CLASS – XII
Subject -Mathematics
Semester I (2011-12)

Theory Marks-55
Internal Assessment-25
Total Marks-80

Time: 2:30 hrs

1. All Questions are Compulsory.
2. Q 1. will consists of seven parts and each part will carry 1 Mark.
3. Q 2. to Q 12 each will be of 3 Marks.
4. Q 13 to Q 15 i.e. three questions each will be of 5 marks.
5. There will be no overall choice. There will be an internal choice in any three questions of 3 marks each and two questions of 5 marks each(Total of 5 internal choices).

Q 6. Use of Calculator is not allowed.

Sr. No	Topic	Q. Carrying 1-Marks	Q. Carrying 3-Marks	Q. Carrying 5-Marks	Total Marks
1.	Relations & Functions	1	2	-	07
2.	Inverse Trigonometric Functions	1	1	-	04
3.	Matrices and Determinants	3	3	1	17
4.	Continuity & Differentiability	1	3	1	15
5.	Applications of Derivatives	1	2	1	12
	Total	**7**	**11**	**3**	**55**

1   Relations and Functions:
Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, inverse of function. Binary operations.

2   Inverse Trigonometric Functions:
Definition, Range, Domain, Principal value branches. Graphs of inverse trigonometric functions. Elementary properties of trigonometric functions.

3   Matrices:
Concept, Notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication. Non-Commutatively of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

4   Determinants:
Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency,

inconsistency and number of solutions of system of linear equation by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

5   Continuity and Differentiability:
Continuity and Differentiability, derivative of composite functions, chain rule, derivative of inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions and their derivative Logarithmic differential. Derivative of functions expressed in parametric forms, Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

6   Applications of Derivatives
Applications of Derivatives: rate of change, increasing/decreasing functions, tangents & normal, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real life situations).

Time:- 3 hrs
1. All questions are compulsory.
2. Q.1 will consist of ten parts and each part will carry 1-mark.
3. Q.2 to Q.16 will carry three marks each.
4. Q.17 to Q.21 i.e. five question each will be of six marks.
5. There will be no over all choice. There will be an internal choice in any three questions of three marks each and any two questions of 6 mark each.
6.   Use of calculator is not allowed

S.No	Topic	Q.Carrying 1-Mark	Q.Carrying 3-Marks	Q.Carrying 6-Marks	Total Marks
1	Integrals	1	4	1	19
2	Application of integrals	1	1	1	10
3	Differential Equations	3	3	-	12
4	Vectors	2	3	-	11
5	Three-dimensional Geometry	1	2	1	13
6	Linear Programming	1	-	1	07
7	Probability	1	2	1	13
	Total	**10**	**15**	**5**	**85**

1   Integrals:
Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{x^2 - a^2}}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}, \int \frac{dx}{ax^2 + bx + c}$$

$$\int \frac{(px + q)}{ax^2 + bx + c} dx, \int \frac{(px + q)}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx \text{ and } \int \sqrt{x^2 - a^2} dx$$

Define integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof).Basic properties of definite integrals and evaluation of definite integrals.

2   Application of integrals:
Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

3   Differential Equations:
Definition, order and degree, general and particular solutions of a differential equation, Formation of differential equation whose general solution is given. Solution of differential equations by method of separation

of variables, homogeneous differential equations of first order and first degree. Solutions of linear equation of the type:

$$\frac{dy}{dx} p(x)y = q(x)$$

Where p(x) and q(x) are functions of x.

4   **Vectors:**

Vectors and scalars, magnitude and directions of a vector. Directions cosines/ratios or vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vectors of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

5   **Three-dimensional Geometry:**

Direction cosines/ ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

6   **Linear Programming:**

Introduction, definition of related terminology such as constraints, 0bjectives function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P Problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optional feasible solutions (up to three non-trivial constrains)

7   **Probability:**

Multiplication theorem on Probability. Conditional probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution.