



C

C

**PROGRAMS
WITH
SOLUTIONS**



S. Anandamurugan

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Programs with Solutions

By

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UNIVERSITY SCIENCE PRESS

(An Imprint of Laxmi Publications Pvt. Ltd.)

BANGALORE • CHENNAI • COCHIN • GUWAHATI • HYDERABAD
JALANDHAR • KOLKATA • LUCKNOW • MUMBAI • PATNA
RANCHI • NEW DELHI

Published by :
UNIVERSITY SCIENCE PRESS
(An Imprint of Laxmi Publications Pvt. Ltd.)
113, Golden House, Daryaganj,
New Delhi-110002
Phone : 011-43 53 25 00
Fax : 011-43 53 25 28
www.laxmipublications.com
info@laxmipublications.com

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Price: ₹ 180.00 Only.

First Edition: 2011

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UCP-9612-180-C PROGRAM WITH SOLUTION-ANA

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Typeset at : Monu Printographics, Delhi

Printed at : Ajit Printers, Delhi

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Preface

This book gives a rich collection of C programs. These programs that support the theoretical concepts are given in a large number to help students understand the concepts better. This book will be useful for students of BE, MCA, BCA, MSc, and BSc, which have C programming language as a part of the course.

The first chapter deals with the fundamental concepts of C language. The second chapter focuses on introduction C programming. The third chapter provides with detailed program on next level to the basic C program. Fourth chapter focuses on C debugging. The fifth chapter deals with the simple C questions and Answers. Sixth chapter deals with the short questions and answers.

The main aim of this book is to give maximum guidance to the students, faculty and research scholars. Suggestions for improvement will be appreciated and incorporated.

—**Author**

Chapter 1 C CONCEPTS

1.0 OVERVIEW OF C PROGRAMMING

C language is one of the most popular computer languages today because it is a structured, high level, machine independent language. It allows software developers to develop programs without worrying about the hardware platforms where they will be implemented. C is called a high level, compiler language. The aim of any high level computer language is to provide an easy and natural way of giving a programme of instructions to a computer.

C is one of a large number of high level languages which can be used for general purpose programming, *i.e.*, anything from writing small programs for personal amusement to writing complex applications. It is unusual in several ways. Before C, high level languages were criticized by machine code programmers because they shielded the user from the working details of the computer. The C language has been equipped with features that allow programs to be organized in an easy and logical way. This is vitally important for writing lengthy programs because complex problems are only manageable with a clear organization and program structure.

C allows meaningful variable names and meaningful function names to be used in programs without any loss of efficiency and it gives a complete freedom of style, it has a set of very flexible loop constructions and neat ways of making decisions. These provide an excellent basis for controlling the flow of programs. Another feature of C is the way it can express ideas concisely. The richness of a language shapes what it can talk about. C gives us the apparatus to build neat and compact programs. C tries to make the best of a computer by linking as closely as possible to the local environment.

The increasing popularity of C is probably due to its many desirable qualities. It is a robust language whose rich set of built-in functions and operators can be used to write any complex program. The C compiler combines the capabilities of an assembly language with the features of a high-level language and therefore it is well suited for writing both system software and business packages. Programs written in C are efficient and fast. This is due to its variety of data types and powerful operators. C is highly portable. This means that C programs written for one computer can be run on another with little or no modification. Another feature of C is its ability to extend itself.

1.1 INTRODUCTION

C is a remarkable language. Designed originally by **Dennis Ritchie**, working at **AT&T Bell Laboratories** in New Jersey, it has increased in use until now it may well be one of the most widely-written computer languages in the world. C is a structured language. It allows variety of programs in small modules. It is easy for debugging, testing, and maintenance if a language is a structured one.

1.2 STRUCTURE OF A C PROGRAM

Include header file section

Global declaration section

main()

{

Declaration part

Executable part

}

User-defined functions

{

Statements

}

Include Header File Section

C program depends upon some header files for function definition that are used in program. Each header file by default is extended with .h. The header file should be included using # include directive as given here.

Global Declaration

This section declares some variables that are used in more than one function. These variables are known as global variables. This section must be declared outside of all the functions.

Function Main

Every program written in C language must contain main () function. The function main() is a starting point of every C program. The execution of the program always begins with the function main ().

Declaration Part

The declaration part declares the entire variables that are used in executable part. The initialisations of variables are also done in this section. Initialisation means providing initial value to the variables.

Executable Part

This part contains the statements following the declaration of the variables. This part contains a set of statements or a single statement. These statements are enclosed between the braces.

User Defined Function

The functions defined by the user are called user-defined functions. These functions are generally defined after the main () function.

1.3 STEPS FOR EXECUTING THE PROGRAM

1. Creation of program

Programs should be written in C editor. The file name does not necessarily include extension C. The default extension is C.

2. Compilation of a program

The source program statements should be translated into object programs which is suitable for execution by the computer. The translation is done after correcting each statement. If there is no error, compilation proceeds and translated program are stored in another file with the same file name with extension “.obj”.

3. Execution of the program

After the compilation the executable object code will be loaded in the computer's main memory and the program is executed.

1.4 C CHARACTER SET

Letters	Digits	White Spaces
Capital A to Z	All decimal digits 0 to 9	Blank space
Small a to z		Horizontal tab
		Vertical tab
		New line
		Form feed

Special Characters

,	Comma	&	Ampersand
.	dot	^	Caret
;	Semicolon	*	Asterisk
:	Colon	-	Minus
'	Apostrophe	+	Plus

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"	Quotation mark	<	Less than
!	Exclamation mark	>	Greater than
	Vertical bar	()	Parenthesis left/right
/	Slash	[]	Bracket left/right
\	Back slash	{}	Braces left/right
~	Tilde	%	Percent
_	Underscore	#	Number sign or Hash
\$	Dollar	=	Equal to
?	Question mark	@	At the rate

1.5 DELIMITERS

Delimiters	Use
: Colon	Useful for label
; Semicolon	Terminates the statement
() Parenthesis	Used in expression and function
[] Square Bracket	Used for array declaration
{ } Curly Brace	Scope of the statement
# hash	Preprocessor directive
, Comma	Variable separator

1.6 C KEYWORDS

Auto	Double	Int	Struct
Break	Else	Long	Switch
Case	Enum	Register	Typedef
Char	Extern	Return	Union
Const	Float	Short	Unsigned
Continue	For	Signed	Void
Default	Goto	Sizeof	Volatile
Do	If	Static	while

1.7 IDENTIFIERS

Identifiers are names of variables, functions, and arrays. They are user-defined names, consisting sequence of letters and digits, with the letter as the first character.

1.8 CONSTANTS

Values do not change during the execution of the program

Types:

1. Numerical constants:

- Integer constants

These are the sequence of numbers from 0 to 9 without decimal points or fractional part or any other symbols. It requires minimum two bytes and maximum four bytes.

Eg: 10,20, + 30, - 14

- Real constants

It is also known as floating point constants.

Eg: 2.5, 5.342

2. Character constants:

- Single character constants

A character constant is a single character. Characters are also represented with a single digit or a single special symbol or white space enclosed within a pair of single quote marks

Eg: 'a', '8', ""

- String constants

String constants are sequence of characters enclosed within double quote marks.

Eg: "Hello", "india", "444"

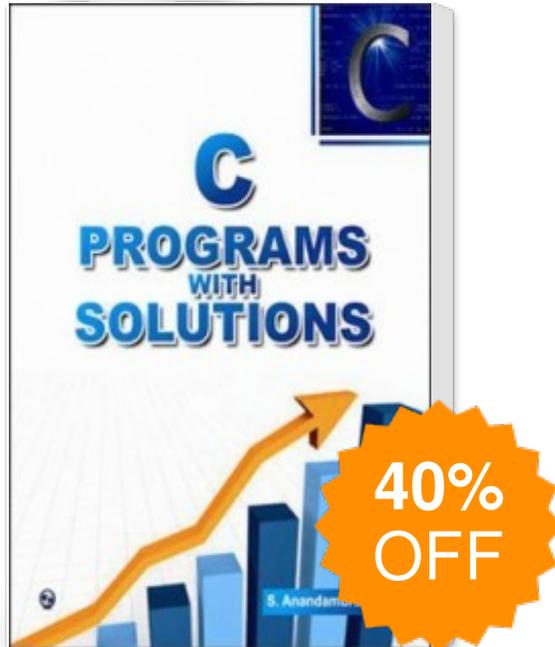
1.9 VARIABLES

It is a data name used for storing a data value. Its value may be changed during the program execution. The value of variables keeps on changing during the execution of a program.

1.10 DATA TYPES

Data type	Size (Bytes)	Range	Format Specifiers
Char	1	- 128 to 127	%c
Unsigned char	1	0 to 255	%c

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Publisher : Laxmi Publications ISBN : 9789380856933

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