**Experiment No.02**

PART A

(PART A: TO BE REFFERED BY STUDENTS)

A.1 Aim: **To study components of a C program.**

A.2 Prerequisite:

Basic constructs of C program like ‘C’ program variables, data types, input and output statements.

A.3 Outcome:

After successful completion of this experiment students will be able to

Develop and Execute C programs using basic programming constructs.

A.4 Theory:

C has become a popular programming language because of its many features. The important characteristics of ‘C’ are as below:

1. C is a general purpose programming language.
2. C is a structured programming language.
3. It has a rich set of operators.
4. Helps in development of system software.
5. It allows manipulation of internal processor registers.
6. Supports a rich set of data types.
7. Very less numbered of reserved words.
8. Pointer arithmetic and pointer manipulation possible.
9. Ability to extend itself by adding functions to its library.

Different programming languages have their own format of coding. The basic structure of a ‘C’ program is as below:

|  |
| --- |
| Documentation Section |
| Link Section |
| Definition Section |
| Global Declaration Section |
| Main( ) Function Section  { Declaration Part  Executable Part } |
| Subprogram Section  User defined functions  Function1  Function 2  .  Function n |

1. **Documentation section:** It is used for the purpose of documenting a program. Details as mentioned below are generally documented in this section:

* Who create the program?
* When it was created (date)?
* When it was last modified (date)?
* Purpose of the program

All the above details are represented in a form of comment as this are not executable statements. The comment in ‘C’ is given as below:

// This program is created by Mr. Neal Sharma 🡪 **Single line comment**

/\* The purpose of this program is to find addition of two numbers. This program is created by Mr. Neal Sharma \*/ -🡪 **Multi line comment**

**Note: Statements represented as comments are not executed.**

1. **Link Section:** All the library files which are required for the program are specified in this section. These statements begin with # symbol, and are also called the preprocessor directives. These statements direct the C preprocessor to include header files and also symbolic constants into a C program.

Some of the preprocessor statements are given below:

#include<stdio.h>

#include “Test.h”

1. **Global Declaration Section:** Variables or functions whose existence is known in the main() function and other user defined functions, are called the global variables and their declarations are called the global declarations. This declaration should be made before main().
2. **The main() function:** As the name itself indicates, this is the main function of every C program. Execution of a C program starts with main(). No C program is executed without the main() function. The function main() should be written in lowercase letters and should not be terminated by a semicolon. It calls other library functions and user defined functions. There should be one and only one main() function in every C program.
3. **Subprogram section:** These are sub programs. Generally, a subprogram is a function to perform a specific task. These are written by the user, hence the name user-defined functions. They may be written before or after the main() function.

**Executing a ‘C’ Program:**

Executing a program in C involves a series of steps. These are:

1. Creating a program
2. Compiling a program
3. Linking the program with functions that are needed from the C library files.
4. Executing the program.

**Process of compiling and running a C Program:**

* An Operating system is a program that controls the entire operation of a computer system.
* All input/output operations are channeled through operating system.
* First Program will be compiled.
* Compilation process will check each statement and translate it into a code which is understood by computer that is object code.
* The translation is done after checking each line for errors.
* The translated program will be stored in a file with extension.o
* Linking is the process of putting together other program files and functions that are required by the program.

**Variable:**

* A variable is a data name that may be used to store a data value.
* Variable may take different values at different times during execution.
* A variable name can be chosen by the programmer in a meaningful way do as to reflect its function or nature in the program.
* Ex: average, amount, height , total
* Variable names may consist of letters, digits, and the underscore character.
* Variable should begin with letter. Some system permit underscore as first character.
* ANSI recognizes a length of 31 characters, however length should not be normally more than 8 characters, since only the first 8 characters are treated significant by many compilers.

**Data Types:**

* C language is rich in data types.
* Ansi C supports three classes of data types:

1. Primary data types

2. Derived data types

3. User defined data types.

* All C compilers support five fundamental data types, namly integer(int), floating point(float), character(char), double-precision floating point(double) and void.
* Many also support extended data types like long int and long double.

**Primary Data Types:**

**Size and Range of Primary Data Types:**

|  |  |  |
| --- | --- | --- |
| **Type** | **Size (bits)** | **Range** |
| **Int or signed int** | **16** | **-32,768 to 32,767** |
| **Unsigned int** | **16** | **0 to 65535** |
| **Short int** | **8** | **-128 to 127** |
| **Signed short int** | **8** | **-128 to 127** |
| **Unsigned short int** | **8** | **0 to 255** |
| **Long int** | **32** | **-2,147,483,648 to 2,147,483,648** |
| **Signed long int** | **32** | **-2,147,483,648 to 2,147,483,648** |
| **Unsigned long int** | **32** | **0 to 4,294,967,295** |
| **Float** | **32** | **3.4E-38 to 3.4E+38** |
| **Double** | **64** | **1.7E-308 to 3.4E+308** |
| **Long double** | **80** | **3.4E-4932 to 1.1E+4932** |

Declaration of variables:

* After designing suitable variable names, we must declare them to the compiler. Declaration does two things:
* It tells the compiler what the variable name is.
* It specifies what type of data the variable will hold.
* Declaration of variable must be done before variable is used in program.
* General Syntax for declaring a variable:

data-type v1,v2,….,vn;

For ex: int total,age,amount;

float average;

double ratio;

short int count;

**Assigning values to the variable:**

* Values can be assigned to variable using the assignment operator = as follows:
* General syntax: variable\_name = constant value;
* For ex :
  + - * total=10;
      * weight =50;
      * balance=10.5
* C permits multiple assignments in one line:
* For ex: total=0; sum=50;
* For ex: year=year+1;
* During assignment operation, C converts the type of value on the right hand side to the type on the left.

**Reading and Writing Data**

* Values can be provided to variables by writing scanf statement
* General syntax for scanf statement:
* scanf(“control string”,&variable1,&variable2);
* When scanf statement is encountered computer waits for user to enter the value with keyboard.
* Control string contains the format of data being received.
* For writing data printf statement is used.
* The general syntax for printf statement is
* printf(“control string message”, variable 1);

#include<stdio.h>

Void main()

{

int number, total;

printf(“\n enter value for number: “);

scanf(“%d %d”,&number,&total);

if(number<100)

printf(“\n Your number is smaller than 100”);

printf(“\n number = %d and total = %d”,number,total);

else

printf(“\n Your number is greater than 100”);

}

Task

1. Write a program to print employee details like employee number, name, and address and phone number.

2. Write a program to calculate area of circle, triangle and rectangle.

3. Write a program to evaluate the following expressions and display their results.

a. 2x3 + x2 + 2x+3

b. x1 + y2+z3

Where x, y and z are integers.

4. To accept the values of int, float, char data types and display them.

5. Write a program to display size of data types like int, float, char, double.

6. Write a program to find largest of two numbers using ternary operator.

7.Write a program to input a four digit number and find the sum of digits and also print the reverse of it.

8.Write a program to perform all arithmetic operations .

PART B

(PART B: TO BE COMPLETED BY STUDENTS)

**(Students must submit the soft copy as per following segments within two hours of the practical. The soft copy must be uploaded on the Portal or emailed to the concerned lab in charge faculties at the end of the practical in case the there is no Portal access available)**

|  |  |
| --- | --- |
| Roll No. | Name: |
| Program: | Division: |
| Semester: | Batch : |
| Date of Experiment: | Date of Submission: |
| Grade : |  |

B.1 Algorithm

1.

2.

3.

4.

B.2 Flow Chart

1.

2.

3.

4.

B.3 Program Code

1.

2.

3.

4.

B.4 Input-Output

1.

2.

3.

4.

B.5 Conclusion:

*(****Students must write the conclusion as per the attainment of individual outcome listed above and learning/observation noted in section B.3)***