

Table of Contents

Introduction	xiii
Chapter 1: Concepts of OOP	1
1.1 Procedural Vs. Object-Oriented Programming	1
1.1.1 Features of Procedure-Oriented Language	2
1.1.2 Features of Object-Oriented Programming Language	2
1.1.3 Difference between C and C++	3
1.2 Basic Concepts and Principles of OOP	3
1.2.1 Object	4
1.2.2 Class	5
1.2.3 Method	5
1.2.4 Message Passing	5
1.2.5 Abstraction	5
1.2.6 Encapsulation	6
1.2.7 Inheritance	6
1.2.8 Polymorphism	7
1.3 Benefits of OOP	8
1.4 Applications of OOP	8
Summary	9
Key Terms	9
Review Exercise	10
True and False	10
Multiple Choice Questions	10
Short Descriptive Questions	12
Chapter 2: C++ Basics	15
2.1 Overview of C++	15
2.1.1 History of C++	16
2.2 Program Structure	16

2.2.1	Commonly used Terms in C++	17
2.2.2	C++ Library Functions and Linkers.....	18
2.2.3	Process Flow of C++ Programs.....	19
2.3	Exploring the Basic Components of C++	22
2.3.1	Keywords	23
2.3.2	Identifiers.....	24
2.3.3	Comments.....	24
2.3.4	Constants.....	25
2.3.5	Variables.....	28
2.3.6	Data Types.....	31
2.4	Type Casting in C++	46
2.5	Preprocessor Directives.....	47
2.5.1	The #define Directive.....	48
2.5.2	The #undef Directive.....	50
2.5.3	The #include Directive.....	50
2.5.4	Directives used in Conditional Compilation	51
2.6	Operators in C++	52
2.6.1	Unary Operators	52
2.6.2	Binary Operators.....	54
2.6.3	Shift Operators	64
2.6.4	The Ternary Operator	65
2.6.5	Special Operators	66
2.6.6	Operator Precedence in C++	70
2.6.7	Operator Associativity.....	74
2.7	Namespace.....	76
2.8	Control Structures.....	77
2.8.1	Working with Conditional Statements	77
2.8.2	Working with Iteration Statements.....	86
2.8.3	Working with Jump Statements.....	93
2.8.4	Using the exit() and abort() Functions	96

Summary	98
Key Terms	98
Review Exercise	99
True and False.....	99
Multiple Choice Questions.....	101
Short Descriptive Questions	103
Practical Problems.....	109
Chapter 3: C++ Functions.....	121
3.1 Explore Functions.....	121
3.1.1 Discussing the Types of C++ Functions.....	123
3.1.2 Declaring a Function Prototype	125
3.1.3 Defining a Function	126
3.1.4 Calling a Function.....	126
3.1.5 Passing Arguments to a Function.....	128
3.1.6 Returning a Value from a Function.....	129
3.1.7 Describing Function Returning void.....	130
3.1.8 Passing Default Arguments	130
3.1.9 Passing Array to a Function	131
3.1.10 Passing Function Argument as const.....	133
3.1.11 Passing String to a Function	134
3.2 Describing Call by Value and Call by Reference	134
3.3 Inline Functions.....	137
3.3.1 Macro vs. Inline Functions.....	139
3.4 Overloading of Functions	140
3.5 String Library Functions.....	142
3.5.1 The strcmp() Function.....	142
3.5.2 The strcat() Function.....	143
3.5.3 The strrev() Function	144
3.5.4 The strcpy() Function.....	144
3.5.5 The strlen() Function	145

3.6	Recursive Functions.....	146
3.7	Friend Functions.....	147
	Summary.....	149
	Key Terms.....	149
	Review Exercise.....	150
	True and False.....	150
	Multiple Choice Questions.....	150
	Short Descriptive Questions.....	152
	Practical Problems.....	153

Chapter 4: Objects and Classes 167

4.1	Basics of Object and Class in C++.....	168
	4.1.1 Creating an Object.....	169
	4.1.2 Creating Data Members.....	171
4.2	Private and Public Members.....	172
4.3	Member Functions.....	173
	4.3.1 Creating const Functions.....	177
	4.3.2 Nesting of Member Functions.....	178
4.4	Data Access Methods.....	179
4.5	Constructors and Their Types.....	180
	4.5.1 Declaring and Using Constructors.....	182
4.6	Destructors.....	194
4.7	Passing Objects as Function Parameters.....	197
	4.7.1 Passing an Object as a Function Argument-By Value.....	197
	4.7.2 Passing an Object as a Function Argument-By Reference.....	198
4.8	Returning Objects from Functions.....	201
	4.8.1 Returning Objects from Non-Member Functions.....	201
	4.8.2 Returning Objects from Member Functions.....	203
4.9	Creating a const Object.....	204
4.10	Static Data.....	205
	4.10.1 Declaring and Using Static Variables.....	206

4.10.2	Declaring and Using Static Functions	208
4.11	Operator Overloading.....	210
4.11.1	Overloading of Unary Operators.....	213
4.11.2	Overloading of Increment (++) Operators	216
4.11.3	Overloading of Unary Operator Returning Object.....	217
4.11.4	Overloading of Binary Operators	219
4.11.5	Adding Objects with Built-in Data Types	224
4.11.6	Overloading of Relational Operators	226
4.12	Type Conversion.....	227
	Summary	229
	Key Terms	229
	Review Exercise	229
	True and False.....	229
	Multiple Choice Questions.....	230
	Short Descriptive Questions	233
	Practical Problems.....	234
Chapter 5: Inheritance	249	
5.1	Concept of Inheritance	250
5.1.1	Advantages of Inheritance	250
5.1.2	Simple Program of Inheritance	251
5.2	Protected Members	253
5.2.1	Types of Derivations.....	254
5.2.2	Class Members Accessibility	255
5.3	Overriding.....	257
5.4	Types of Inheritance.....	259
5.4.1	Implementing Single Inheritance	259
5.4.2	Implementing Multilevel Inheritance.....	260
5.4.3	Implementing Hierarchical Inheritance.....	263
5.4.4	Implementing Multiple Inheritance.....	266
5.4.5	Implementing Hybrid Inheritance.....	268

5.5	Ambiguity and Solution While Implementing Multiple Inheritance	273
5.5.1	Using the Scope Resolution Operator	274
5.5.2	Implementing the Concept of Virtual Base Classes.....	275
5.6	Constructors and Destructors Invocation Order in Multiple Inheritance .	276
	Summary	279
	Key Terms	279
	Review Exercise	279
	True and False.....	279
	Multiple Choice Questions.....	280
	Short Descriptive Questions	281
	Practical Problems.....	283

Chapter 6: Pointers and Polymorphism..... 299

6.1	Pointers in C++	300
6.1.1	Getting Variable Address with the & Operator	300
6.1.2	Declaring Pointers.....	301
6.1.3	Creating and Using Pointers.....	302
6.1.4	Using Pointer to Pointer	303
6.1.5	Using Arrays with Pointers	304
6.1.6	Using Pointers with Character Strings	307
6.2	Pointers and Objects.....	308
6.3	Dynamic Memory Management Using Operators.....	309
6.3.1	Using the new Operator to Allocate Memory	309
6.3.2	Using the delete Operator to De-allocate Memory	309
6.4	The this Pointer.....	310
6.5	Implementing Polymorphism.....	312
6.5.1	Implementing Static or Early Binding	313
6.5.2	Virtual Functions	315
6.5.3	Creating Pure Virtual Functions	318
6.5.4	Creating Abstract Classes	320
	Summary	323

Key Terms	323
Review Exercise	323
True and False.....	323
Multiple Choice Questions.....	325
Short Descriptive Questions	326
Practical Problems.....	329
Chapter 7: I/O and File Management.....	337
7.1 Concept of Streams.....	337
7.2 The cin and cout Objects	338
7.3 C++ Stream Classes	339
7.4 Unformatted I/O	340
7.4.1 Using the get() and put() Functions.....	341
7.4.2 Using the read() and write() Functions	341
7.5 Formatted I/O	342
7.6 Manipulators.....	343
7.6.1 Using the endl Manipulator.....	343
7.6.2 Using the setw() Manipulator	344
7.6.3 Using the setprecision() Manipulator.....	345
7.6.4 Using the setfill() Manipulator	346
7.6.5 Creating Customized Manipulator.....	347
7.7 Stream Error States.....	348
7.8 File Stream.....	349
7.9 C++ File Stream Classes	350
7.10 File Management Functions.....	351
7.10.1 File Modes.....	351
7.10.2 Functions Detecting Stream States.....	351
7.10.3 Stream Pointers	352
7.10.4 Writing Data to a Sequential Access File	353
7.10.5 Reading Data from a Sequential Access File	354
7.11 Binary and Random Files.....	356

7.11.1	Creating a Random Access File	357
7.11.2	Writing Data Randomly to a Random Access File.....	357
7.11.3	Reading Data Sequentially from a Random Access File.....	358
7.11.4	Reading Data Randomly from a File	359
	Summary	360
	Key Terms	360
	Review Exercise	361
	True and False.....	361
	Multiple Choice Questions.....	361
	Short Descriptive Questions	362
	Practical Problems.....	363
Chapter 8:	Templates, Exceptions, and STL.....	365
8.1	What is Template?	366
8.1.1	Function Templates	367
8.1.2	Class Templates.....	368
8.2	Overview and Use of Standard Template Library.....	369
8.2.1	Containers	370
8.2.2	Iterators.....	371
8.2.3	Algorithms.....	372
8.3	Basics of C++ Exception Handling.....	372
8.3.1	Try Block	373
8.3.2	Catch Block	373
8.3.3	Throw Statement	374
8.3.4	Multiple Catch	375
8.3.5	Catch All.....	375
8.3.6	Rethrowing Exception.....	376
8.3.7	Implementing User Defined Exceptions.....	377
8.3.8	Different Exception Handling Techniques.....	378
	Summary	379
	Key Terms	380

Review Exercise	380
True and False.....	380
Multiple Choice Questions.....	381
Short Descriptive Questions	382
Practical Problems.....	384
Practicals	391
Projects.....	413
Index.....	431

