Contents

UNIT 1 COMPUTERS & NUMBER SYSTEMS

1.1 Introduction	2
1.1.1 Basic Outlook of Computer	2
1.2 Definition of Computer	3
1.3 Basic Functions of a Computer	3
1.4 Characteristics of Computers	4
1.5 Applications of Computers	5
1.6 Evolution of Computers	9
1.6.1 Abacus	9
1.6.2 Napier Bones	10
1.6.3 Pascals Machine	11
1.6.4 Leibnitz's Machine / Stepped Reckoner	11
1.6.5 Punch Card System	12
1.6.6 Differential Engine and Analytical Engine	12
1.6.7 Hollerith Tabulating Machine	13
1.6.8 ENIAC	14
1.6.9 EDSAC	14
1.6.10 EDVAC	15
1.6.11 UNIVAC	15
1.6.12 Microprocessor based Computer	16
1.7 Generation of Computers	16
1.7.1 First Generation Computers (1940-1956)	16
1.7.2 Second Generation Computers (1956-1963)	
1.7.3 Third Generation Computers (1964-1971)	
1.7.4 Fourth Generation Computers (1975-1989)	
1.7.5 Fifth Generation Computers (1989-present)	21

1.8 Comparison of Generation of Computer	23
1.9 Classification of Computers	24
1.9.1 Classification Based on Application	24
1.9.2 Classification Based on Operating Principle	25
1.9.3 Based on Size and Capacity	28
1.10 Basic Organization of a Computer	30
1.10.1 Input Devices	32
1.10.2 Central Processing Unit (CPU)	36
1.10.3 Memory or Storage Unit	38
1.10.4 Output Unit	46
1.11 Number System	50
1.11.1 Binary Number System	51
1.11.2 Decimal Number System	52
1.11.3 Octal Number System	52
1.11.4 Hexadecimal Number System	53
1.12 Conversion	55
1.12.1 Conversion of a Number from Any	
System to Decimal System	55
1.12.2 Converting Decimal Number to	
Other Systems	56
1.12.3 Conversion of Binary Number to Octal Number	
or Hexa Decimal Number	60
1.12.4 Conversion of Octal Number to Binary or	
Hexa Decimal Number	62
1.12.5 Conversion of Hexa Decimal Number to	
Binary or Octal Number	63
1.12.6 Conversions of Fractions Decimal Number	
to Other Systems	65

1.12.7 Conversions of Fraction of Any System
with Radix or to The Decimal System 68
1.12.8 Conversion of a Number From One System
to Other System
1.13 Solved Problems
1.14 Need for Logical Analysis and Thinking 80
1.15 Algorithm 81
1.15.1 Qualities of an Algorithm 83
1.15.2 Method for Developing an Algorithm 83
1.15.3 Structured Programming84
1.15.4 Qualities/Characteristics of a Good Algorithm
1.15.5 Examples of Algorithms in Programming
1.16 PseudoCode 87
1.16.1 Basic Guidelines of Pseudocode88
1.16.2 Advantages of Pseudocode88
1.16.3 Disadvantages of Pseudocode88
1.16.4 Solving Sample Pseudocode89
1.17 Flowchart96
1.17.1 Types of Flowchart96
1.17.2 Need for Flowchart96
1.17.3 Flowchart Symbols97
1.17.4 Basic guidelines for preparing Flowchart97
1.17.5 Advantages of Using Flowchart98
1.17.6 Limitations of Using Flowchart99
1.18 Examples for Algorithm, Flowchart and Pseudocode 100
Review Questions

UNIT 2 C PROGRAMMING BASICS

2.1 Introduction	6
2.2 Problem Formulation11	6
2.3 Problem Solving	6
2.4 Introduction to C 11	9
2.4.1 High Level Language 11	9
2.4.2 Low Level Language	9
2.4.3 Features of C	20
2.4.4 Advantages of C Language 12	21
2.4.5 Disadvantages of C Language 12	22
2.4.6 Applications of C Language 12	22
2.4.7 Characteristics of C	23
2.4.8 Valid Steps in C Language	23
2.5 Structure of C Program 12	4
2.6 Executing the C Program 12	7
2.7 Compilation and Linking Process 12	8
2.8 Fundamentals of C 12	9
2.9 Constants	3
2.9.1 Numeric Constant	33
2.9.2 Character Constant	35
2.10 Variables	8
2.10.1 Rules for Declaring the Values	38
2.10.2 Rules for Naming the Values	38
2.10.3 Declaration of Variables	39
2.10.4 User-defined Type Declaration	39
2.10.5 Scope of Variables	12
2.11 Delimiter	4

2.12 Data Types
2.13 Expressions Using Operators in 'C' 147
2.13.1 Operators
2.13.2 Types of Operators
2.14 Evaluation of Expressions
2.14.1 Precedence and Associativity of C Operators 168
2.14.2 Rules for Evaluation of Expression
2.14.3 Precedence in Arithmetic Operators
2.15 Type Conversions 170
2.15.1 Implicit Type Conversion
2.15.2 Explicit Type Conversion
2.16 Managing Input and Output Operations 174
2.16.1 Formatted Functions
2.16.2 Unformatted Functions
2.17 Decision Making and Branching 184
2.17.1 If Statement
2.17.2 Switch Statement
2.17.3 Comparison Between Switch Case
Statement and Nested if
2.17.4 Goto Statement
2.17.5 Label Statement
2.17.6 The Break Statement 198
2.17.7 Continue Statement
2.17.8 Comparison between Break and Continue 200
2.18 Looping Statements 201
2.18.1 For Loop
2.18.2 While Loop
2.18.3 doWhile Loop
2.19 Solving Simple Scientific and Statistical Problems 211
Review Questions

UNIT 3 ARRAYS AND STRINGS

3.1 Array226
3.1.1 Characteristics of Array
3.1.2 Need for an Array Variable227
3.1.3 Comparison Between Static and Dynamic Array 227
3.2 Array Declaration 227
3.3 Array Initialization
3.4 Classification of Arrays
3.4.1 One Dimensional Array
3.4.2 Multi Dimensional Array
3.5 Passing Arrays to Function
3.6 Returning Array from Function 240
3.7 String242
3.7.1 Declaring the String Variables
3.7.2 Initializing the String Variables 244
3.7.3 Reading a String 245
3.7.4 Printing a String
3.8 String Handling Functions
3.9 String Arrays
3.10 Sorting Techniques
3.10.1 Sorting - Bubble Sort
3.10.2 Insertion Sort
3.10.3 Selection Sort
3.10.4 Heap Sort
3.10.5 Quick Sort
3.10.6 Merge Sort
3.10.7 Shell Sort

3.11 Searching Techniques
3.11.1 Linear Search (Sequential Search)
3.11.2 Binary Search
3.12 Matrix
3.12.1 Types of Matrices
3.12.2 Matrix Operations
Review Questions
UNIT 4 FUNCTIONS AND POINTERS
4.1 Function
4.2 Function Declaration
4.3 Function Definition
4.3.1 Function Header
4.3.2 Function Body
4.4 Function Call
4.5 Parameters
4.6 Categories of Function
4.6.1 Function with No Arguments
and No Return Values
4.6.2 Function with Arguments and No Return Values 319
4.6.3 Function with Arguments and Return Values 321
4.6.4 Function with No Arguments and Return Values 323
4.7 Function Arguments 326
4.7.1 Passing Argument to Function
4.7.2 Two Ways of Passing Argument to Function
4.8 Pass By Value or Call by Value
4.9 Pass By Reference or Call by Reference 328

4.10 Recursion	
4.10.1 Tower of Hanoi Problem	
4.11 Pointers	
4.11.1 How to Use Pointers	
4.11.2 Features of Pointers	
4.11.3 Limitations of Pointers	
4.12 Pointer Declaration	
4.12.1 Accessing the Address of a Variable 340	
4.12.2 Accessing the Value of a Pointer Variable 341	
4.13 Initialization of Pointers	
4.13.1 Steps for Initializing Pointers	
4.13.2 NULL Pointers in C	
4.13.3 Pointer to Pointer	
4.14 Pointers Arithmetic	
4.14.1 Incrementing Pointer	
4.14.2 Decrementing Pointer	
4.14.3 Addition of Pointer and Number	
4.14.4 Subtraction of Pointer and Number	
4.14.5 Comparing Two Pointers	
4.15 Pointers and Arrays 350	
4.15.1 Accessing One Dimensional Array using Pointers 352	
4.15.2 Accessing Two Dimensional Array using Pointers 354	
4.16 Pointers To Functions354	
4.16.1 Pointers as Function Arguments or	
Call by Reference	
4.16.2 Functions Returning Pointers (Call by Value) 356	
4.17 Pointers and Strings	

4.18 Pointers and Structures
4.19 Dynamic Memory Allocation 361
4.20 Resizing and Releasing Memory
4.21 Static Memory Allocation
Review Questions
UNIT 5 STRUCTURES AND UNIONS
5.1 Introduction
5.2 Defining a Structure
5.2.1 Rules for Declaring a Structure
5.3 Declaring Structure Variables
5.3.1 Declaring more than One Structure Variables 375
5.3.2 Structure Declaration in Separate Header File 377
5.3.3 Uses of Structures
5.4 Accessing Structure Members
5.5 Structure Initialization
5.5.1 Rules for Initializing Structure
5.5.2 Comparison between Structure and Array 381
5.6 Copying and Comparing Structure Variables381
5.7 Operations on Individual Members
5.8 Nested Structure or Embedded Structure383
5.9 Array of Structures
5.10 Structure to Function
5.11 Structure and Pointers
5.12 Typedef

5.13 Union
5.13.1 Declaration of Union Variable
5.13.2 Accessing a Union Member
5.13.3 Advantages of Union
5.13.4 Disadvantages of Union
5.13.5 Comparison of Unions and Structures
5.14 Programs Using Structures and Unions 398
5.15 Storage Classes 405
5.15.1 Types of Storage Class
5.15.2 Storage Specifiers and Its Scope
5.16 PreProcessor Directives
Review Questions
Review Questions
APPENDIX
APPENDIX 1. Number System