

Table of Contents

Introduction	xi
Chapter 1: Structured Programming with C++	1
1.1 Introduction to C++.....	1
1.2 History of C++	2
C: Procedure-Oriented Programming.....	2
C++: Object Oriented Programming.....	3
1.3 C++: Superset of the C Programming Language	4
Commonly used Terms in C++.....	5
C ++ Library Functions and Linkers	6
Process Flow of C++ Programs.....	7
1.4 Exploring the Basic Components of C++	11
Keywords.....	12
Identifiers.....	13
Comments.....	13
Constants.....	14
Variables.....	16
Data Types	19
Preprocessor Directives.....	37
Operators in C++	42
Streams in C++.....	73
Summary.....	76
Exercises.....	76
True or False	76
Multiple Choice Questions	76
Short Questions/Answers	78
Debugging Exercises	84

Chapter 2: Input/Output Data and Flow Controls.....	89
2.1 Exploring Data Input and Output Processes	89
Using getchar() and putchar() Functions.....	90
Using scanf() and printf() Functions	90
Using gets() and puts() Functions.....	93
Using cout and cin Objects	95
Working with Manipulators.....	96
2.2 Working with Conditional Statements	102
Using the if Statement	102
Using the if-else Statement	103
Creating the Nested if Statements	105
Using the if-else Ladder	107
Using the switch Statement	108
Creating Nested switch Statements.....	110
2.3 Working with Iteration Statements	112
Using the while Loop	112
Creating Nested while Loop	115
Using the do-while Loop	116
Using the for Loop	118
Creating Nested for Loop	123
2.4 Working with Jump Statements.....	124
Using the break Statement.....	124
Using the continue Statement	125
Using the goto Statement.....	126
2.5 Using the exit() and abort() Functions	128
Summary	129
Exercises	129
True or False	129
Multiple Choice Questions	130
Short Questions/Answers	133
Debugging Exercises	135

Chapter 3: Working with Arrays and Functions	143
3.1 Arrays.....	144
One-dimensional Array	147
Two-dimensional Array.....	148
Three-dimensional Array.....	151
3.2 Function	160
Discussing the Types of C++ Functions	161
Declaring a Function Prototype	163
Defining a Function	164
Calling a Function.....	165
Passing Arguments to a Function.....	166
Returning a Value from a Function.....	167
Describing Function Returning void.....	170
Specifying Default Argument	170
Describing Call by Value and Call by Reference	171
Passing Array to a Function	176
Passing Function Argument as const	180
Passing String to a Function	181
Using Recursion	182
Creating Inline Function	183
Using String Library Functions.....	185
3.3 Scope of Variable.....	190
Local Variable.....	191
Global Variable.....	192
3.4 Exploring Storage Classes.....	194
Using the Automatic Storage Class	195
Using the Static Storage Class	196
Using the External Storage Class	196
Using the Register Storage Class	197
3.5 Declaring and Using const Variable	198
Summary	199
Exercises	199
True/False Questions.....	199

Multiple Choice Questions	200
Short Questions/Answers	202
Debugging Exercises	205
Chapter 4: Pointer.....	211
4.1 Managing Memory by Using Pointers	211
Getting Variable Address with the & Operator	212
Declaring Pointers.....	213
Creating and Using Pointers	214
Using Other Pointer Types	215
Using Pointer to Pointer.....	216
Handling Memory at Runtime with Pointers	218
4.2 Exploring Arrays with Pointers	219
Using Pointer Arithmetic.....	221
Using Pointers with Character Strings.....	223
Exploring Dynamic Array	225
4.3 Using Pointers as Function Arguments	230
4.4 Returning Pointers from a Function.....	231
Summary.....	241
Exercises	241
True or False	241
Multiple Choice Questions	242
Short Questions/Answers	244
Debugging Exercises	247
Chapter 5: Structures and Unions	253
5.1 Exploring Structures in C++.....	253
Accessing and Initializing Structure Elements	256
Creating Nested Structure	259
Creating Structure inside the Function.....	263
Passing Structure to a Function	264
Returning Structure from Function.....	266
Creating an Array in a Structure.....	267
Creating an Array of Structure.....	268

Using Structure Array as a Function Argument.....	273
Using Pointers with Structure	276
Passing a Structure Pointer to a Function.....	281
Linked List using the Structure and Pointer	283
5.2 Union in C++.....	293
Creating a Structure Instance as a Union Member.....	296
Creating a Union Instance as a Structure Member.....	297
Summary.....	299
Exercises.....	299
True or False	299
Multiple Choice Questions	300
Short Questions/Answers	302
Debugging Exercises	306
Chapter 6: Object-Oriented Programming with C++	317
6.1 Exploring Basic Concepts of Object-Oriented Programming.....	318
Object.....	318
Class.....	319
Method	319
Message Passing.....	320
Abstraction.....	320
Encapsulation.....	320
Inheritance	321
Polymorphism.....	322
6.2 Working with Classes and Objects.....	323
Defining a Class	323
Creating an Object	325
Creating Data Members	327
Using Access Specifiers.....	327
Creating Member Functions.....	329
6.3 Explaining the Difference between C Structures and C++ Classes.....	338
6.4 Creating Data Access Methods	339
6.5 Creating Inline Functions	340

	Difference between Inline Functions and Macros	343
6.6	Working with Constructors and Destructors.....	344
	Declaring and Using Constructors	346
	Creating Dynamic Constructors	358
	Declaring and Using Destructors.....	361
6.7	Exploring Local and Nested Classes	365
	Nested Classes.....	366
	Creating Local Classes.....	369
6.8	Passing Objects as Function Parameters.....	370
	Passing an Object as a Function Argument-By Value.....	371
	Passing an Object as a Function Argument-By Reference.....	372
6.9	Returning Objects from Functions.....	376
	Returning Objects from non-member Functions	376
	Returning Objects from Member Functions	377
6.10	Working with Arrays in C++	379
	Using an Array in a Class	379
	Creating an Array of Objects.....	383
6.11	Creating a const Object.....	385
6.12	Using the this Pointer	386
6.13	Working with Friend Functions and Friend Classes.....	388
	Defining a Friend Function.....	389
	Creating a Friend Function as a Bridge between Two Classes	391
	Creating Friend Classes	392
6.14	Declaring and Using Static Variables and Functions	393
	Declaring and Using Static Variables	394
	Declaring and Using Static Functions	396
6.15	Overloading.....	399
	Function Overloading	399
	Constructor Overloading.....	402
	Operator Overloading.....	406
	Overloading of Unary Operator Returning Object	417
	Adding Objects with Built-in Data Types.....	430
	Summary.....	437

Exercises	437
True or False	437
Multiple Choice Questions	438
Short Questions/Answers	441
Debugging Exercises	444
Chapter 7: About Inheritance	455
7.1 Exploring the Concept of Base and Derived Classes	456
7.2 Using the protected Access Specifier	458
7.3 Creating a Simple Program of Inheritance	459
7.4 Explaining Various Types of Derivations	461
7.5 Overriding Base Class Members	464
7.6 Invoking Constructors and Destructors of Base and Derived Classes	468
7.7 Creating Container Classes	480
7.8 Explaining the Forms of Inheritance	485
Single Inheritance	485
Multilevel Inheritance	490
Hierarchical Inheritance	496
Multiple Inheritance	504
Hybrid Inheritance	512
7.9 Describing Some Problems While Implementing Multiple Inheritance	517
Overriding Base Class Functions in the Derived Class	519
Using the Scope Resolution Operator	520
Implementing the Concept of Virtual Base Classes	522
7.10 Creating and Using Pointer Objects	531
Creating a Pointer of Class Members	535
Creating an Array of Pointer Objects	538
Creating Pointer Objects of the Base and Derived Classes	540
7.11 Implementing Static and Dynamic Binding	542
Implementing Static or Early Binding	543
Implementing Dynamic or Late Binding using Virtual Functions	545
Explaining the Difference between Static and Dynamic Binding	554
Creating Pure Virtual Functions	555

x ► Table of Contents

Creating Abstract Classes	557
Creating Virtual Destructors	560
Summary	563
Exercises	563
True or False	563
Multiple Choice Questions	564
Short Questions/Answers	566
Debugging Exercises	571
Frequently Asked Questions	585
Index	723