

Contents

<i>Preface to the Third Edition</i>	v
<i>Preface to the First Edition</i>	vii
1. Overview of C	1
1.1 History of C	1
1.2 Importance of C	2
1.3 Sample Program 1: Printing a Message	3
1.4 Sample Program 2: Adding Two Numbers	6
1.5 Sample Program 3: Interest Calculation	7
1.6 Sample Program 4: Use of Subroutines	9
1.7 Sample Program 5: Use of Math Functions	10
1.8 Basic Structure of C Programs	12
1.9 Programming Style	13
1.10 Executing a 'C' Program	14
1.11 Unix System	14
1.12 MS-DOS System	17
<i>Review Questions</i>	18
<i>Programming Exercises</i>	20
2. Constants, Variables, and Data Types	22
2.1 Introduction	22
2.2 Character Set	22
2.3 C Tokens	24
2.4 Keywords and Identifiers	24
2.5 Constants	25
2.6 Variables	29
2.7 Data Types	30
2.8 Declaration of Variables	33
2.9 Declaration of Storage Class	36
2.10 Assigning Values to Variables	38
2.11 Defining Symbolic Constants	43
2.12 Declaring a Variable as Constant	44
2.13 Declaring a Variable as Volatile	45

2.14	Overflow and Underflow of Data	45	
	<i>Case Studies</i>	46	
	<i>Review Questions</i>	48	
	<i>Programming Exercises</i>	50	
3.	Operators and Expressions		51
3.1	Introduction	51	
3.2	Arithmetic Operators	51	
3.3	Relational Operators	54	
3.4	Logical Operators	55	
3.5	Assignment Operators	56	
3.6	Increment and Decrement Operators	58	
3.7	Conditional Operator	59	
3.8	Bitwise Operators	60	
3.9	Special Operators	60	
3.10	Arithmetic Expressions	62	
3.11	Evaluation of Expressions	62	
3.12	Precedence of Arithmetic Operators	64	
3.13	Some Computational Problems	66	
3.14	Type Conversions in Expressions	67	
3.15	Operator Precedence and Associativity	70	
3.16	Mathematical Functions	72	
	<i>Case Studies</i>	73	
	<i>Review Questions</i>	76	
	<i>Programming Exercises</i>	78	
4.	Managing Input and Output Operations		80
4.1	Introduction	80	
4.2	Reading a Character	81	
4.3	Writing a Character	84	
4.4	Formatted Input	85	
4.5	Formatted Output	94	
	<i>Case Studies</i>	103	
	<i>Review Questions</i>	106	
	<i>Programming Exercises</i>	108	
5.	Decision Making and Branching		110
5.1	Introduction	110	
5.2	Decision Making with if Statement	110	
5.3	Simple if Statement	111	
5.4	The if.....else Statement	115	
5.5	Nesting of if.....else Statements	118	
5.6	The Else if Ladder	122	

5.7	The Switch Statement	125	
5.8	The ? : Operator	129	
5.9	The Goto Statement	132	
	<i>Case Studies</i>	135	
	<i>Review Questions</i>	139	
	<i>Programming Exercises</i>	142	
6.	Decision Making and Looping		145
6.1	Introduction	145	
6.2	The While Statement	147	
6.3	The do Statement	150	
6.4	The for Statement	152	
6.5	Jumps in Loops	159	
	<i>Case Studies</i>	168	
	<i>Review Questions</i>	174	
	<i>Programming Exercises</i>	177	
7.	Arrays		180
7.1	Introduction	180	
7.2	One-dimensional Arrays	182	
7.3	Declaration of One-dimensional Arrays	183	
7.4	Initialization of One-dimensional Arrays	185	
7.5	Two-dimensional Arrays	189	
7.6	Initializing Two-dimensional Arrays	193	
7.7	Multi-dimensional Arrays	197	
7.8	Dynamic Arrays	198	
7.9	More About Arrays	199	
	<i>Case Studies</i>	200	
	<i>Review Questions</i>	212	
	<i>Programming Exercises</i>	214	
8.	Character Arrays and Strings		217
8.1	Introduction	217	
8.2	Declaring and Initializing String Variables	218	
8.3	Reading Strings From Terminal	219	
8.4	Writing Strings to Screen	224	
8.5	Arithmetic Operations on Characters	228	
8.6	Putting Strings Together	230	
8.7	Comparison of Two Strings	231	
8.8	String-handling Functions	232	
8.9	Table of Strings	237	
8.10	Other Features of Strings	239	
	<i>Case Studies</i>	240	

Review Questions 243
Programming Exercises 245

9. User-defined Functions 247

- 9.1 Introduction 247
- 9.2 Need for User-defined Functions 247
- 9.3 A Multi-function Program 248
- 9.4 Elements of User-defined Functions 251
- 9.5 Definition of Functions 252
- 9.6 Return Values and their Types 254
- 9.7 Function Calls 255
- 9.8 Function Declaration 257
- 9.9 Category of Functions 259
- 9.10 No Arguments and No Return Values 259
- 9.11 Arguments but No Return Values 261
- 9.12 Arguments with Return Values 265
- 9.13 No Arguments but Returns a Value 269
- 9.14 Functions that Return Multiple Values 269
- 9.15 Nesting of Functions 271
- 9.16 Recursion 272
- 9.17 Passing Arrays to Functions 273
- 9.18 Passing Strings to Functions 278
- 9.19 The Scope, Visibility and Lifetime of Variables 279
- 9.20 Multifile Programs 289
 - Case Study* 292
 - Review Questions* 295
 - Programming Exercises* 299

10. Structures and Unions 301

- 10.1 Introduction 301
- 10.2 Defining a Structure 301
- 10.3 Declaring Structure Variables 303
- 10.4 Accessing Structure Members 304
- 10.5 Structure Initialization 306
- 10.6 Copying and Comparing Structure Variables 307
- 10.7 Operations on Individual Members 309
- 10.8 Arrays of Structures 310
- 10.9 Arrays within Structures 313
- 10.10 Structures within Structures 314
- 10.11 Structures and Functions 316
- 10.12 Unions 319
- 10.13 Size of Structures 320
- 10.14 Bit Fields 321

Case Study 324
Review Questions 328
Programming Exercises 331

11. Pointers **333**

- 11.1 Introduction 333
- 11.2 Understanding Pointers 334
- 11.3 Accessing the Address of a Variable 336
- 11.4 Declaring Pointer Variables 337
- 11.5 Initialization of Pointer Variables 338
- 11.6 Accessing a Variable through its Pointer 340
- 11.7 Chain of Pointers 342
- 11.8 Pointer Expressions 343
- 11.9 Pointer Increments and Scale Factor 344
- 11.10 Pointers and Arrays 345
- 11.11 Pointers and Character Strings 349
- 11.12 Array of Pointers 351
- 11.13 Pointers as Function Arguments 352
- 11.14 Functions Returning Pointers 355
- 11.15 Pointers to Functions 355
- 11.16 Pointers and Structures 358
 - Case Studies* 362
 - Review Questions* 367
 - Programming Exercises* 368

12. File Management in C **370**

- 12.1 Introduction 370
- 12.2 Defining and Opening a File 371
- 12.3 Closing a File 372
- 12.4 Input/Output Operations on Files 373
- 12.5 Error Handling During I/O Operations 379
- 12.6 Random Access to Files 381
- 12.7 Command Line Arguments 386
 - Review Questions* 389
 - Programming Exercises* 390

13. Dynamic Memory Allocation and Linked Lists **391**

- 13.1 Introduction 391
- 13.2 Dynamic Memory Allocation 391
- 13.3 Allocating a Block of Memory: Malloc 392
- 13.4 Allocating Multiple Blocks of Memory: Calloc 394
- 13.5 Releasing the Used Space: Free 395
- 13.6 Altering the Size of a Block: Realloc 396

13.7	Concepts of Linked Lists	397	
13.8	Advantages of Linked Lists	400	
13.9	Types of Linked Lists	401	
13.10	Pointers Revisited	402	
13.11	Creating a Linked List	404	
13.12	Inserting an Item	407	
13.13	Deleting an Item	410	
13.14	Application of Linked Lists	412	
	<i>Case Studies</i>	413	
	<i>Review Questions</i>	420	
	<i>Programming Exercises</i>	421	
14.	The Preprocessor		423
14.1	Introduction	423	
14.2	Macro Substitution	424	
14.3	File Inclusion	428	
14.4	Compiler Control Directives	429	
14.5	ANSI Additions	432	
	<i>Review Questions</i>	435	
	<i>Programming Exercises</i>	436	
15.	Developing a C Program: Some Guidelines		437
15.1	Introduction	437	
15.2	Program Design	437	
15.3	Program Coding	439	
15.4	Common Programming Errors	441	
15.5	Program Testing and Debugging	448	
15.6	Program Efficiency	451	
	<i>Review Questions</i>	451	
	Appendix I: Bit-level Programming		453
	Appendix II: ASCII Values of Characters		459
	Appendix III: ANSI C Library Functions		460
	Appendix IV: A Phone Book		464
	Bibliography		485
	Index		486