

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF NATURAL SCIENCES, JAMIA MILLIA ISLAMIA, NEW DELHI-110025

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SYLLABUS FOR M.C.A. ENTRANCE TEST

FORMAT: Multiple-Choice Questions

Category	Distribution of Questions (approx.)
1. Mathematics (CBSE Senior Secondary/10+2 Level)	50%
2. Computer Awareness	20%
3. Reasoning	20%
4. General English	10%

DETAILED SYLLABUS

1. MATHEMATICS: Sets, Relations & Functions-Sets and their representations, Subsets, operation on sets; Ordered pairs, Cartesian product of sets. Relation and function, domain, co-domain and range; Types of relations & functions; Typical functions, sum, difference, product, and quotients of functions. **Trigonometric Functions**-Positive and negative angles, measuring angles, conversion from one measure to another; Definition of trigonometric functions, Signs of trigonometric functions, Deducing the identities, Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$; General solution of trigonometric equations. **Inverse Trigonometric Functions**-Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions. **Principle of Mathematical Induction**-proof by induction, principle of mathematical induction and simple applications. **Complex Numbers**- Real and complex numbers, Quadratic equation, algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of fundamental theorem of Algebra, solution in the complex number system. **Linear Inequalities**-Linear inequalities, Algebraic solutions of linear inequalities in one variable, Graphical solution of linear inequalities, Solution of system of linear inequalities in two variables. **Permutations & Combinations**-Fundamental principle of counting, Factorial, Permutations and combinations, derivation of formulae and their connections, simple applications. **Binomial Theorem**-statement and proof, positive integral indices, Pascal's triangle, General and middle term in binomial expansion, simple applications. **Sequence and Series**-Sequence and Series, Arithmetic progression, arithmetic mean, Geometric progression, general term of a G.P., sum of n terms of a G.P., geometric mean, relation between A.M. and G.M. Sum to n terms of the special series $\sum n$, $\sum n^2$ and $\sum n^3$. **Straight Lines**-Slope of a line and angle between two lines, Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two point form, intercepts form and normal form. General equation of a line. Distance of a point from a line. **Conic Sections**- Sections of a cone: circle, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines, Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle. **Three-dimensional Geometry**-Coordinate axes and coordinate planes, Coordinates of a point, Distance between two points and section formula. Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane. **Mathematical Reasoning**-Mathematically acceptable statements, Connecting words/ phrases and their uses; Validating the contradiction, converse and contrapositive. **Statistics**-Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances. **Probability**-Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution. **Matrices**-Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices; Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication; Non-commutativity of multiplication of matrices and existence of non-zero matrices, elementary row and column operations, Invertible matrices. **Determinants**-Determinant, properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency, solving system of linear equations. **Limits and Derivatives**-Derivative and intuitive idea of limit, definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions. **Applications of Derivatives**-Applications of derivatives: Rate of change, increasing/decreasing functions, tangents and normal, approximation, maxima and minima. **Continuity and Differentiability**-Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concepts of exponential, logarithmic functions, common Derivatives, Logarithmic differentiation. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems and their geometric interpretations. **Integrals**- Integration as inverse process of differentiation. Integration of a

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variety of functions by substitution, by partial fractions and by parts, simple integrals. **Applications of Integrals**-Applications in finding the area under simple curves, especially lines, arcs of circles/parabolas/ ellipses, area between the two above said curves. **Differential Equations**-Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equations, Solution by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equations. **Vectors**-Vectors and scalars, magnitude and direction, Types of vectors, position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio; Scalar product of vectors, projection of a vector on a line. Vector (cross) product of vectors, scalar triple product. **Linear Programming**-Introduction, related terminology such as constraints, objective function, optimization, 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, optimal feasible solutions (up to three non-trivial constrains).

2. COMPUTER AWARENESS: Computer Organization and Architecture, Components, I/O Devices, Storage Devices, Types of Computer Systems, Types of Software, Programming Languages, Number Systems, Internet vs Intranet, Popular Computer Brands, Popular Computer Software Companies, Recent Developments, Common Computer Terminologies, Windows and Current Trends/News.

3. REASONING: Logical, Symbolic, Verbal & Mathematical Reasoning, Finding Odd-Man Out, Matching, Differences, Similarities, Prediction, Interpolation and Extrapolation in Number Series, Number Series and Alphabet Series, Test of Direction Sense, Coding-Decoding, Number Ranking, Arithmetical Reasoning, Blood Relations, Analogy, Decision Making, Non-verbal Series, Mirror Images, Grouping Identical Figures & Common Reasoning Fallacies.

4. GENERAL ENGLISH: Vocabulary, Punctuation, Syntax, Verb, Forms, Spelling, Synonyms, Antonyms, Homonyms, Tense, Use of Preposition, Conjunctions, Active and Passive voice, Simple, Complex and Compound Sentences, Degree of Comparison, Direct and Indirect Speech.