Paper – I

Discrete Mathematics

Unit – I

Sets:

Sets, power sets, pictorial representation of sets, set operations, laws of the algebra of sets, principal of duality, Cartesian product of sets and cardinality, mathematical induction.

Unit – II

Relations, lattices and functions:

Proposition, binary relation, types of relations on a set, equivalence relation and partitions, partially ordered sets and lattices chains and anti chains, functions and kinds of functions.

Unit – III

Algebra structures:

Binary operations, groups, rings, fields and integral domain, elementary properties and examples.

Unit – IV

Counting techniques:

Basic counting principle of inclusion and exclusion, permutation and combinations, pigeon hole principle, discrete probability, simple examples.

Unit – V

Languages:

Alphabet, word, language, operations on language, grammars, types of grammar.

Unit – VI

Finite state machine:

Finite state automata, finite state machine, finite state machine as language Recognizer.

Unit – VII

Boolean algebra:

Boolean lattices an algebraic structure, dually, idempotent laws, bounded ness laws, absorption laws, associative laws, involution laws, De Morgan's laws, order relation in a Boolean algebra.

Unit – VIII

Boolean expressions and functions:

Boolean expression, complement of Boolean functions, switching circuits.

Unit – XI

Discrete numeric functions and generating functions.

Unit – X

Recurrence relations:

Recurrence relation, linear recurrence relation with constant constant coefficients and their solutions, solving linear recurrence relations using generating functions.

Unit – XI

Graphs – basic terminology and operations on graphs.

Graphs, incidence and degree, sub graphs, spanning sub graph, regular and complete graphs, bipartite graphs, graph isomorphism, walk and connectedness, and simple graph properties. Operations on graphs – deleting and adding vertices or edges, complement, union, intersection, join, product and composition.

Unit – XII

Graph traversals:

Eulerian and Hamiltonian graphs, their historical background and simple properties, Konigsberg bridge problem, traveling salesman problem – explanation only, shortest path Dijkstra's algorithm.

Unit – XIII

Planner graphs:

Plane and planar graphs, Kuratowski's non-planar graphs, Euler polyhedral equation, dual graph, crossing numbers and thickness of a graph.

Unit – XIV

Trees:

Trees and their simple properties centers in a tree, rooted and binary trees, spanning trees, algorithms for shortest spanning tree in a weighted graph – Kruskal and Prim's algorithm.

Unit- XV

Digraphs:

Some types of digraphs, degree, isomorphic digraphs, digraphs and binary relations, matrix representation of graphs and digraphs.