalar and vector fields
- The gradient, divergence and curl

**Analytic Geometry of Three Dimensions**

- Rectangular coordinates system in a space
- Cylindrical and spherical coordinate system
- Direction ratios and direction cosines of a line
- Equation of straight lines and planes in three dimensions

- Shortest distance between skew lines
- Equation of sphere, cylinder, cone, ellipsoids, paraboloids, hyperboloids
- Quadric and ruled surfaces
- Spherical trigonometry, Direction of Qibla

### **Section-III (2/12)**

#### **Matrices, Determinants, System of Linear Equations, and Vector Spaces**

- Algebra of Matrices, types of matrices
- Determinant of square matrix, inverses of matrices
- Rank of a matrix
- Introduction to systems of linear equations
- Cramer's rule, Gaussian elimination and Gauss Jordan method
- Solution of homogenous and non-homogenous linear equations
- Vector spaces and subspaces
- Linear combination Linear independence, Bases and dimension

### **Section-IV (2/12)**

#### **First Order Differential Equations**

- Formation of differential equation
- Separable equations, Homogeneous and non-homogeneous equations
- Linear and nonlinear equations
- Exact and non-exact equations and integrating factors
- Orthogonal trajectory, Bernoulli, Ricatti, Clairaut's equations

#### **Higher Order Linear Differential Equations**

- Fundamental solutions of linear homogenous equations
- Operator method, Method of undetermined coefficients
- Cauchy Euler's equation
- Variation of parameters

#### **Recommended Books:**

1. Thomas, Calculus, 11th Edition. Addison Wesley Publishing Company, 2005
2. Howard Anton and Chris Rorres, Elementary Linear Algebra Applications, John Wiley and Sons Inc. 9th Edition, 2005
3. Murray R. Spiegel, Vector Analysis, Schaum's Outline Series, McGraw Hill Book Company, 2005
4. Seymour Lipschutz, Theory and Problems of Beginning Linear Algebra, Schaum's Outline Series, Mc-Graw Hill Company, New York, 1997
5. W.E. Boyce and Dprima, Elementary Differential Equations, 8th Edition, John Wiley & Sons, 2005
6. Erwin, Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 2004
7. Dennis G.Zill & Michael R. Cullen, Differential Equation With Boundary Value Problems, PWS Publishing Company, 2000