

**Syllabus for the descriptive type test in computer science at the undergraduate level for students seeking admission to the CS stream of the M.Tech.(CS) and (CrS) course**

**Analytical Reasoning**

**Data structures** - array, stack, queue, linked list, binary tree, heap, AVL tree, B-tree.

**Discrete Mathematics** - recurrence relations, generating functions, graph theory - paths and cycles, connected components, trees, digraphs.

**Design and analysis of algorithms** - Asymptotic notation, searching, sorting, selection, graph traversal, minimum spanning tree.

**Switching Theory and Logic Design** - Boolean algebra, minimization of Boolean functions, combinational and sequential circuits - synthesis and design.

**Computer organization and architecture** - Number representation, computer arithmetic, memory organization, I/O organization, microprogramming, pipelining, instruction level parallelism.

**Operating systems** - Memory management, processor management, critical section problem, deadlocks, device management, file systems.

**Formal languages and automata theory** - Finite automata and regular expressions, pushdown automata, context-free grammars, Turing machines, elements of undecidability.

**Database management systems** - Relational model, relational algebra, relational calculus, functional dependency, normalization (2NF, 3NF and BCNF).

**Computer networks** - OSI, LAN technology - Bus/tree, Ring, Star; MAC protocols; WAN technology - circuit switching, packet switching; data communications - data encoding, routing, flow control, error detection/correction, Inter-networking, TCP/IP networking including IPv4.

**Syllabus for the descriptive type test in mathematics at the undergraduate level for students seeking admission to the non-CS stream of the M.Tech.(CS) and (CrS) course**

**Analytical Reasoning**

**Algebra** - Arithmetic, geometric and harmonic progressions. Continued fractions. Elementary combinatorics: Permutations and combinations, and Binomial theorem. Theory of equations. Polynomials of a single variable. Inequalities. Complex numbers and De Moivre's theorem. Elementary set theory. Functions and relations. Elementary number theory: Divisibility, congruences, and primality. Algebra of matrices. Determinant, rank and inverse of a matrix. System of linear equations. Eigenvalues and eigenvectors of matrices. Properties of symmetric and idempotent matrices. Quadratic forms. Groups and their properties. Subgroups, normal subgroups, and abelian groups. Boolean algebra.

**Coordinate geometry** - Straight lines, circles, parabolas, ellipses and hyperbolas.

**Calculus** - Sequences and series. Limits and continuity of functions of one variable. Differentiation and integration of functions of one variable with applications. Maxima and minima. Power series, Taylor and Maclaurin series. Definite integrals. Functions of several variables: limits, continuity, differentiability. Double integrals and their applications. Ordinary linear differential equations. Vector calculus.

**Elementary discrete probability theory** - Combinatorial probability, Conditional probability, and Bayes theorem. Discrete random variables. Expectation and variance of discrete random variables.

**Graph Theory** - Graphs, Adjacency matrix and adjacency list representations of graphs, subgraphs, connectivity, Trees and their properties.