Mathematics Syllabus

The syllabus is divided into three sections: A, B and C. Section A is compulsory for all candidates. You have a choice of attempting questions from either Section B or Section C. There is one paper of three hours duration of 100 marks.

Section A (80 marks) consists of nine questions. You are required to answer Question 1 (compulsory) and five out of the rest of the eight questions.

In Section B/C (20 marks), you are required to answer two questions out of three from either Section B or Section C.

SECTION A

1. Determinants and Matrices

(i) Determinants

- Order.
- Minors.
- Cofactors.
- Expansion.
- Properties of determinants.
- Simple problems using properties of determinants

Cramer's Rule

(ii) Matrices

Martin’s Rule

2. Boolean Algebra

Boolean algebra as an algebraic structure, principle of duality, Boolean function. Switching circuits, application of Boolean algebra to switching circuits.

3. Conics

As a section of a cone.

Definition of Foci, Directrix, Latus Rectum.

PS = ePL where P is a point on the conics, S is the focus, PL is the perpendicular distance of the point from the directrix.

(i) Parabola

(ii) Ellipse

(iii) Hyperbola

4. Inverse Trigonometric Function

5. Calculus

(i) Differential Calculus

(ii) Integral Calculus

6. Correlation and Regression

- Definition and meaning of correlation and regression coefficient.
- Coefficient of Correlation by Karl Pearson.
- Rank correlation by Spearman's (Correction included).
- Lines of regression of x on y and y on x.

7. Probability

- Random experiments and their outcomes.
- Events: sure events, impossible events, mutually exclusive events, independent events and dependent events.
- Definition of probability of an event.
- Laws of probability: addition and multiplication laws, conditional probability (excluding Baye's theorem).

8. Complex Numbers

- Argument and conjugate of complex numbers.
- Sum, difference, product and quotient of two complex numbers additive and multiplicative inverse of a complex number.
- Simple locus question on complex number;
- Triangle inequality.
- Square root of a complex number.
- Demoivre's theorem and its simple applications.
- Cube roots of unity: $1,\omega,\omega^2$; application problems.

9. Differential Equations

- Differential equations, order and degree.
- Solution of differential equations.
- Variable separable.
- Homogeneous equations and equations reducible to homogeneous form.
- Linear form

SECTION B

10. Vectors

- Scalar (dot) product of vectors.
- Cross product - its properties - area of a triangle, collinear vectors.
- Scalar triple product - volume of a parallelopiped, co-planarity.

Proof of Formulae (Using Vectors)

- Sine rule.
- Cosine rule
- Projection formula
- Area of a $\Delta = \frac{1}{2}$ ab sin C

11. Co-ordinate Geometry in 3-Dimensions

(i) Lines

- Cartesian and vector equations of a line through one and two points.
- Coplanar and skew lines.
- Conditions for intersection of two lines.
- Shortest distance between two lines.

(ii) Planes

- Cartesian and vector equation of a plane.
- Direction ratios of the normal to the plane.
- One point form.
- Normal form.
- Intercept form.
- Distance of a point from a plane.
- Angle between two planes, a line and a plane.
- Equation of a plane through the intersection of two planes

12. Probability

Baye's theorem; theoretical probability distribution, probability distribution function; binomial distribution - its mean and variance.

SECTION C

13. Discount

True discount; banker's discount; discounted value; present value; cash discount, bill of exchange.

14. Annuities

Meaning, formulae for present value and amount; deferred annuity, applied problems on loans, sinking funds, scholarships. NOTE: Annuity due is required to be covered.

15. Linear Programming

Introduction, definition of related terminology such as constraints, objective function, optimization, isoprofit, isocost lines; advantages of linear programming; limitations of linear programming; application areas of linear programming; 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, optimum feasible solution.

16. Application of derivatives in Commerce and Economics

Cost function, average cost, marginal cost, revenue function and break even point.

17. Index numbers and moving averages

- Price index or price relative.
- Simple aggregate method.
- Weighted aggregate method.
- Simple average of price relatives.
- Weighted average of price relatives (cost of living index, consumer price index).