

Contents

<i>Preface to the Fourth Edition</i>	<i>xi</i>
1 Overview of C	1
1.1 History of C	1
1.2 Importance of C	3
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	8
1.6 Sample Program 4: Use of Subroutines	10
1.7 Sample Program 5: Use of Math Functions	11
1.8 Basic Structure of C Programs	12
1.9 Programming Style	14
1.10 Executing a 'C' Program	14
1.11 Unix System	16
1.12 Ms-Dos System	18
<i>Review Questions</i>	19
<i>Programming Exercises</i>	20
2 Constants, Variables, and Data Types	23
2.1 Introduction	23
2.2 Character Set	23
2.3 C Tokens	25
2.4 Keywords and Identifiers	25
2.5 Constants	26
2.6 Variables	30
2.7 Data Types	31
2.8 Declaration of Variables	34
2.9 Declaration of Storage Class	37
2.10 Assigning Values to Variables	38
2.11 Defining Symbolic Constants	44
2.12 Declaring a Variable as Constant	45
2.13 Declaring a Variable as Volatile	45

2.14	Overflow and Underflow of Data	46	
	<i>Review Questions</i>	49	
	<i>Programming Exercises</i>	51	
3	Operators and Expressions		52
3.1	Introduction	52	
3.2	Arithmetic Operators	52	
3.3	Relational Operators	55	
3.4	Logical Operators	57	
3.5	Assignment Operators	57	
3.6	Increment and Decrement Operators	59	
3.7	Conditional Operator	61	
3.8	Bitwise Operators	61	
3.9	Special Operators	61	
3.10	Arithmetic Expressions	63	
3.11	Evaluation of Expressions	64	
3.12	Precedence of Arithmetic Operators	65	
3.13	Some Computational Problems	67	
3.14	Type Conversions in Expressions	68	
3.15	Operator Precedence and Associativity	72	
3.16	Mathematical Functions	74	
	<i>Review Questions</i>	78	
	<i>Programming Exercises</i>	81	
4	Managing Input and Output Operations		84
4.1	Introduction	84	
4.2	Reading a Character	85	
4.3	Writing a Character	88	
4.4	Formatted Input	89	
4.5	Formatted Output	98	
	<i>Review Questions</i>	110	
	<i>Programming Exercises</i>	112	
5	Decision Making and Branching		114
5.1	Introduction	114	
5.2	Decision Making with IF Statement	114	
5.3	Simple IF Statement	115	
5.4	The IF.....ELSE Statement	119	
5.5	Nesting of IF....ELSE Statements	122	
5.6	The ELSE IF Ladder	126	
5.7	The Switch Statement	129	
5.8	The ? : Operator	133	
5.9	The GOTO Statement	136	
	<i>Review Questions</i>	144	
	<i>Programming Exercises</i>	148	

6	Decision Making and Looping	152
6.1	Introduction	152
6.2	The WHILE Statement	154
6.3	The DO Statement	157
6.4	The FOR Statement	159
6.5	Jumps in LOOPS	166
6.6	Concise Test Expressions	174
	<i>Review Questions</i>	182
	<i>Programming Exercises</i>	186
7	Arrays	190
7.1	Introduction	190
7.2	One-dimensional Arrays	192
7.3	Declaration of One-dimensional Arrays	193
7.4	Initialization of One-dimensional Arrays	195
7.5	Two-dimensional Arrays	199
7.6	Initializing Two-dimensional Arrays	204
7.7	Multi-dimensional Arrays	208
7.8	Dynamic Arrays	209
7.9	More about Arrays	209
	<i>Review Questions</i>	223
	<i>Programming Exercises</i>	225
8	Character Arrays and Strings	229
8.1	Introduction	229
8.2	Declaring and Initializing String Variables	230
8.3	Reading Strings from Terminal	231
8.4	Writing Strings to Screen	236
8.5	Arithmetic Operations on Characters	241
8.6	Putting Strings Together	242
8.7	Comparison of Two Strings	244
8.8	String-handling Functions	244
8.9	Table of Strings	250
8.10	Other Features of Strings	252
	<i>Review Questions</i>	257
	<i>Programming Exercises</i>	259
9	User-defined Functions	262
9.1	Introduction	262
9.2	Need for User-defined Functions	262
9.3	A Multi-function Program	263
9.4	Elements of User-defined Functions	266
9.5	Definition of Functions	267
9.6	Return Values and their Types	269
9.7	Function Calls	270
9.8	Function Declaration	272

9.9	Category of Functions	274	
9.10	No Arguments and no Return Values	274	
9.11	Arguments but no Return Values	277	
9.12	Arguments with Return Values	280	
9.13	No Arguments but Returns a Value	284	
9.14	Functions that Return Multiple Values	285	
9.15	Nesting of Functions	286	
9.16	Recursion	288	
9.17	Passing Arrays to Functions	289	
9.18	Passing Strings to Functions	294	
9.19	The Scope, Visibility and Lifetime of Variables	295	
9.20	Multifile Programs	305	
	<i>Review Questions</i>	311	
	<i>Programming Exercises</i>	315	
10	Structures and Unions		317
10.1	Introduction	317	
10.2	Defining a Structure	317	
10.3	Declaring Structure Variables	319	
10.4	Accessing Structure Members	321	
10.5	Structure Initialization	322	
10.6	Copying and Comparing Structure Variables	324	
10.7	Operations on Individual Members	326	
10.8	Arrays of Structures	327	
10.9	Arrays within Structures	329	
10.10	Structures within Structures	331	
10.11	Structures and Functions	333	
10.12	Unions	335	
10.13	Size of Structures	337	
10.14	Bit Fields	337	
	<i>Review Questions</i>	344	
	<i>Programming Exercises</i>	348	
11	Pointers		351
11.1	Introduction	351	
11.2	Understanding Pointers	351	
11.3	Accessing the Address of a Variable	354	
11.4	Declaring Pointer Variables	355	
11.5	Initialization of Pointer Variables	356	
11.6	Accessing a Variable through its Pointer	358	
11.7	Chain of Pointers	360	
11.8	Pointer Expressions	361	
11.9	Pointer Increments and Scale Factor	362	
11.10	Pointers and Arrays	364	
11.11	Pointers and Character Strings	367	
11.12	Array of Pointers	369	

11.13	Pointers as Function Arguments	370	
11.14	Functions Returning Pointers	373	
11.15	Pointers to Functions	373	
11.16	Pointers and Structures	376	
11.17	Troubles with Pointers	379	
	<i>Review Questions</i>	385	
	<i>Programming Exercises</i>	388	
12	File Management in C		389
12.1	Introduction	389	
12.2	Defining and Opening a File	390	
12.3	Closing a File	391	
12.4	Input/Output Operations on Files	392	
12.5	Error Handling During I/O Operations	398	
12.6	Random Access to Files	400	
12.7	Command Line Arguments	405	
	<i>Review Questions</i>	408	
	<i>Programming Exercises</i>	409	
13	Dynamic Memory Allocation and Linked Lists		411
13.1	Introduction	411	
13.2	Dynamic Memory Allocation	411	
13.3	Allocating a Block of Memory: MALLOC	413	
13.4	Allocating Multiple Blocks of Memory: CALLOC	415	
13.5	Releasing the Used Space: Free	415	
13.6	Altering the Size of a Block: REALLOC	416	
13.7	Concepts of Linked Lists	417	
13.8	Advantages of Linked Lists	420	
13.9	Types of Linked Lists	421	
13.10	Pointers Revisited	422	
13.11	Creating a Linked List	424	
13.12	Inserting an Item	428	
13.13	Deleting an Item	431	
13.14	Application of Linked Lists	433	
	<i>Review Questions</i>	440	
	<i>Programming Exercises</i>	442	
14	The Preprocessor		444
14.1	Introduction	444	
14.2	Macro Substitution	445	
14.3	File Inclusion	449	
14.4	Compiler Control Directives	450	
14.5	ANSI Additions	453	
	<i>Review Questions</i>	456	
	<i>Programming Exercises</i>	457	

15	Developing a C Program: Some Guidelines	458
15.1	Introduction	458
15.2	Program Design	458
15.3	Program Coding	460
15.4	Common Programming Errors	462
15.5	Program Testing and Debugging	469
15.6	Program Efficiency	471
	<i>Review Questions</i>	472
	Appendix I: Bit-level Programming	474
	Appendix II: ASCII Values of Characters	480
	Appendix III: ANSI C Library Functions	482
	Appendix IV: Projects	486
	Appendix V: C99 Features	537
	Bibliography	545
	<i>Index</i>	547