

MATHEMATICS

PART - I 100

PART – II 100

TOTAL: 200

Marks: 100	PART –I (CLASS-XI)	Time: 3:00 Hours
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- UNIT-1 Complex Numbers
- 1.1 Complex Numbers
- 1.2 Equality of Two Complex Numbers
- 1.3 Complex Polynomials as a Product of Linear Factors
- 1.4 Three Cube Roots of Unity /Polar Coordinates System
- 1.5 Complex Numbers in the Real World
- UNIT-2 Functions and Graphs
- 2.1 Concept of Function
- 2.2 Finding the Intersecting Point(s) Graphically
- 2.3 Graph of the Square Root Function
- 2.4 Graph of the Cube Root Function
- 2.5 Real Life Applications
- UNIT-3 Theory of Quadratic Functions
- 3.1 Quadratic Function
- 3.2 Inverse of Quadratic Function
- 3.3 Absolute Value
- 3.4 Solutions of Equations Reducible to the Quadratic Equation
- 3.5 Real World Problems of Quadratic Equations and Inequalities
- UNIT-4 Matrices and Determinants
- 4.1 Matrix
- 4.2 Matrix Operations
- 4.3 Properties of Matrix Addition, Scalar Multiplication and Matrix Multiplication
- 4.4 Determinants
- 4.5 Adjoint and Inverse of a Square Matrix
- 4.6 Elementary Row Operations on a Matrix
- 4.7 Echelon and Reduced Echelon Forms of Matrices
- 4.8 System of Non-Homogeneous Linear Equations
- 4.9 System of Homogeneous Linear Equations
- 4.10 Applications of Matrices in Real World
- UNIT-5 Partial Fractions
- 5.1 Rational Fraction
- UNIT-6 Sequences and Series
- 6.1 Sequence
- 6.2 Arithmetic Progression or Arithmetic Sequence (A.P)
- 6.3 Arithmetic Mean (A.M)
- 6.4 Series
- 6.5 Geometric Progression (G.P)
- 6.6 Geometric Mean (G.M.)
- 6.7 Geometric Series
- 6.8 Arithmetico-Geometric Progression (A.G.P.)
- 6.9 Harmonic Progression (H.P)
- 6.10 Miscellaneous Series
- 6.11 Real Life Problems involving Sequences and Series
- UNIT-7 Permutations and Combinations
- 7.1 Fundamental Principle of Counting
- 7.2 Permutations
- 7.3 Permutation of Objects Not All Different
- 7.4 Combinations
- UNIT-8 Mathematical Inductions and Binomial Theorem
- 8.1 Principle of Mathematical Induction
- 8.2 Binomial Theorem

Marks : 100	PART – II (CLASS-XII)	Time: 3 Hours
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UNIT-1 FUNCTIONS AND LIMITS

Introduction

Concept of Function, Definition (Function – Domain – Range), Notation and Value of a Function, Graphs of Algebraic Functions, Graph of Functions Defined Piece-wise.

Types of Functions

Algebraic Functions, Trigonometric Function, Inverse Trigonometric Functions, Exponential Function, Logarithmic Function, Hyperbolic Functions, Inverse Hyperbolic Functions, Explicit Function, Implicit Function, Even Function, Odd Function

Composition of Functions and Inverse of a Function

Composition of Functions, Inverse of a Function, Algebraic Method to find the Inverse Function

Limit of a Function and Theorems on Limits

Meaning of the Phrase “x approaches zero”, Meaning of the Phrase “x approaches infinity”, Meaning of the Phrase “x approaches a”, Concept of Limit of a Function, Limit of a Function, Theorems on Limits of Function

Limits of Important Functions

$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$ where n is an integer and $a > 0$, $\lim_{x \rightarrow 0} \frac{\sqrt{x+a} - \sqrt{a}}{x} = \frac{1}{2\sqrt{a}}$ Limit at Infinity,

Method for Evaluating the Limits at Infinity, $\lim_{x \rightarrow +\infty} \left[1 + \frac{1}{n}\right] = e$, $\lim_{x \rightarrow 0} \frac{a^x - 1}{x} = \log_e a$ The

Sandwich Theorem, If θ is measured in radian, then $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$.

Continuous and Discontinuous Functions

One-Sided Limits, Criterion for Existence of Limit of a Function, Continuity of a function at a number

Graphs

Graph of the Exponential Function $f(x) = a^x$, Graph of the Exponential Function $f(x) = e^x$, Graph of Common Logarithmic Function $f(x) = \lg x$, Graphs of Natural Logarithmic Function $f(x) = \ln x$, Graphs of Implicit Functions, Graph of Parametric Equations, Graphs of Discontinuous Functions, Graphical Solution of the Equation

UNIT-2 DIFFERENTIATION : Introduction

Average Rate of Change, Derivative of a Function

Finding $f'(x)$ from definition of derivative

Derivation of x^n where $n \in \mathbb{Z}$, Differentiation of Expressions of the Types

Theorems on Differentiation

The chain rule

Derivatives of inverse functions

Derivative of a Function given in the form of parametric equations

Differentiation of Implicit Relations

Derivatives of Trigonometric Functions

Derivatives of inverse Trigonometric functions

Derivative of exponential functions

Derivative of the logarithmic function

Logarithmic differentiation

Derivative of Hyperbolic functions

Derivatives of the inverse hyperbolic functions

Successive Differentiation (or Higher derivatives)

Series expansions of functions

Taylor series expansions of functions

Geometrical interpretation of a derivative

Increasing and decreasing functions

Relative extrema

Critical values and critical points

UNIT-3 INTEGRATION: Introduction

Differentials of Variables, Distinguishing between dy and δy ,

Finding $\frac{dy}{dx}$ by using differentials, Simple application of differentials

- Integration as anti-derivative (Inverse of derivative)
 Some Standard Formulae for Anti-Derivatives, Theorems on Anti-Derivatives, Anti-Derivatives of $[f(x)]^n f'(x)$ and $[f(x)]^{-1} f'(x)$.
 Integration by method of substitution
 Some useful substitutions
 Integration by parts
 Integration involving partial fractions
 The definite integrals
 The area Under the curve, Fundamental theorem and properties of Definite Integrals
 Application of definite integrals
 Differential equations
 Solution of a differential equation of first order, Initial conditions
- UNIT-4 INTRODUCTION TO ANALYTIC GEOMETRY: Introduction
 The Distance Formula, Point dividing the join of two points in a given ratio
 Translation and rotation of axes
 Equations of straight lines
 Slope or gradient of a straight line joining two points, Equation of a straight line parallel to the x-axis (or perpendicular to the y-axis), Equation of a straight line parallel to the y-axis (or perpendicular to the x-axis), Derivation of standard forms of equations of straight lines, A linear equation in two variables represents a straight line, To transform the general linear equation to standard forms, Position of a point with respect to a line
 Two and three straight lines
 The Point of intersection of two Straight Lines, Condition of concurrency of three Straight Lines, Equation of Lines through the Point of Intersection of Two Lines, Distance of a Point from a Line, Distance between two Parallel Lines, Area of a Triangular region whose vertices are given
 Angle between two lines
 Equation of a straight line in Matrix form
 Homogeneous equation of the second degree in two variables
 Homogeneous Equation, To find measure of the Angle between the Lines represented by $ax^2 + 2hxy + by^2 = 0$
- UNIT-5 LINEAR INEQUALITIES AND LINEAR PROGRAMMING: Introduction
 Linear Inequalities
 Graphing of a linear inequality in two variables
 Region bounded by 2 or 3 simultaneous Inequalities
 Problem Constraints
 Feasible solution set
 Linear Programming
 Linear Programming Problems
- UNIT-6 CONIC SECTION: Introduction
 Equation of a Circle, General form of an Equation of a Circle, Equations of Circles determined by given conditions
 Tangents and Normals
 Length of the Tangent to a Circle (Tangential Distance)
 Analytic proofs of important Properties of a Circle
 Parabola
 General form of an Equation of a Parabola, Other standard Parabolas, Graph of the Parabola
 Ellipse and its Elements
 Standard form of an Ellipse, Graph of an Ellipse
 Hyperbola and its Elements
 Standard equation of Hyperbola, Graph of the Hyperbola
 Tangents and normals
 Translation and Rotation of Axes
 The General Equation of Second Degree
 Classification of conics by the discriminant

UNIT-7 VECTORS: Introduction

Geometric interpretation of Vector, Multiplication of Vector by a Scalar, Addition and Subtraction of two Vectors, Position Vector, Vectors in a plane, Properties of magnitude of a Vector, Another notation for representing vector in plane. A unit Vector in the direction of another given Vector, The ratio formula, Vector Geometry

Introduction of Vector in Space

Concept of a vector in space, properties of Vectors, Another notation for representing Vectors in space, Distance between two points in space, Direction Angles and Direction Cosines of a Vector

The Scalar product of two Vectors

Deductions of the important results, Perpendicular (Orthogonal) Vectors, Properties of dot product, Analytical expression of dot product $\underline{u} \cdot \underline{v}$, Angle between two Vectors, Projection of one Vector upon another Vector

The cross product or vector product of two vectors

Derivation of useful results of cross products, Properties of cross product, Analytical Expression of $\underline{u} \times \underline{v}$, Parallel Vectors, Area of Parallelogram, Area of Triangle

Scalar Triple product of Vectors

Analytical expression of $\underline{u} \cdot (\underline{v} \times \underline{w})$, The volume of the Parallelepiped, The volume of the Tetrahedron, Application of Vectors in Physics and engineering.

TOPIC-WISE WEIGHTAGE & TIME (XII)

UNIT	TOPIC		WEIGHT AGE	PERIODS (45 minutes each)
I	Functions & limits		6%	11
II	Differentiation of Functions	Polynomial & Algebraic Trigonometry and Inverse Trigonometric Logarithmic & Exponential	15%	07 07 07
	Successive differentiation and theorems and Maximum/Minimum		5%	07
III	Integration (Indefinite Integrals)	Standard forms	29%	07
		By partial fractions		07
		By Substitution		05
	Definite Integrals	By parts		07
		Area under the curve		07
		Differential Equations		
IV	Introduction to Analytic Geometry		8%	13
V	Linear In-Equalities Linear Programming		7%	07 05
VI	Conic Sections	Circle Parabola Ellipse Hyperbola General Equation	17%	12 04 04 04 04
VII	Vectors	Introduction to vector & Scalar Product Vector product Scalar triple Product	13%	07 07 04
			100%	150 (6 periods a week)

Recommended Book: "MATHEMATICS Part-II"

Author : 1. Prof. Muhammad Amin Chaudhary 2. Prof. Muhammad Sharif Ghauri
3. Prof. Muhammad Khalid Saleem 4. Mr. Mazhar Hayat

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