CONTENTS

UNIT I

CHAPTER 1 : SETS

- Set Terminology
- Set Operations
- Disjoint Sets
- Some Set Identities
- Venn Diagrams
- Generalized Set Operations
- Exercises

CHAPTER 2 : LOGIC

- Proposition and Logical Connectives
- Conjunction
- Disjunction
- Negation
- Biconditional
- Conditional
- Contradiction
- Predicate Logic
- ✤ Some Important Inference Rules of Predicate Logic
- Exercises

CHAPTER 3: RELATIONS AND FUNCTIONS

- Relations
- Properties of Relations
- Functions
- Exercises

CHAPTER 4 : RECURSION

- Recursive Definition of Functions
- Exercises

CHAPTER 5 : INDUCTION

- Mathematical Induction
- General Induction
- Exercises

UNIT II

CHAPTER 1 : INTRODUCTION TO LANGUAGES

- Definitions
- Operations On Languages
- Exercisess

CHAPTER 2: FORMAL GRAMMARS AND CHOMSKY HIERARCHY

- Formal grammars
- Chomsky Hierarchy of Formal Languages
- Exercises

CHAPTER 3 : REGULAR EXPRESSIONS

- Precedence Of Operators
- Equality Of Regular Expressions
- Exercises

CHAPTER 4 : INTRODUCTION TO FINITE AUTOMATA

- Definition Of Deterministic Finite Automata
- Extended Transition Function (δ^*)
- Operation Of Finite Automata
- Properties of δ *
- Language Accepted By DFA
- Exercises

CHAPTER 5: NONDETERMINISTIC FINITE AUTOMATA

- Formal Definition
- δ^* For NFA
- Language Accepted By NFA
- NFA With ϵ -Transitions
- Epsilon-Closure
- * For ϵ -NFA
- Exercises

CHAPTER 6: REGULAR GRAMMAR AND REGULAR LANGUAGES

• Regular Grammar

- Regular Language
- Relation Between Regular Grammar And Finite Automa
- Union of regular languages
- Closure Properties Of Regular Language
- Kleen's Closure of Regular Language
- Concatenation of Regular Languages
- Complement of a Regular Language
- Intersection of Regular Languages
- Difference of Regular Languages
- Reversal Of Regular Language
- Automata For Reversal Of Regular Language
- Homomorphism
- Decision Properties Of Regular Languages
- Exercises

CHAPTER 7 : EQUIVALENCE OF FINITE AUTOMATA

- Conversion Of -NFA To NFA
- Kleene's Theorem
- Kleene's Theorem -- Part 2
- Conversion From DFA To Regular Expression
- Minimization of DFA
- Equivalence Of Two DFAs
- Exercises

ε

CHAPTER 8: NON-REGULAR LANGUAGES

- Myhill-Nerode Theorem
- Pumping Lemma
- Exercises

CHAPTER 9: FINITE AUTOMATA WITH OUTPUT

- Moore Machine
- Formal definition
- Mealy machine
- Conversion Of Moore Machine Into Mealy Machine
- Equivalence Of Moore And mealy Machine
- Conversion of Mealy machine into Moore machine
- Exercises

UNIT III

CHAPTER 1: CONTEXT-FREE GRAMMAR

- Formal Definition Of Context Free Grammar
- Derivations And Syntax Trees

- Ambiguous Grammar
- Removing Ambiguity From Grammar
- Inherently Ambiguous Grammar
- Properties Of Context-Free Languages
- Normal Forms
- Conversion Of A Context Free Grammar Into CNF
- Normalization
- Greibach Normal Form
- Pumping Lemma For Context-Free Languages
- Decision Properties Of Context Free Languages
- CYKAlgorithm
- Exercises

CHAPTER 2: PUSHDOWN AUTOMATON

- Processing of String By PDA
- Acceptance By Empty Stack
- Language Accepted By Pushdown Automata
- Equivalence Of Acceptance By Final State And Accep
- Euivalence Between PDA And CFG
- Conversion From PDA To CFG
- Deterministic Pushdown Automata
- Exercises

UNIT IV

CHAPTER 1 : TURING MACHINES

- Definition Of Turing Machine
- How To Design A Turing Machine
- Configuration Of a Turing Machine
- TM For A Context-Free Language
- TM For A Non Context-Free Language
- Variations Of Turing Machine
- Turing Machines with Two Dimensional Tapes
- Universal Turing Machine
- Two-Stack PDA (Minsky Theorem)
- Exercises
- Theorems

CHAPTER 2: LANGUAGE OF TURING MACHINE

- Unrestricted Grammar
- Equivalence Between TM And Unrestricted Grammars
- From TM To Unrestricted Grammar

- Context-Sensitive Languages
- Exercises ÷
- Theorems

CHAPTER 3: UNDECIDABILITY

- Diagonalization Language
- Halting Problem
- More Undecidable Problems •
- Definition of the problem
- Modified Post Correspondence Problem (MPCP)
- Undecidable Decision Problems Related ÷
- To Context Free Languages Other Unsolvable Problems
- ÷
- Exercise •
- Theorems •

UNIT V

CHAPTER 1 : COMPUTATIONAL COMPLEXITY

- Computational Complexity
- Big-O Notation
- Related Asymptotic Notations: O, , 0 ,
- Turing Machines And Time Complexity
- Complexity Classes ÷
- The Classes P and NP •
- NP-complete Problems
- NP-Completeness
- Polynomial time reduction
- Exercises

CHAPTER 2 : RECURSIVE FUNCTION THEORY

- The Initial Functions
- The Building Operations •
- Primitive Recursion •
- Minimization ÷
- Primitive Recursive Functions •
- **Recursive Function** •
- Ackermann function •
- Gödel Numbering •
- -Recursive Functions -
- Exercises -

CHAPTER 3 : OTHER MODELS OF COMPUTATIONS

- L-system structure
 L-Systems
 Post Systems
 Markov algorithm
 Exercises

SOLUTIONS