ALGEBRA SYLLABUS

1. **Preliminary Concepts**
   Natural, integer, rational, irrational numbers. Sign rules. Basic operations.

2. **Exponent Theory**
   Definitions. Properties - Exponentiation, roots.

3. **Special Products**
   Definition, identities, properties.

4. **Polynomials**
   Single-variable polynomials. Numerical value. Variable substitution. Degree (absolute/relative). Special polynomials.

5. **Algebraic Division**
   Fundamental identity. Division types (exact/inexact). Horner's/Ruffini's methods. Remainder Theorem.

6. **Divisibility**
   Divisibility theorems. Examples.

7. **Special Quotients**
   Properties. Examples.

8. **Factorization**
   Criteria: Common factor, grouping. Cross method (simple/double/special). Factor Theorem.

9. **GCD & LCM**
   Theorems. Fractions.

10. **Factorials & Combinations**
    Properties. Combinatorial numbers.

11. **Binomial Theorem**
    General term formula. Leibniz's formula.

12. **Radicals**

Simplifying double radicals. Rationalization.

13. **Rationalization**

Transformations.

14. **Complex Numbers I**

Definition. Forms (standard, conjugate). Imaginary unit powers.

15. **Complex Numbers II**

Geometric representation. Polar/exponential forms.

16. **Complex Numbers III**

Operations. De Moivre's Theorem. Roots of unity.

17. **Equation Theory I**

Polynomial equations. Fundamental Theorem of Algebra.

18. **Equation Theory II**

Quadratic/reciprocal equations. Cardano-Vieta formulas.

19. **Inequalities**

Interval types. Operations.

20. **Polynomial Inequalities I**

Linear/quadratic inequalities.

21. **Inequalities II**

Fractional/irrational inequalities (CVA).

22. **Absolute Value**

Equations/inequalities. Floor function.

23. **Relations & Functions I**

Definitions. Domain/range.

24. **Functions II**

Graphs: Linear, quadratic, absolute value, etc.

25. **Function Algebra**

Composition. Even/odd functions.

26. **Function Types**

Injective/surjective/bijective. Inverses.

27. **Matrices**

Types: Square, diagonal, symmetric, etc.

28. **Determinants & Inverses**

Sarrus' rule. Cofactors.

29. **Linear Systems**

Cramer's rule. Solution analysis.

30. **Graph Transformations**

Shifts, reflections, scaling.

31. **Linear Programming**

Feasible region. Optimal solution.

32. **Logarithms**

Properties. Decimal/natural logs.

33. **Exponential/Log Functions**

Graphs. Inequalities.

34. **Limits**

One-sided limits. Indeterminate forms.

35. **Sequences**

Convergence. Monotonicity.

36. **Series**

Convergence tests. Geometric series.

37. **Progressions**

Arithmetic/geometric. Sum formulas.

38. **Derivatives**

Introduction. Properties.