Mathematics Syllabus

There is one paper of two and a half hours duration carrying 80 marks and Internal Assessment of 20 marks. The paper is divided into two sections: Section I (40 marks) and Section II (40 marks).

Section I consists of compulsory short answer questions. In Section II, you are required to answer four out of seven questions.

1. Pure Arithmetic

Irrational Numbers

(a) Rational, irrational numbers as real numbers, their place in the number system. Surds and rationalization of surds.

(b) Irrational numbers as non-repeating, non-terminating decimals.

(c) Classical definition of a rational number p/q, p, q ε Z, q≠ 0. Hence, define irrational numbers as what cannot be expressed as above.

(d) Simplifying an expression by rationalizing the denominator.

2. Commercial Mathematics

(i) Profit and Loss

The meaning of Marked price, selling price and discount, thus giving an idea of profit and loss on day to day dealings. Simple problems related to Profit and Loss and Discount, including inverse working.

(ii) Compound Interest

Compound Interest as a repeated Simple Interest computation with a growing Principal. Use of formula - $A = P(1+r/100)^n$. Finding CI from the relation CI=A-P. Simple direct problems based on above formulae.

3. Algebra

(i) Expansions

- $(a \pm b)^2$
- $(a \pm b)^3$
- $(x \pm a)(x \pm b)$

(ii) Factorization

- $a^2 - b^2$
- $a^3 \pm b^3$
- $ax^2 + bx + c$, by splitting the middle term.

(iii) Changing the subject of a formula

Concept that each formula is a perfect equation with variables.

Concept of expressing one variable in terms, of another various operators on terms transposing the terms squaring or taking square root, etc.

(iv) Linear Equations and Simultaneous (linear) Equations

Solving algebraically (by elimination as well as substitution) and graphically.

Solving simple problems based on these by framing appropriate formulae.

(v) Indices/ Exponents

Handling positive, fractional, negative and "zero" indices.

Simplification of expressions involving various exponents; use of laws of exponents.

(vi) Logarithms

(a) Logarithmic form vis-à-vis exponential form: interchanging.

(b) Laws of Logarithms and its use

Expansion of expression with the help of laws of logarithm

4. Geometry

(i) Triangles, Relation between sides and angles of triangles. Types of triangles, Congruent triangles.

(a) Congruency: four cases: SSS, SAS, AAS, RHS. Illustration through cutouts. Simple applications.

(b) Problems based on:

- Angles opposite equal sides are equal and converse.
- If two sides of a triangle are unequal, then the greater angle is opposite the greater side and converse.
- Sum of any two sides of a triangle is greater than the third side.
- Of all straight lines that can be drawn to a given line from a point outside it, the perpendicular is the shortest.

Proofs not required.

(ii) Constructions (using ruler and compasses)

Constructions of triangles involving 30°, 45°, 60°, 75°, 90°, 120°, 135° angles.

(iii) Mid Point Theorem and its converse, equal intercept theorem

- (a) Proof and simple applications of mid point theorem and its converse.
- (b) Equal intercept theorem: proof and simple application.

(iv) Similarity, conditions of similar triangles.

- (a) As a size transformation.
- (b) Comparison with congruency, keyword being proportionality.
- (c) Three conditions: SSS, SAS, AA. Simple applications (proof not included).
- (d) Applications of Basic Proportionality Theorem.

(v) Pythagoras Theorem

Proof and Simple applications of Pythagoras Theorem and its converse.

(vi) Rectilinear Figures

Rectilinear figures or polygons, Different kinds of polygons and its names interior and exterior angles and their relations. Types of regular polygons parallelograms, conditions
of parallelograms, Rhombus, Rectangles.

Proof and use of theorems on parallelogram.

(a) Sum of interior angles of a polygon.

(b) Sum of exterior angles of a polygon.

(c) Regular polygons.

(d) Parallelogram:

- Both pairs of opposite sides equal (without proof).
- Both pairs of opposite angles equal.
- One pair of opposite sides equal and parallel (without proof).
- Diagonals bisect each other and bisect the parallelogram.
- Rhombus as a special parallelogram whose diagonals meet at right angles.
- In a rectangle, diagonals are equal, in a square they are equal and meet at right angles.

(e) Quadrilaterals

Construction of quadrilaterals (including parallelograms and rhombus) and regular hexagon using ruler and a pair of compasses only.

(f) Proof and use of area theorems on parallelograms:

- Parallelograms on the same base and between the same parallels are equal in area.
- The area of a triangle is half that of a parallelogram on the same base and between the same parallels.
- Triangles between the same base and between the same parallels are equal in area (without proof).
- Triangles with equal areas on the same bases have equal corresponding altitudes.

Note: Proofs of the theorems given above are to be taught unless specified otherwise.

5. Statistics

Introduction, collection of data, presentation of data, Graphical representation of data, Mean, Median of ungrouped data.

- (i) Understanding and recognition of raw, arrayed and grouped data.
- (ii) Tabulation of raw data using tally-marks.
- (iii) Understanding and recognition of discrete and continuous variables.
- (iv) Mean, median of ungrouped data (v) Class intervals, class boundaries and limits, frequency, frequency table, class size for grouped data.
- (vi) Grouped frequency distributions: the need to and how to convert discontinuous intervals to continuous intervals.
- (vii) Drawing a histogram and frequency polygon.
- (viii) Understanding of how a histogram differs from a bar chart.

6. Mensuration

Area and perimeter of a triangle and a quadrilateral. Area and circumference of a circle. Surface area and volume of Cube, Cuboids and Cylinder.

(a) Area and perimeter of triangle (including Heron’s formula), square, rhombus, rectangle, parallelogram and trapezium.

(b) (i) Circle: Area and circumference (ii) Simple direct problems involving inner and outer dimensions and cost.

(c) Surface area and volume of 3-D solids: cube, cuboid and cylinder including problems of type involving:

- Different internal and external dimensions of the solid.
- Cost.
- Concept of volume being equal to area of cross-section x height.
- Open/closed cubes/cuboids/cylinders.

7. Trigonometry

(a) Trigonometric Ratios: sine, cosine, tangent of an angle and their reciprocals.

(b) Trigonometric ratios of standard angles - 0, 30, 45, 60, 90 degrees. Evaluation of an expression involving these ratios.

(c) Simple 2-D problems involving one right-angled triangle.

(d) Concept of sine and cosine being complementary with simple, direct application.

8. Co-ordinate Geometry

Cartesian System, Plotting a point in the plane for given coordinates.

(a) Dependent and independent variables.

(b) Ordered pairs, co-ordinates of points and plotting them in the Cartesian Plane.

(c) Graphs of x=0, y=0, x=a, y=a, x=y, y=mx+c including identification and conceptual understanding of slope and y-intercept.

(d) Recognition of graphs based on the above.