

FIRST SEMESTER

Computer Science

COURSE CS 1.1– DISCRETE MATHEMATICS: **Mathematical logic and set theory**

Block-1: Mathematical logic and set theory

Unit 1: Introduction, statements and notation- connectives, WFF- tautologies, logical implications, logical equivalence, duality, normal forms.

Unit 2: Rules of inference, predicate calculus and inference theory of the predicate calculus – problems.

Unit 3: Basic concepts of set theory, principles of inclusion and exclusion, mathematical induction.

Unit 4: Counting principles – rules of sum and products, permutations and combinations,

pigeon hole principle - simple problems. Properties, relation matrix and digraph

of a relation.Partition and covering, equivalence relation, compatibility relations,

composition of binary relations. Manipulation of relations, transitive closures.

Warshall's algorithm – related problems.

Block-II: Recurrence relation and generating functions

Unit 1: Introduction, linear recurrence relation with constant coefficient (LLR)- backtrack method, homogenous solutions, particular solutions.

Unit 2: Manipulation of numeric functions and generating functions, solution of LLR by

using generating function – problems.

Unit 3: Functions: Definitions and introduction, various types of functions, composition

of functions, inverse function, characteristic function of set.

Unit4: Permutation function, hashing function, recursive functions –

problems. Introduction, basic terminology, multi graphs of weighed graphs.

Paths and circuits, Eulerian and Hamiltonian circuits, traveling salesman

problem. Trees – rooted trees, path lengths in rooted trees, prefix codes, binary

search trees. Spanning trees, algorithm for minimal spanning trees.

Block-III: Algebraic structures

Unit 1: Introduction, semi groups and monoids, groups definition and examples, properties, sub groups.

Unit 2: Cosets and Lagrange's theorem, normal subgroups.

Unit 3: Homomorphism and isomorphism, algebraic system with two binary operations.

Unit 4: Group codes, error detecting and correcting codes.

Block-VI: Probability

Unit 1: Definition, axioms, theorems; conditional probability, Bayes' theorem.

Unit 2: Probability distributions; Discrete random variable (Bernoulli, Binomial, geometric, Poisson, uniform) distributions, mean and variance.

Unit 3: Continuous random variable(exponential, normal, uniform) distributions, mean and variance.

Unit 4: Joint probability distributions, functions of random variables, covariance and correlation.