

DEPARTMENT OF COMPUTER SCIENCE

JAMIA MILLIA ISLAMIA, NEW DELHI-110025

Annexure III

Syllabus : MCA Entrance Test 2022-23

FORMAT: Multiple-Choice Questions

| Category | Distribution of Questions (approx.) |
|-------------------------------------|-------------------------------------|
| Mathematics (CBSE/10+2 Level) | 40% |
| Computer Fundamental sand Awareness | 40% |
| Reasoning | 10% |
| English | 10% |

DETAILED SYLLABUS

1. MATHEMATICS: Sets, Relations and Functions - Sets and their representations, Subsets, operation on sets; Ordered pairs. Cartesian product of sets domain, co-domain and range; Types of relations & functions; Typical functions, sum, difference, product, and quotients of functions. **Complex Numbers and Quadratic Equations** - Real and complex numbers, Quadratic equations and their solutions, 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. **Binomial Theorem** - Statement and proof, positive integral indices, Pascal's triangle. General and middle term in binomial expansion, simple applications. **Permutations, Combinations and Probability** - Fundamental principle of counting. Factorial, Permutations and combinations, derivation of formulae and their connections, simple applications; Multiplication theorem on probability, Conditional probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution. **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 $\sum n^3$. **Mathematical Reasoning** - Mathematically acceptable statements, connecting words/phrases and their uses: Validating the contradiction, converse and contra positive. **Statistics** - Measure of dispersion: mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances. **Matrices and Determinants** - 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, 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, Continuity, Derivatives and their applications** - Derivative and intuitive idea of limit, definition of derivative, relate it to slope of tangent of the curve, Continuity and differentiability, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions, 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, Applications of Derivatives related to rate of change, increasing/decreasing functions, tangents and normal, errors and approximation, maxima and minima. **Integrals and their applications** - Integration as inverse process of differentiation, integration of a variety of functions by substitution, by partial fractions and by parts, simple integrals, Application of integrals in finding the area under simple curves especially lines, arcs of circles, parabolas/ellipse/hyperbolas, area between two said curves. **Differential Equation** - Definition, order and degree, General and Particular solutions of a differential equation, Formation of differential equations, Solution by method of separation of variables, homogenous differential equations of first order and first degree, Solutions of Linear differential equations. **Linear Programming** - Introduction, related terminologies such as constraints, objective functions, 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 constraints)

2. Computer Fundamentals and Awareness: Basic Computing Systems, Computer Organization and Architecture.. Layers of a Computing System, History of Computing, Computing Software, Stored-Program Concept and von Neumann Architecture. Fetch-Execute Cycle, Input-Output Devices, Mouse, Keyboard, Touch Screens. **Data Representation and Logic Gates:** Binary Values and Computers, Data and Computers, Analog and Digital Data; Binary Representation. Number Systems: Binary, Octal, Decimal, and Hexadecimal. Conversions of Data from one Number System to another Number System. Representation of Numeric Data - Negatives and Real Data Representation. Representing Texts - ASCII and Unicode Character Sets. Binary Arithmetic - Addition and Substraction of Numbers in Different Number Systems. Gates and Circuits: Computers and Electricity. **Logic Gates and Circuits:** AND, OR, NOT,

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XOR, NAND and NOR Gates. Gate Processing; Gates with More Inputs; Constructing Gates; Transistors; Circuits - Combinatorial Circuits: Adders and Multiplexers. Circuit as Memory; Integrated Circuits; CPU Chips. **Programming Languages:** Computer Operations; Levels of Abstraction; Machine Language; Assembly Language; Pseudo-Operations; Introduction to Interpreter and Compiler, Programming Language Paradigms, Procedural vs. Object-Oriented Paradigms. Boolean Expressions; Strong Typing; Input-Output Structures; Control Structures; Composite Data Types. System Programs: Compilers; Interpreters; Loader, Linker, and Operating Systems. **Memory:** Basic Concepts of Memory, Types of Memory, Hierarchy: Registers, Cache, ROM, RAM, ROM BIOS/Firmware, Secondary, Tertiary Storage Devices, and their Relative Characteristics. Internet. Popular computer brands, Software industry and popular software companies. Terminologies. Current Trends and news. **C Programming:** Basic concepts like characters, Identifiers, Data types and Range, Operators and Expressions, Precedence and Associativity, Managing console I/O; Control Structures - Branching and Looping structures; Functions - Library functions and User defined functions, Function declaration and definition, Function call, Recursion, Storage class and Scope of variables; Arrays, Strings and Pointers; Structures and Unions, Structure Pointers and Bit fields; File Handling- Defining, Opening and closing of Files, Operation on Files; Command line arguments.

3. Reasoning: Logical, Symbolic, verbal and non-verbal reasoning. Odd-man out, Matching, Differences, Similarities. Number series and Alphabet series. Test of direction-sense, coding-decoding Arithmetic reasoning, Blood relation, analogy, decision making, non verbal series, Mirror images, Common reasoning fallacies.

4. General English : Tenses-Present, past & Future, Active and Passive Voice, Simple, Complex and compound sentences Prepositions, Conjunctions, Degree of comparison, Direct and indirect speech, Punctuations, Verb Forms. Synonyms, antonyms and homonyms etc.
