

ESSENTIALS OF COMPUTING

C O N T E N T S

UNIT I : COMPUTERS

| | | |
|-----|-----------------------------------|-------------|
| 1.1 | WHAT IS A COMPUTER? | 1.1 |
| 1.2 | CHARACTERISTICS OF COMPUTERS | 1.16 |
| 1.3 | HISTORY OF COMPUTERS | 1.20 |
| 1.4 | CLASSIFICATION OF COMPUTERS | 1.26 |
| 1.5 | APPLICATIONS OF COMPUTERS | 1.29 |
| 1.6 | BASIC ORGANIZATION OF COMPUTER | 1.32 |
| 1.7 | DATA REPRESENTATION | 1.55 |
| | 1.7.1 Introduction | 1.55 |
| | 1.7.2 Basics of Spreadsheet | 1.57 |
| | 1.7.3 Data Visualization in Excel | 1.85 |
| | ACTIVITIES | 1.86 |

UNIT II : COMPUTATIONAL THINKING

| | | |
|-----|--|------|
| 2.1 | WHAT IS COMPUTATIONAL THINKING? | 2.1 |
| 2.2 | DECOMPOSITION | 2.7 |
| 2.3 | ABSTRACTION: CLASS DIAGRAMS | 2.10 |
| | 2.3.1 Abstraction: Use Case Diagrams | 2.13 |
| 2.4 | NUMBER SYSTEMS | 2.16 |
| 2.5 | REAL WORLD INFORMATION TO COMPUTABLE DATA | 2.39 |
| | 2.5.1 Converting Information into Data | 2.43 |
| | 2.2.2 Data Capacity | 2.46 |
| 2.6 | LOGIC | 2.49 |
| | 2.6.1 What is Logic? | 2.49 |
| | 2.6.2 Key Aspects of Logic in Computational Thinking | 2.50 |
| | 2.6.3 Types of Logic – Elaborate Notes | 2.51 |
| | 2.6.4 Importance of Logic | 2.56 |
| | 2.6.5 Boolean Logic | 2.59 |
| | 2.6.6 Propositional Logic | 2.61 |

ESSENTIALS OF COMPUTING

| | | |
|--|---|-------------|
| 2.6.7 | Writing Well-Formed Propositions | 2.62 |
| 2.6.8 | Evaluating Propositions | 2.65 |
| 2.6.8.1 | Conjunction (AND) | 2.66 |
| 2.6.8.2 | Disjunction (OR) | 2.67 |
| 2.6.8.3 | Implication (IMPLIES) | 2.68 |
| 2.6.8.4 | Equivalence (\equiv) | 2.69 |
| 2.6.8.5 | Logical Negation (NOT) | 2.70 |
| 2.6.8.6 | Compound Propositions | 2.70 |
| 2.6.8.7 | Logical Equivalence | 2.73 |
| 2.6.8.8 | Tautologies and Contradictions | 2.73 |
| 2.6.9 | Applications of Propositional Logic | 2.74 |
| 2.6.9.1 | Search Queries | 2.74 |
| 2.6.9.2 | Conjunction in Search Queries | 2.75 |
| 2.6.9.3 | Disjunction in Search Queries | 2.75 |
| 2.6.9.4 | Negation in Search Queries | 2.75 |
| 2.6.10 | Digital Logic | 2.75 |
| 2.6.10.1 | Image Compositing | 2.77 |
| 2.6.10.2 | Database Queries | 2.79 |
| NUMBER SYSTEM (Solutions) | | 2.79 |
| UNIT III : PROBLEM SOLVING BASICS | | |
| 3.1 | PROBLEM DEFINITION | 3.1 |
| 3.2 | LOGICAL REASONING | 3.8 |
| 3.3 | DECOMPOSITION: SOFTWARE DESIGN | 3.17 |
| 3.4 | SOFTWARE DESIGN PROCESS | 3.24 |
| 3.4.1 | What is Software Design Process? | 3.24 |
| 3.4.2 | Software Design Levels | 3.24 |
| 3.4.3 | Software—Design-Phases | 3.26 |
| 3.4.4 | Elements of Software Design | 3.27 |
| 3.4.5 | How Software Design Fits into the SDLC? | 3.28 |
| 3.4.6 | Software Design Principles | 3.28 |
| 3.4.7 | Tools for Software Design | 3.29 |
| 3.4.8 | Coupling and Cohesion | 3.29 |
| 3.4.8.1 | Cohesion | 3.30 |
| 3.4.8.2 | Coupling | 3.30 |

ESSENTIALS OF COMPUTING

| | | |
|----------|---|-------|
| 3.4.9 | Software Analysis & Design Tools | 3.31 |
| 3.4.9.1 | Data Flow Diagram | 3.31 |
| 3.4.9.2 | Types of DFD | 3.31 |
| 3.4.9.3 | Structure Charts | 3.33 |
| 3.4.9.4 | HIPO Diagram | 3.36 |
| 3.4.9.5 | Structured English | 3.37 |
| 3.4.9.6 | Pseudo-Code | 3.38 |
| 3.4.9.7 | Decision Tables | 3.39 |
| 3.4.9.10 | Entity-Relationship Model | 3.39 |
| 3.5 | THE CONCEPT OF AN ALGORITHM | 3.42 |
| 3.6 | REPRESENTATION OF ALGORITHM | 3.50 |
| 3.6.1 | VERBAL representations of an algorithm | 3.51 |
| 3.6.2 | Pseudocode Representation of an Algorithm | 3.51 |
| 3.6.3 | Flow Chart Representation of an Algorithm | 3.54 |
| 3.7 | ALGORITHM DISCOVERY | 3.66 |
| 3.8 | ITERATION STATEMENTS IN PROGRAMMING | 3.71 |
| 3.9 | RECURSIVE STRUCTURES | 3.79 |
| 3.9.1 | Binary Search Algorithm | 3.82 |
| 3.9.2 | Dynamic Programming (Top-Down) | 3.87 |
| 3.10 | EFFICIENCY AND CORRECTNESS | 3.95 |
| 3.10.1 | Algorithm Efficiency | 3.95 |
| 3.10.1.1 | Time Efficiency | 3.95 |
| 3.10.1.2 | Space Efficiency | 3.96 |
| 3.10.2 | Algorithm Correctness | 3.99 |
| 3.11 | IMPLEMENTATION OF ALGORITHMS | 3.105 |
| 3.11.1 | Phases of Implementation | 3.105 |
| 3.11.2 | Methods of Implementation | 3.107 |
| 3.11.3 | Fundamental Algorithms | 3.111 |
| 3.11.3.1 | Exchanging the values of two variables | 3.111 |
| 3.11.3.2 | Counting of Numbers | 3.113 |
| 3.11.3.3 | Summation of a set of numbers | 3.117 |
| 3.11.3.4 | Factorial Computation | 3.120 |
| 3.11.3.5 | Generation of Fibonacci Sequence | 3.122 |

ESSENTIALS OF COMPUTING

| | |
|---|--------------|
| 3.11.3.6 Reversing the digits of an Integer | 3.124 |
| 3.11.3.7 Base Conversion | 3.126 |
| ACTIVITIES | 3.129 |

UNIT IV : PROGRAMMING LANGUAGES

| | |
|--|------|
| 4.1 PROGRAM DEVELOPMENT LIFE CYCLE | 4.1 |
| 4.2 PROGRAM DESIGN TOOLS | 4.5 |
| 4.2.1 What are Software Analysis and Design Tools? | 4.7 |
| 4.2.2 Data Flow Diagram | 4.7 |
| 4.2.3 Structure Charts | 4.13 |
| 4.2.4 HIPO Diagram | 4.16 |
| 4.2.5 Structured English | 4.17 |
| 4.2.6 Pseudo-Code | 4.17 |
| 4.2.7 Decision Tables | 4.18 |
| 4.2.8 Entity-Relationship Model | 4.22 |
| 4.2.9 Data Dictionary | 4.32 |
| 4.3 ALGORITHMS | 4.36 |
| 4.3.1 How to Design an Algorithm? | 4.40 |
| 4.3.2 How to Analyze an Algorithm? | 4.42 |
| 4.3.3 What is Algorithm complexity and how to find it? | 4.43 |
| 4.3.4 How to Calculate Space Complexity? | 4.43 |
| 4.3.5 How to Calculate, Time Complexity? | 4.44 |
| 4.3.6 How to express an Algorithm? | 4.45 |
| 4.4 FLOWCHARTS | 4.45 |
| 4.4.1 When to Use Flowchart? | 4.47 |
| 4.5 PSEUDOCODES | 4.55 |
| 4.5.1 How to write a Pseudo-code? | 4.55 |
| 4.6 ROLE OF ALGORITHMS | 4.56 |
| 4.7 PROGRAMMING LANGUAGES | 4.60 |
| 4.8 PROGRAMMING PARADIGMS | 4.63 |
| 4.9 TRADITIONAL PROGRAMMING CONCEPTS | 4.69 |
| 4.10 PROCEDURAL UNITS | 4.72 |

ESSENTIALS OF COMPUTING

| | |
|----------------------------------|-------------|
| 4.11 LANGUAGE IMPLEMENTATION | 4.75 |
| 4.12 DECLARATIVE PROGRAMMING | 4.78 |
| 4.13 SUGGESTED ACTIVITIES | 4.80 |

UNIT V : SCRATCH PROGRAMMING

| | |
|--|------|
| 5.1 WHAT IS SCRATCH? | 5.1 |
| 5.2 SCRATCH PROGRAMMING ENVIRONMENT | 5.3 |
| 5.3 PAINT EDITOR | 5.16 |
| 5.3.1 Example-1: First scratch game | 5.17 |
| 5.4 SCRATCH BLOCKS | 5.22 |
| 5.5 ARITHMETIC OPERATORS AND FUNCTIONS | 5.23 |
| 5.5.1 Arithmetic Operators | 5.23 |
| 5.6 MOTION AND DRAWING | 5.24 |
| 5.6.1 Using Motion Commands | 5.24 |
| 5.7 PEN COMMANDS AND EASY DRAW | 5.31 |
| 5.8 THE POWER OF REPEAT | 5.50 |
| 5.9 LOOKS AND SOUND | 5.54 |
| 5.9.1 The Looks Palette | 5.54 |
| 5.9.2 Changing Costumes to Animate (Animation.sb2) | 5.54 |
| 5.9.3 Sprites That Speak and Think | 5.56 |
| 5.9.4 Image Effects (GraphicEffects .sb2) | 5.56 |
| 5.9.5 Size and Visibility | 5.57 |
| 5.9.6 Layers (Layers.sb2) | 5.58 |
| 5.10 THE SOUND PALETTE | 5.58 |
| 5.10.1 Playing Audio Files | 5.58 |
| 5.10.2 Playing Drums and Other Sounds | 5.59 |
| 5.10.3 Composing Music | 5.60 |
| 5.10.4 Controlling Sound Volume (VolumeDemo.sb2) | 5.61 |
| 5.10.5 Setting the Tempo | 5.61 |
| 5.11 VARIABLES | 5.62 |
| 5.11.1 Data Types in Scratch | 5.62 |

ESSENTIALS OF COMPUTING

| | | |
|----------------------------------|---|--------------|
| 5.11.2 | What is in shapes? | 5.62 |
| 5.11.3 | Automatic Data Type Conversion | 5.63 |
| 5.12 | INTRODUCTION TO VARIABLES | 5.64 |
| 5.13 | GETTING INPUT FROM USERS | 5.73 |
| 5.14 | MAKING DECISIONS - OPERATORS IN SCRATCH | 5.80 |
| 5.14.1 | Relational/Comparison Operator | 5.80 |
| 5.15 | LOGICAL-OPERATORS IN SCRATCH | 5.83 |
| 5.16 | COMPARING LETTERS AND STRINGS | 5.86 |
| 5.17 | DECISION STRUCTURES | 5.88 |
| 5.18 | SCRATCH ITERATION BLOCK | 5.93 |
| 5.19 | STOP COMMAND | 5.100 |
| 5.20 | COUNTERS | 5.103 |
| 5.20.1 | Check a Password- Password Check.sb2 | 5.103 |
| 5.20.2 | Examples | 5.104 |
| 5.21 | NESTED LOOPS | 5.106 |
| 5.22 | RECURSION: PROCEDURES THAT CALL THEMSELVES - RECURSION.SB2 | 5.111 |
| 5.23 | STRING PROCESSING | 5.113 |
| 5.23.1 | String data Types | 5.113 |
| 5.23.2 | Counting Special Characters in a String- VowelCount.sb2 | 5.113 |
| 5.23.3 | Comparing String Characters -Palindrome.sb2 | 5.114 |
| 5.23.4 | String Manipulation | 5.116 |
| 5.24 | LIST | 5.119 |
| 5.25 | DYNAMIC LISTS | 5.121 |
| 5.26 | NUMERICAL LISTS IN SCRATCH | 5.125 |
| 5.27 | SORTING NUMBERS IN SCRATCH | 5.129 |
| 5.28 | SEARCHING IN A LIST (LINEAR SEARCH) | 5.130 |
| ACTIVITIES | | 5.131 |
| UNIT VI : APP DEVELOPMENT | | |
| 6.1 | BUILDING AN APP USING A PROBLEM | 6.1 |
| 6.2 | SOLVING TECHNIQUES ON APP DEVELOPMENT PLATFORM | 6.3 |

ESSENTIALS OF COMPUTING

| | | |
|------|--|-------------|
| 6.3 | SOFTWARE DEVELOPMENT MODELS | 6.5 |
| 6.4 | INCREMENTAL MODEL | 6.12 |
| 6.5 | ITERATIVE MODEL | 6.17 |
| 6.6 | REUSABLE MODULES FOR MOBILE APPS | 6.21 |
| 6.7 | PROBLEMS WITH REUSE | 6.22 |
| 6.8 | THE REUSE LANDSCAPE | 6.23 |
| 6.9 | APPROACH THAT SUPPORTS SOFTWARE REUSE | 6.24 |
| 6.10 | MODULARIZATION | 6.26 |
| 6.11 | ALGORITHM THINKING TECHNIQUES IN APP DEVELOPMENT | 6.28 |
| 6.12 | ABSTRACTION IN APP DEVELOPMENT | 6.31 |
| 6.13 | DECOMPOSITION METHOD IN APP DEVELOPMENT | 6.33 |
| 6.14 | TESTING AND DEBUGGING | 6.37 |
| | ACTIVITIES | 6.46 |

TWO MARKS QUESTIONS AND ANSWERS