CLASS–XII

One Paper

Time: 3 hrs.
Max Marks. 100

Units		No. of Periods	Marks
I.	Relations and Functions	30	10
II.	Algebra	50	13
III.	Calculus	80	44
IV.	Vectors and Three - Dimensional Geometry	30	17
V.	Linear Programming	20	06
VI.	Probability	30	10
	Total	240	100

Unit - I: Relations and Functions

1. Relations and Functions :   **15 Periods**

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

2. Inverse Trigonometric Functions: **15 Periods**

Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

Unit-II: Algebra

1. Matrices: **25 Periods**

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-commutativity 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).

2. Determinants: **25 Periods**

Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants, minors, co-factors 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 equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-III: Calculus

1. Continuity and Differentiability: **20 Periods**

Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretation.

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2. **Applications of Derivatives:**   **10 Periods**

Applications of derivatives: rate of change of bodies, increasing/decreasing functions, tangents and normals, use of derivatives in 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).

3. **Integrals:**   **20 Periods**

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

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

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

$$\int \sqrt{ax^2 + bx + c} \, dx \, , \int (px + q)\sqrt{ax^2 + bx + c} \, dx \, .$$

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

4. **Applications of the Integrals:**   **15 Periods**

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

5. **Differential Equations:**   **15 Periods**

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 differential equation of the type:

$$\frac{dy}{dx} + py = q, \text{ where p and q are functions of } x \text{ or constants}$$

$$\frac{dx}{dy} + px = q, \text{ where p and q are functions of } y \text{ or constants}$$

Unit-IV: Vectors and Three-Dimensional Geometry

1. **Vectors:**   **15 Periods**

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector 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. Scalar triple product of vectors.

2. **Three - dimensional Geometry:**   **15 Periods**

Direction cosines and direction 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.

Unit-V: Linear Programming

1. Linear Programming: 20 Periods

Introduction, related terminology such as constraints, objective 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, optimal feasible solutions (up to three non-trivial constraints).

Unit-VI: Probability

1. Probability: 30 Periods

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

Prescribed Books:

1) **Mathematics Part I** - Textbook for Class XI, NCERT Publication

2) **Mathematics Part II** - Textbook for Class XII, NCERT Publication

3) Laboratory Manual Mathematics (Higher Secondary Stage) NCERT Publication

MATHEMATICS (CODE - 041)
QUESTION PAPER DESIGN
CLASS - XII (2014-15)

Time 3 Hours   **Max. Marks: 100**

S. No.	Typology of Questions	Learning Outcomes and Testing Competencies	Very Short Answer (1 marks)	Long Answer 1 (4 marks)	Long Answer II (6 marks)	Marks	% Weightage
1	**Remembering-** **(Knowledge based** Simple recall questions, to know specific facts, terms, concepts, principles, or theories, Identify, define, or recite, information)	• Reasoning • Analytical Skills • Critcal thinking • Derivative	2	3	1	20	20%
2	**Understanding-** **(Comprehension** -to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase information)		2	2	1	16	16%
3	**Application** (Use abstract information in concrete situation, to apply knowledge to new situations, Use given content to interpret a situation, provide an example, or solve a problem)		1	3	2	25	25%
4	High Order Thinking Skills (Analysis & Synthesis- Classify, compare, contrast, or differentiate between different pieces of information, Organize and/or integrate unique pieces of information from a variety of sources)		1	2	2	21	21%
5	**Evaluation and Multi-Disciplinary-** (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)		–	2+1 (values based)	1	18	18%
	TOTAL		6x1 = 6	13x4 = 52	7x6 = 42	100	100%

QUESTION WISE BREAK UP

Type of Question	Mark per Question	Total No. of Questions	Total Marks
VSA	1	6	06
LA-I	4	13	52
LA-II	6	7	42
Total		**26**	**100**

1. *No chapter wise weightage. Care to be taken to cover all the chapters.*

2. *The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.*