

4. Syllabus of Advanced Mathematics (E)

Subject Code : 19

For Class - X

Total Marks - 100

Unit-1. Set

Algebra of sets :

Proofs of laws of Algebra of sets. Derivation of $n(A \cup B) = n(A) + n(B) - n(A \cap B)$. Relation as subset of Cartesian product, function. Concepts of reflexive, symmetric and transitive relation. Equivalence relation.

Unit 2 : Complex Number :

1. Introduction to imaginary numbers.
2. Complex number, as an ordered pair of real numbers.
3. Operations of complex numbers.
4. Properties of complex numbers.
5. Diagrammatic representation of a complex number in a plane.
6. Conjugate complex number, properties of conjugate complex numbers.
7. Modulus of complex number and properties.
8. Argument of a complex number and properties.
9. Representation of complex number in (r, θ) form
10. In a quadratic equation, complex roots occur in conjugate pair (without proof).
11. Square root of complex number.

Unit -3 : Arithmetic of integers :

Method of induction (Statement only) and simple applications. Divisibility of Integers : Division algorithm, Greatest Common Divisor (GCD), simple peoperties of

GCD.

If d is the GCD of two integers a and b then there exist integers x and y such that $d = ax + by$.

Least common multiple (LCM) of integers. Theorem on GCD & LCM, Calculation of GCD of two integers by Euclid's Algorithm. Prime numbers, composite numbers perfect number, relative prime nos. congruence of integers modulo, properties of modular congruence.

Unit - 4 : Quadratic equation :

Formation of quadratic equation from roots, equations reducible to Quadratic equation. Application problems involving quadratic equation. Simultaneous equations in two variables - one linear and other quadratic.

Unit - 5 : Application of Common Logarithm :

Characteristic and Mantissa. Use of Log table in numerical calculations.

Unit -6 : Permutation & Combination :

Combination and Permutation of distinct objects only. Symbols ${}^n C_r$ and ${}^n P_r$ with proofs. Restricted permutations and combinations, applications in simple problems.

Unit -7 : Plane Trigonometry :

Trigonometric ratios for angles θ , $90^\circ \pm \theta$, $180^\circ \pm \theta$, $270^\circ \pm \theta$, $360^\circ \pm \theta$.

Trigonometric ratios of compound angles : Formula for $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$, (Idea of multiple angles and with simple application excluding identities)

Unit -8 : Plane Geometry :

Proofs of the following theorems and exercises on them :

- (i) The angles made by a tangent to a circle with a chord drawn from point of contact are respectively equal to the angles in the alternate segments of the circle.
- (ii) If two chords of a circle cut at a point within or outside it,

the rectangles contained by their segments are equal.

- (iii) If a straight line drawn from an external point P intersects a circle at A and B and a straight line drawn from P touches the circle at T then $PA \cdot PB = PT^2$.
- (iv) The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle. (The corresponding theorem about an external bisector should be given as an exercise).
- (v) If the vertical angle of a triangle is bisected by a straight line which cuts the base, the rectangle contained by the sides of the triangle is equal to the rectangle contained by the segment of the base, together with the square on the straight line which bisects the angle.
- (vi) The rectangle contained by the diagonals of a quadrilateral inscribed in a circle is equal to the sum of the two rectangles contained by the opposite sides.

Unit -9 : Co-ordinate Geometry : Straight line :

Every first degree equation in x and y represents a straight line. Equation of straight line in gradient form, intercept form and normal form, passing through two points. Angle between two straight lines and condition of perpendicularity and parallelism.

LIST OF PRACTICALS
ADVANCED MATHEMATICS (E)
Subject Code - 19, Class - X

1. Graph of Relations
2. Plotting complex numbers on Argand plane and to verify-
 - i) Whether the points are concyclic or not.
 - ii) Whether the points are collinear or not.
3. Geometrical representation of
 - i) Addition of complex numbers.
 - ii) Subtraction of complex numbers.
4. To find the prime numbers between 1 and 1000.
5. To draw the graph of quadratic polynomial $p(x)$ and find the roots of the equation $p(x)=0$ (same polynomial should **not** be given to all the students)
6. Find the values using log table.

$$i) \sqrt[11]{\frac{(4.21)^8 \times (7.294)^9}{(16.529)^{10} \times (234.1)^7}} \quad (ii) \left(\frac{315}{2^5 \times 7^6}\right)^{235}$$

Teachers are requested **not** to provide the same problem (question) to all the students. They are requested to create similar question at least 15-20 so that each student gets different question.

7. Verification of fundamental principle of counting.
8. Draw the graph of $y = \sin x$ and $y = \cos x$.
9. To draw a straight line when its slope and a point on it are given.
10. Verify the following theorems
 - i) Tangents drawn to a circle from an external point are equal in length.
 - ii) Alternate segment theorem.
 - iii) Theorems on area of rectangle related to circles.

N.B. : Students have to do atleast 8 (eight) practicals.

ADVANCED MATHEMATICS (E)

Subject Code : 19

Class-X

Time : 3 hours

Full Marks : 100

Pass Marks : 30

Internal Assessment : 10

Pass marks in written examination : 27

Sl. No.	LESSONS	Marks	
		Half Yearly	Final
1.	Sets	✓	✓
2.	Complex Numbers	✓	✓
3.	Arithmetic of Integers	✓	✓
4.	Quadratic Equation	✓	✓
5.	Applications of Common Logarithm	✓	✓
6.	Permutation and Combination		✓
7.	Trigonometry		✓
8.	Plane Geometry		✓
9.	Co-ordinate Geometry		✓
	Total	90	90
10.	Internal Assessment	10	10
	Grand Total	100	100

Textbook: New Advanced Mathematics

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* Questions from each Unit/Lesson will carry marks 2-15.