

DISCRETE MATHEMATICAL STRUCTURES

(Common to CSE & IT)

Course Code:13BM1106

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Pre requisites:

- ❖ Fundamentals of Set theory.
- ❖ Elementary algebra and Calculus.

Course Educational Objectives:

To impart the necessary fundamental principles that are essential to study courses in computer science and related fields. To develop logical thinking and prerequisite knowledge necessary for skilled software engineer.

Course Outcomes:

Upon successful completion of the course, the students should be able to

- ❖ Explain and apply the basic methods of discrete mathematics in Computer Science.
- ❖ Use these methods in subsequent courses in the design and analysis of algorithms, Computability theory, software engineering, and computer systems.

UNIT-I

(12 Lectures)

MATHEMATICAL LOGIC:

Statements and notations, connectives, well formed formulas, tautologies, equivalence of formulas, Duality law, Tautological Implications, other connectives, Normal forms, Rules of inference, consistency of premises and indirect method of proof, Predicates, the statement function, variables and quantifiers, predicate formula, free and bound variables, universe of discourse, inference theory of the predicate calculus. (1-1, 1-2.1 to 1-2.4, 1-2.6 to 1-2.11, 1-2.14, 1-3.1 to 1-3.4, 1-4.2, 1-4.3, 1-5.1 to 1-5.5, 1-6.1 to 1-6.4 of Text book[1])

UNIT-II**(12 Lectures)****RELATIONS:**

Definition, properties of binary relations in a set, Relation matrix and Graph of a relation, Partition and covering of set, equivalence relations, partial ordering, partially ordered set.

ALGEBRAIC SYSTEMS:

Definition and examples, Semi groups and monoids: Definitions and examples, Some simple algebraic systems and general properties. Groups: Definitions and examples.

(2-3.1 to 2-3.5, 2-3.8, 2-3.9, 3-1.1, 3-1.2, 3-5.1 of Text book [1])

UNIT-III**(12 Lectures)****COMBINATORICS :**

Basics of counting, Combinations and permutations, Enumerating Combinations and permutations with repetitions, Multinomial theorems, Generating Functions of sequences, Calculating coefficients of generating functions, Recurrence relations, Solving Recurrence relations by substitution and generating functions, the method of characteristic roots.

(2.1, 2.2, 2.4, 2.7(Multinomial theorem only), 3.1 to 3.5 of Text book [2])

UNIT-IV**(12 Lectures)****GRAPH THEORY:**

Basic concepts: Graph, Directed Graph, Multi Graph, Degree of vertex and their properties, Adjacency Matrix, Cycle Graph, Bipartite graphs, Isomorphism and Subgraphs, Trees and their properties,

SPANNING TREES:

DFS, BFS, Kruskal's Algorithm for finding minimal Spanning tree. (5.1-5.4 of Text book [2])

UNIT-V**(12 Lectures)**

Representation and Manipulation of Imprecision

Fuzzy sets, Possibility theory, Applications of Fuzzy sets to Expert Systems.

(8.1 to 8.3 of Text book [2])

TEXT BOOKS:

1. J.P Tremblay, R.Manohar, “*Discrete Mathematical Structures with Applications to Computer Science*”, Tata McGraw-Hill Publishing Company Limited, 1997.
2. J.L. Mott, A. Kandel, T.P. Baker, “*Discrete Maths for Computer Scientists & Mathematicians*”, Second Edition, Prentice Hall of India Pvt Limited, New Delhi, 2009.

REFERENCE:

Kenneth Bogart, Clifford Stein, Robert L.Drysdale, “*Discrete Mathematics for Computer Science*”, Springer International Edition, 2006.

