PROGRAMMING FOR PROBLEM SOLVING LABORATORY

LAB MANUAL

Course Code	:	**ACSB02**
Regulations	:	**IARE-R18**
Class	:	**II Semester**
Branch	:	**CSE/IT/ECE/EEE/CE**

Team of Instructors

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INSTITUTE OF AERONAUTICAL ENGINEERING

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Dundigal, Hyderabad - 500 043

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	Program Outcomes – Common to all branches
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes – Computer Science and Engineering	
PSO1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.
PSO2	**Problem Solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

Program Specific Outcomes –Information Technology	
PSO1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.
PSO2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

Program Specific Outcomes –Electronics and Communication Engineering	
PSO1	**Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.
PSO2	**Problem-Solving Skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.
PSO3	**Successful Career and Entrepreneurship:** An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.

Program Specific Outcomes –Electrical and Electronics Engineering	
PSO1	**Problem Solving:** Exploit the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environment, for the research based team work.
PSO2	**Professional Skills:** Identify the scientific theories, ideas, methodologies and the new cutting edge technologies in renewable energy engineering, and use this erudition in their professional development and gain sufficient competence to solve the current and future energy problems universally.
PSO3	**Modern Tools in Electrical Engineering:** Comprehend the technologies like PLC, PMC, process controllers, transducers and HMI and design, install, test, maintain power systems and industrial applications.

	Program Specific Outcomes –Civil Engineering
PSO1	**Engineering Knowledge:** Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.
PSO2	**Broadness And Diversity:** Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.
PSO3	**Self-Learning And Service:** Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.

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ATTAINMENT OF PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES							
S. No	Experiment	Program Outcome Attained	Program Specific Outcomes Attained (CSE)	Program Specific Outcomes Attained (IT)	Program Specific Outcomes Attained (ECE)	Program Specific Outcomes Attained (EEE)	Program Specific Outcomes Attained (CE)
1	OPERATORS AND EVALUATION OF EXPRESSIONS	PO1, PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
2	CONTROL STRUCTURES	PO1, PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
3	CONTROL STRUCTURES	PO1, PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
4	ARRAYS	PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
5	STRINGS	PO3, PO4	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
6	FUNCTIONS	PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
7	POINTERS	PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
8	STRUCTURES AND UNIONS	PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO4	PSO1, PSO4
9	ADDITIONAL PROGRAMS	PO3, PO4	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
10	PREPROCESSOR DIRECTIVES	PO3, PO4	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
11	FILES	PO2, PO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3	PSO1, PSO3
12	COMMAND LINE ARGUMENTS	PO2, PO3	PSO1, PSO3	PSO1, PSO3			

PROGRAMMING FOR PROBLEM SOLVING LABORATORY

I Semester: Common for AE/ME | II Semester: Common for CSE /ECE /EEE/CE/IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACSB02	**Foundation**	-	-	3	2	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36	Total Classes: 36

OBJECTIVES:

The course should enable the students to:

I.   Formulate problems and implement algorithms using C programming language.
II. Develop programs using decision structures, loops and functions.
III. Learn memory allocation techniques using pointers.
IV. Use structured programming approach for solving of computing problems in real world.

LIST OF EXPERIMENTS

Week-1	**OPERATORS AND EVALUATION OF EXPRESSIONS**

a. Write a C program to check whether a number is even or odd using ternary operator.
b. Write a C program to perform the addition of two numbers without using + operator.
c. Write a C program to evaluate the arithmetic expression $((a + b / c * d - e) * (f - g))$. Read the values a, b, c, d, e, f, g from the standard input device.
d. Write a C program to find the sum of individual digits of a 3 digit number.
e. Write a C program to read the values of x and y and print the results of the following expressions in one line:
   i. $(x + y) / (x - y)$
   ii. $(x + y)(x - y)$

Week-2	**CONTROL STRUCTURES**

a. Write a C program to find the sum of individual digits of a positive integer.
b. A Fibonacci sequence is defined as follows: The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
d. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if-else and switch case. The following table shows the range of ASCII values for various characters.

Characters	ASCII values
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127

e. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Write a C program to determine how much profit or loss incurred in percentage.

Week-3	CONTROL STRUCTURES

a. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).
b. Write a C program to calculate the following sum:
$$\text{sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$
c. Write a C program to find the roots of a quadratic equation.
d. Write a C program to check whether a given 3 digit number is Armstrong number or not.
e. Write a C program to print the numbers in triangular form

```
        1
        1 2
        1 2 3
        1  2  3   4
```

Week-4	ARRAYS

a. Write a C program to find the second largest integer in a list of integers.
b. Write a C program to perform the following:
    i.   Addition of two matrices
    ii.   Multiplication of two matrices
c. Write a C program to count and display positive, negative, odd and even numbers in an array.
d. Write a C program to merge two sorted arrays into another array in a sorted order.
e. Write a C program to find the frequency of a particular number in a list of integers.

Week-5	STRINGS

a. Write a C program that uses functions to perform the following operations:
    i.   To insert a sub string into a given main string from a given position.
    ii.   To delete n characters from a given position in a given string.
b. Write a C program to determine if the given string is a palindrome or not.
c. Write a C program to find a string within a sentence and replace it with another string.
d. Write a C program that reads a line of text and counts all occurrence of a particular word.
e. Write a C program that displays the position or index in the string S where the string T begins, or 1 if S doesn't contain T.

Week-6	FUNCTIONS

a. Write C programs that use both recursive and non-recursive functions
    i.   To find the factorial of a given integer.
    ii.   To find the greatest common divisor of two given integers.
b. Write C programs that use both recursive and non-recursive functions
    i.   To print Fibonacci series.
    ii.   To solve towers of Hanoi problem.
c. Write a C program to print the transpose of a given matrix using function.
d. Write a C program that uses a function to reverse a given string.

Week-7	POINTERS

a. Write a C program to concatenate two strings using pointers.
b. Write a C program to find the length of string using pointers.
c. Write a C program to compare two strings using pointers.
d. Write a C program to copy a string from source to destination using pointers.
e. Write a C program to reverse a string using pointers.

Week-8	STRUCTURES AND UNIONS

a. Write a C program that uses functions to perform the following operations:
   i. Reading a complex number
   ii. Writing a complex number
   iii. Addition and subtraction of two complex numbers
   iv. Multiplication of two complex numbers. Note: represent complex number using a structure.
b. Write a C program to compute the monthly pay of 100 employees using each employee's name, basic pay. The DA is computed as 52% of the basic pay. Gross-salary (basic pay + DA). Print the employees name and gross salary.
c. Create a Book structure containing book_ id, title, author name and price. Write a C program to pass a structure as a function argument and print the book details.
d. Create a union containing 6 strings: name, home_ address, hostel_ address, city, state and zip. Write a C program to display your present address.
e. Write a C program to define a structure named DOB, which contains name, day, month and year. Using the concept of nested structures display your name and date of birth.

Week-9	ADDITIONAL PROGRAMS

a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots+x^n$. For example: if n is 3 and x is 5, then the program computes $1+5+25+125$. Print x, n, the sum. Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.
b. 2"s complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2"s complement of 11100 is 00100. Write a C program to find the 2"s complement of a binary number.
c. Write a C program to convert a Roman numeral to its decimal equivalent. E.g. Roman number CD is equivalent to 400.

Week-10	PREPROCESSOR DIRECTIVES

a. Define a macro with one parameter to compute the volume of a sphere. Write a C program using this macro to compute the volume for spheres of radius 5, 10 and 15 meters.
b. Define a macro that receives an array and the number of elements in the array as arguments. Write a C program for using this macro to print the elements of the array.
c. Write symbolic constants for the binary arithmetic operators +, -, *, and /. Write a C program to illustrate the use of these symbolic constants.

Week-11	FILES

a. Write a C program to display the contents of a file.
b. Write a C program to copy the contents of one file to another.
c. Write a C program to reverse the first n characters in a file, where n is given by the user.
d. Two files DATA1 and DATA2 contain sorted lists of integers. Write a C program to merge the contents of two files into a third file DATA i.e., the contents of the first file followed by those of the second are put in the third file.
e. Write a C program to count the no. of characters present in the file.

Week-12	COMMAND LINE ARGUMENTS

a. Write a C program to read arguments at the command line and display it.
b. Write a C program to read two numbers at the command line and perform arithmetic operations on it.

c. Write a C program to read a file name at the command line and display its contents.

Reference Books:

1. Yashavant Kanetkar, "Let Us C", BPB Publications, New Delhi, 13th Edition, 2012.
2. Oualline Steve, "Practical C Programming", OʼReilly Media, 3rd Edition, 1997.
3. King K N, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
4. Kochan Stephen G, "Programming in C – A Complete Introduction to the C Programming Language", Samʼs Publishers, 3rd Edition, 2004.
5. Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1st Edition, 1994.

Web References:

1. http://www.sanfoundry.com/c-programming-examples
2. http://www.geeksforgeeks.org/c
3. http://www.cprogramming.com/tutorial/c
4. http://www.cs.princeton.edu

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 60 STUDENTS:

HARDWARE:

Desktop systems: 60 nos

Printers: 02

SOFTWARE:

System Software: Windows 7.

Application Software: MS Office.

Programming Languages: Dev C++

WEEK-1

OPERATORS AND EVALUATION OF EXPRESSIONS

OBJECTIVE:

1. Write a C program to check whether a number is even or odd using ternary operator.

2. Write a C program to perform the addition of two numbers without using + operator.

3. Write a C program to evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)).

    Read the values a, b, c, d, e, f, g from the standard input device.

4. Write a C program to find the sum of individual digits of a 3 digit number.

5. Write a C program to read the values of x and y and print the results of the following expressions in one line:

    iii. $(x + y) / (x - y)$

    iv. $(x + y)(x - y)$

RESOURCES:

Dev C++ 5.11

PROGRAM LOGIC:

To check whether a number is even or odd using ternary operator

1. Start
2. Read n
3. (n%2==0 ? "EVEN" : "ODD")
4. Display EVEN if n%2==0
5. Otherwise ODD
6. Stop

To perform the addition of two numbers without using + operator

1. Start
2. Read a,b
3. sum = a - ~b -1
4. Display the value of sum
5. Stop

To evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)).

1. Start
2. Read a,b,c,d,e,f,g
3. A=a+b
4. B=A/c
5. C=(d-e)
6. D=(f-g)
7. Calculate B*C*D
8. Store B*C*D value to Result
9. Display the Result

To find the sum of individual digits of a 3 digit number.

1. Start
2. Read a number N
3. Initialize the Sum=0
4. if n > 0 then calculate reminder R= N %10
5. Add reminder R to Sum
6. Store N/10 value to N
7. If N=0 then Display Sum
8. Stop

To read the values of x and y and print the results of the following expressions in one line

i.   **(x + y) / (x - y)**   **ii.**   **(x + y)(x - y)**

i. (x + y) / (x - y)

1. Start
2. Read numbers x and y
3. A=x+y
4. B=x-y
5. Perform A/B
6. Store the value of A/B in Result
7. Display the Result

ii. (x + y)(x - y)

1. Start
2. Read numbers x and y

11

3. A=x+y

4. B=x-y

5. Perform A*B

6. Store the value of A*B in Result

7. Display the Result

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.

2. Compile: F9

3. Execute: F10

SOURCE CODE:

<u>To check whether a number is even or odd using ternary operator</u>

```c
#include<stdio.h>
int main()
{

        int n;
        printf("\n enter the values of n:");
        scanf("%d",&n);
        (n%2)?printf("odd") : printf("even");
        return 0;

}
```

<u>To perform the addition of two numbers without using + operator</u>

```c
#include<stdio.h>
int main()
{
        int a,b,c;
        printf("\n enter the values of a,b:");
        scanf("%d%d",&a,&b);
        c=(a-~b)-1;
        printf("sum=%d",c);
        return 0;
}
```

To evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)).

```c
#include<stdio.h>
int main()
{
        int a,b,c,d,e,f,g,res;
        printf("\n enter the values of a,b,c,d,e,f,g:");
        scanf("%d%d%d%d%d%d%d",&a,&b,&c,&d,&e,&f,&g);
        res=((a+b/c*d-e)*(f-g));
        printf("res=%d",res);
        return 0;
}
```

To find the sum of Individual digits of a 3 digit number

```c
#include<stdio.h>
int main()
{
        int n,d1,d2,d3;
        printf("\n enter the values of 3 digit no:");
        scanf("%d",&n);
        d1=n%10;
        n=n/10;
        d2=n%10;
        n=n/10;
        d3=n%10;
        n=n/10;
        n=d1+d2+d3;
        printf("the sum of individual number=%d",n);
}
```

To read the values of x and y and print the results of the following expressions in one line

    i. $(x + y) / (x - y)$

    ii. $(x + y)(x - y)$

i. $(x + y) / (x - y)$

```c
#include<stdio.h>
void main()
{
        int x,y,A,B;
        float Result;
```

13

```
        printf("Enter the values of x,y\n");
        scanf("%d %d " ,&x, &y);
        A=(x+y);
        B=(x-y);
        Result=A/B ;
        printf("%f", Result);
    }
```

ii. (x + y)(x - y)
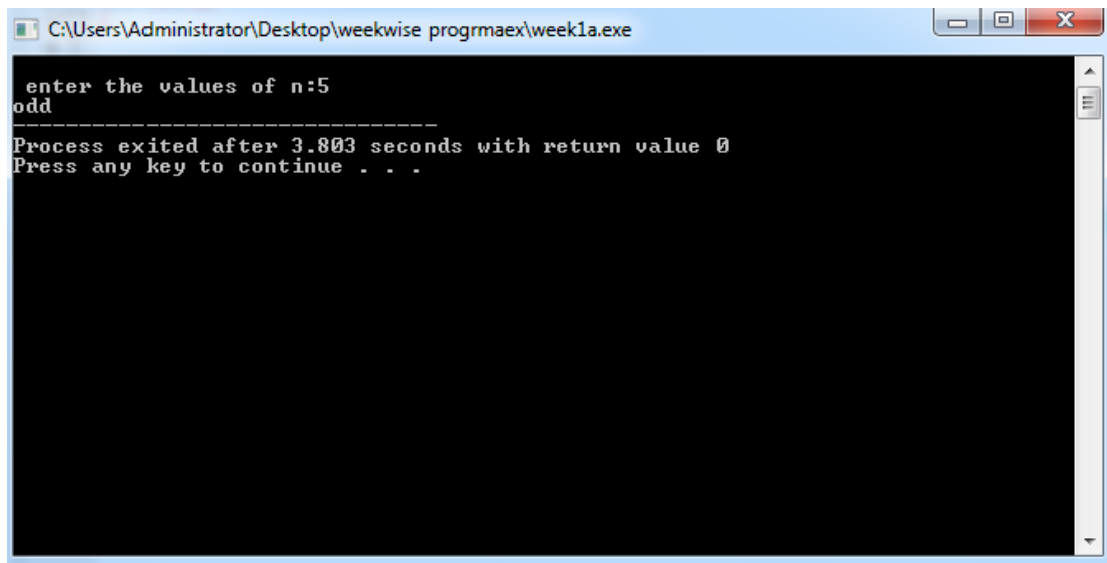
```
#include<stdio.h>
void main()
{
        int x,y,A,B;
        float Result;
        printf("Enter the values of x,y\n");
        scanf("%d %d " ,&x, &y);
        A=(x+y);
        B=(x-y);
        Result=A*B ;
        printf("%f", Result);
    }
```
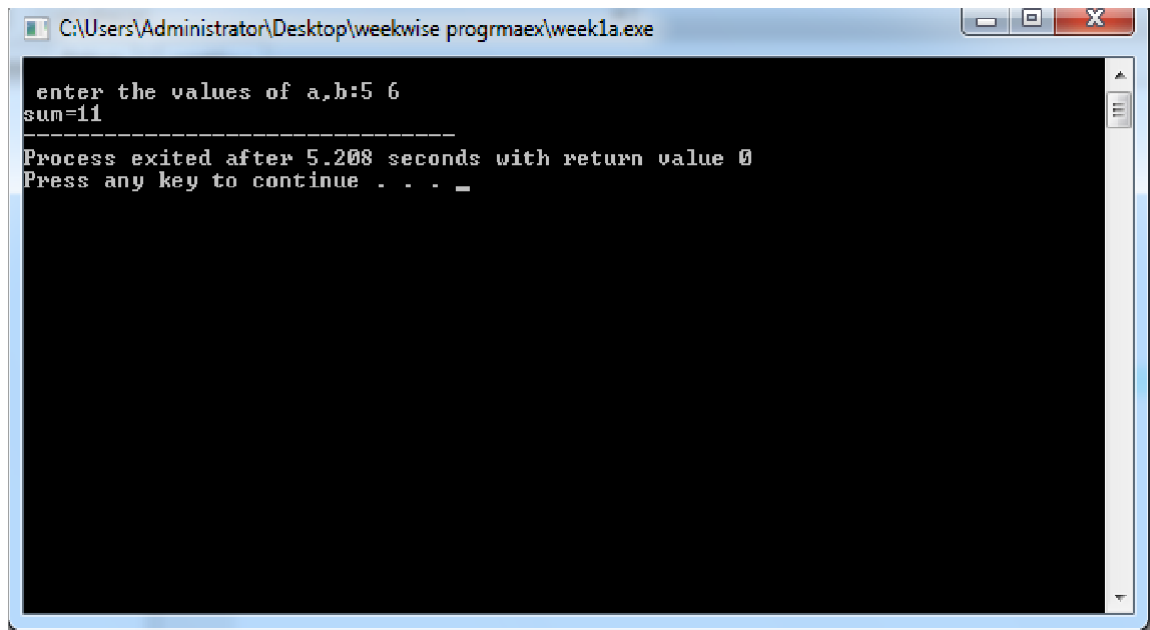
INPUT/OUTPUT

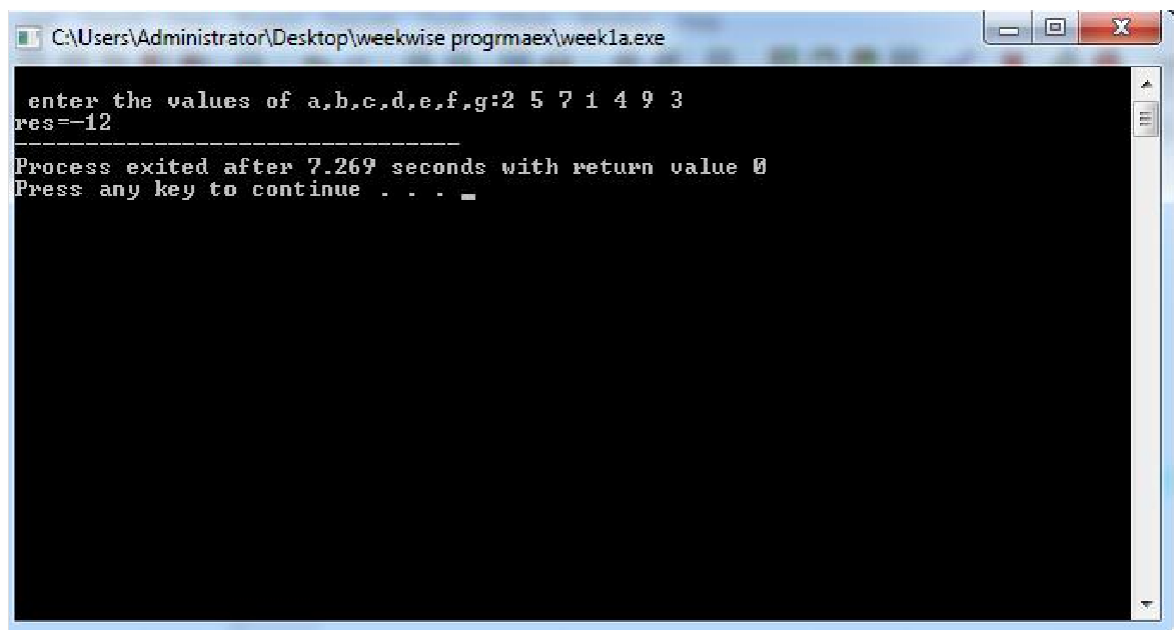**<u>To check whether a number is even or odd using ternary operator</u>**

To perform the addition of two numbers without using + operator

```
 enter the values of a,b:5 6
sum=11
--------------------------------
Process exited after 5.208 seconds with return value 0
Press any key to continue . . . _
```
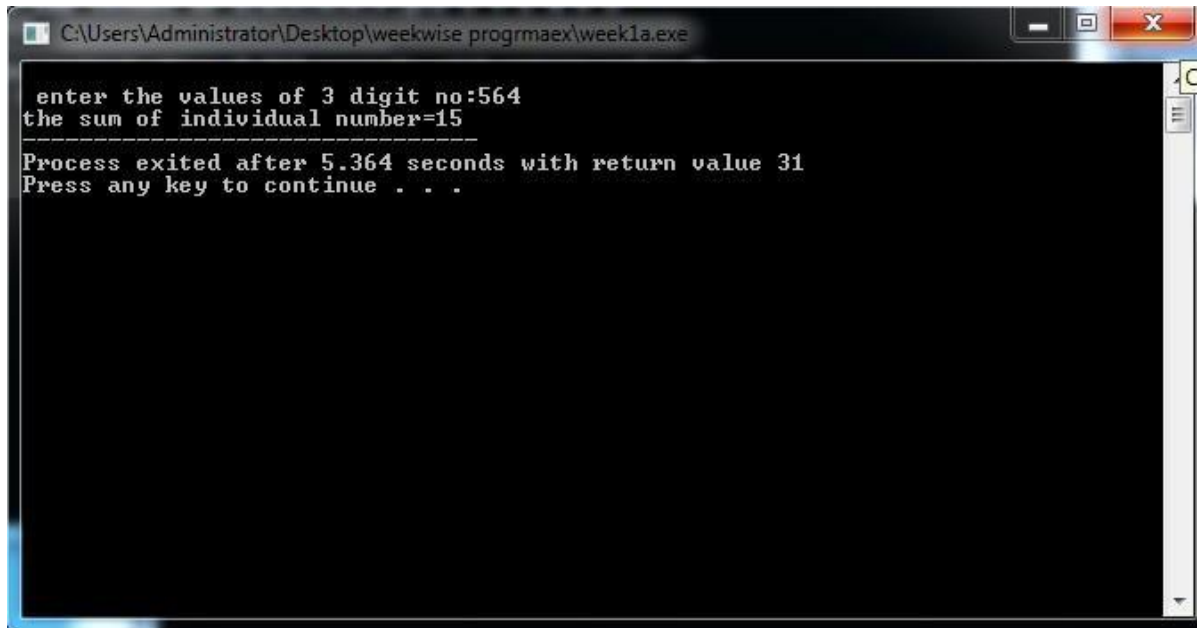
To evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)).
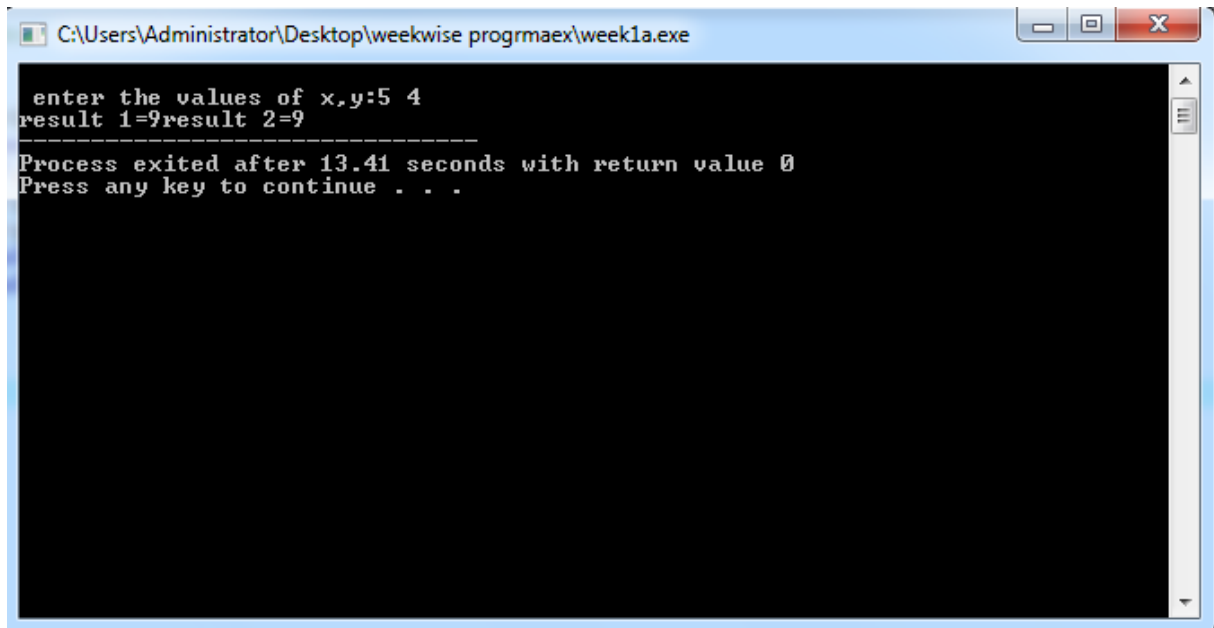
```
 enter the values of a,b,c,d,e,f,g:2 5 7 1 4 9 3
res=-12
--------------------------------
Process exited after 7.269 seconds with return value 0
Press any key to continue . . . _
```

To find the sum of Individual digits of a 3 digit number

```
C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

 enter the values of 3 digit no:564
the sum of individual number=15
----------------------------------
Process exited after 5.364 seconds with return value 31
Press any key to continue . . .
```

To read the values of x and y and print the results of the following expressions in one line

```
C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

 enter the values of x,y:5 4
result 1=9result 2=9
----------------------------------
Process exited after 13.41 seconds with return value 0
Press any key to continue . . .
```

PRE LAB VIVA QUESTIONS:

1. Who is the father of C language?

2. Which operator takes only integer operands?

3. C programs are converted into machine language with the help of

   a. An editor

   b. A compiler

c. An operating system

d. None

4. C was primarily developed as

    a. System programming language

    b. General purpose language

    c. Data processing language

    d. None

5. How many keywords are recognized by standard ANSI C?

6. Why variable names beginning with underscore is not encouraged?

7. In C programming language, which of the following types of operators will have highest precedence

    a. Relational operators

    b. Equality operators

    c. Logical operators

    d. Arithmetic operators

8. If i,j,k are integer variables with values 1,2 3 respectively, then what is the value of the expression !((j+k) > (i+5))?

9. Arrange these operators ., | |, <, =, if arranged in ascending order of precedence?

10. The format identifier "%i" is used for which data type?

LAB ASSIGNMENT:
1. Find the output of the following code?
```c
void main()
{
    int i=10;
    i = !i > 14;
    printf("i=%d",i);
}
```
2. Find the output of the following code?
```c
void main()
{
    int i=0, j=1, k=2,m;
    m = i++ || j++ || k++;
    printf(%3d%3d%3d%3d", m, i, j, k);
}
```
3. Find the output of the following code?
```c
void main()
{
    int main=3;
    printf("%d", main);
}
```
4. Find the output of the following code?
```c
void main()
{
```

17

```
            int k;
            k = „a' > 60;
            printf("%d", k);
    }
5.  Find the output of the following code?
    void main()
    {
        printf("iare\rcollege\n");
    }
6.  Find the output of the following code?
    void main()
    {
        int const k = 5;
        k++;
        printf("k is %d", k);
    }
7.  Find the output of the following code?
    int x;
    void main()
    {
        if (x)
                printf("hi");
        else
                printf("how are u");
    }
8.  Find the output of the following code?
    void main()
    {
        int x = 0;
         if (x == 0)
                printf("hi");
                 else
                printf("how are u");
                 printf("hello");
    }
9.  Find the output of the following code?
    void main()
    {
        int x = 5;
                    if (x < 1);
                    printf("Hello");
    }
10. Find the output of the following code?
    void main()
    {
        int ch;
        printf("enter a value btw 1 to 2:");
        scanf("%d", &ch);
         switch (ch)
         {
                    case 1: printf("1\n");
                    default:printf("2\n");
```

```
        }
    }
11. Find the output of the following code?
    void main()
    {
        char ch;
        int i;
        ch = 'G';
        i = ch-'A';
        printf("%d", i);
    }
12. Find the output of the following code?
    void main()
    {
        int i=065, j=65;
        printf(%4d%4d",i, j);
    }
13. Find the output of the following code?
    void main()
    {
        unsigned int a = 10;
        a = ~a;
        printf("%d\n", a);
    }
14. Find the output of the following code?
    void main()
    {
        int x = 97;
        int y = sizeof(x++);
        printf("x is %d",x);
    }
15. Find the output of the following code?
    void main()
    {
        int x = 4, y, z;
        y = --x;
        z = x--;
        printf("%3d%3d%3d", x, y, z);
    }
```

POST LAB VIVA QUESTIONS:

1. Identify the operators whose meaning is context dependent?

2. Evaluate the following expression $4 + 6 / 3 * 2 - 2 + 7 \% 3$?

3. Which variables can be accessed by all modules in a program?

4. If integer needs 4 bytes of storage, then what is the maximum value of a signed integer?

5. If ASCII value of 'x' is 120, then what is the value of the H, if
   H = ('x' – 'w') / 3;

6. What is the usage of goto statement in C language?

7. If switch feature is used, then

a. default case must be present

b. default case, if used, should be the last case

c. default case, if used, can be placed anywhere

d. none

8. The switch feature

   a. Can always be replaced by a nested if then else clause

   b. Enhances logical clarity

   c. Can"t always be replaced by a nested if-then-else clause

9. Both (a) and (b) Which function is used to read character as you type? Which format specifier is used to print the values of double type variable?

CONTROL STRUCTURES

OBJECTIVE:

1. Write a C program to find the sum of individual digits of a positive integer.

2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

4. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if-else and switch case. The following table shows the range of ASCII values for various characters.

Characters	ASCII values
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127

5. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Write a C program to determine how much profit or loss incurred in percentage.

RESOURCES:
Dev C++ 5.11

PROGRAM LOGIC:

To find the sum of individual digits of a positive integer.

1. Start

2. Read a number N

3. Initialize the Sum=0

4. if n > 0 then calculate reminder R= N %10

5. Add reminder R to Sum

6. Store N/10 value to N

7. If N=0 then Display Sum

8. Stop

Fibonacci Series

1. Start

2. Initialize first two number of Fibonacci series A=0, B=1

3. Read N value for displaying the Fibonacci series up to Nth term

4. If N= 1 or N=2 display the value of A and B

5. If N > 2, calculate the next term by taking a temporary variable T = A +B

6. Display the term T

7. Swap the contents of A and B using a third variable T

8. Stop

Generate Prime Number

9. Start

10. Read the prime number range N

11. Initialize flag =0

12. Take two numbers i and j, if i % j =0 then make flag=1

13. If flag = 0 then display the number i as prime number

14. Stop

To determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol

1. Start

2. Read a character

3. if(ch>=65&&ch<=90)

4. Display entered character is a uppercase letter

5. if(ch>=97&&ch<=122)

6. Display entered character is a lowercase letter

7. if(ch>=48&&ch<=57)

8. Display entered character is a digit

9. if((ch>=0&&ch<48)||(ch>57&&ch<65)||(ch>=90&&ch<97)||(ch>122))

10. Display entered character is a special symbol

11. Strop

To determine how much profit or loss incurred in percentage

1. Start

2. Declare variables cp, sp, pro=0, loss=0, lossper, proper

3. Read variables sp and cp

22

4. if(cp>sp)

5. Calculate loss=cp-sp

6. if(sp>cp)

7. Calculate pro=sp-cp

8. Calculate lossper=(loss/cp)*100 and proper=(pro/cp)*100;

9. if(cp>sp) dispaly loss percentage

10. if(sp>cp) display profit percentage

11. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.

2. Compile: F9

3. Execute: F10

SOURCE CODE:
To find the sum of individual digits of a positive integer.

```
#include<stdio.h>
void main()
{
        int n,d,s=0;
        printf("\n Enter a number:");
        scanf("%d",&n);
        while(n!=0)
        {
                d=n%10;
                n=n/10;
                s=s+d;
   }
        printf("sum of individual digits=%d",s);
}
```

Fibonacci Series

```
#include<stdio.h>
void main()
{
        int a,b,n,c,i;
        printf("\n Enter a number of terms:");
```

23

```c
        scanf("%d",&n);
        a=0;
        b=1;
        for(i=0;i<=n-2;i++)
        {
                if(a==0 && b==1)
                 printf("the fibonacci sequence is %d\t%d",a,b);
                c=a+b;
                printf("\t%d",c);
                a=b;
                b=c;
    }
}
```

<u>Generate Prime Number</u>

```c
#include<stdio.h>
void main()
{
        int r=0,i,f,j,ctr;
        printf("\nEnter the range of the numbers:");
        scanf("%d",&r);
        for(i=2;i<=r;i++)
        {
                f=0;
                for(j=1;j<=i/2;j++)
                {
                        if(i%j==0)
                         f=f+1;
                }
                if(f==1)
                {
                        printf("\t%d",i);
                        ctr++;
                }
        }
}
```

To determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol

```c
#include<stdio.h>
void main()
{
                char ch;
                printf("\nEnter the character: ");
                scanf("%c",&ch);
                if(ch >= 65 && ch <= 90)
                printf("\n%c is uppercase",ch);
                else if(ch >= 97 && ch <= 122)
                printf("\n%c is lowercase",ch);
                else if(ch >= 48 && ch <= 57)
                printf("\n %c is a digit");
                else
                printf("\n %c is a special character");
}
```
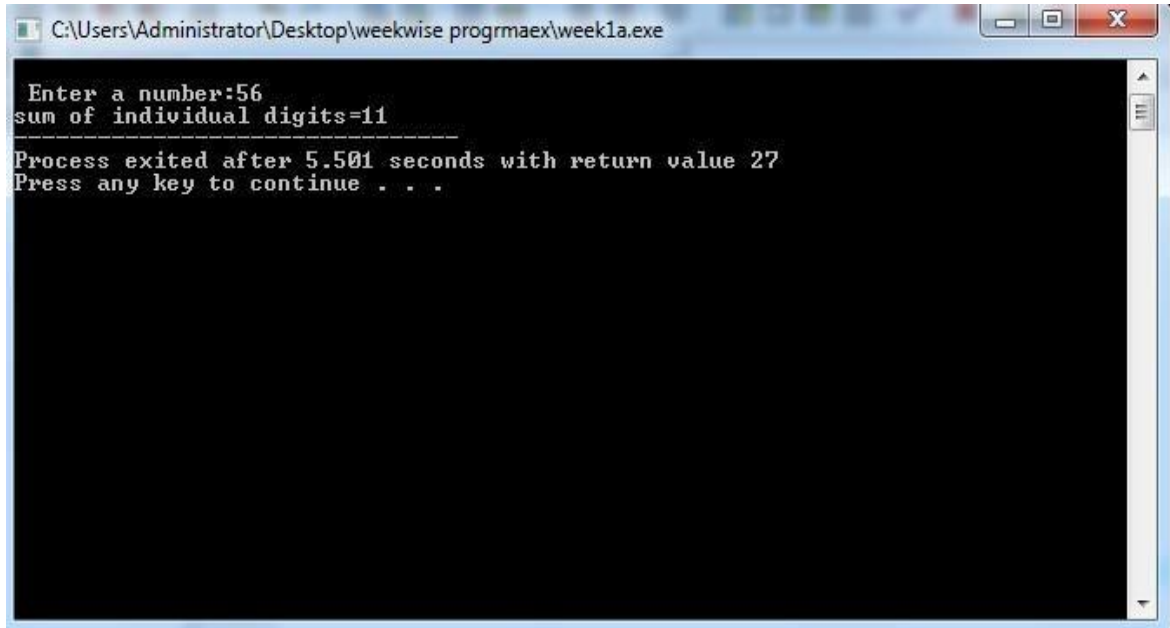
To determine how much profit or loss incurred in percentage

```c
#include<stdio.h>
void main()
{
        float cp,sp,p,l,pp,lp;
        printf("Enter the costprice and selling prices of an article: ");
        scanf("%d%d",&cp,&sp);
        if(cp > sp)
        {
                l=cp-sp;
                lp=(l/cp)*100;
                printf("The seller had a loss and loss precentage=%f",lp);
        }
        else if(sp > cp)
        {
                p=sp-cp;
                pp=(p/cp)*100;
                printf("The seller had a profit and profit percentage=%f",pp);
        }
```

else

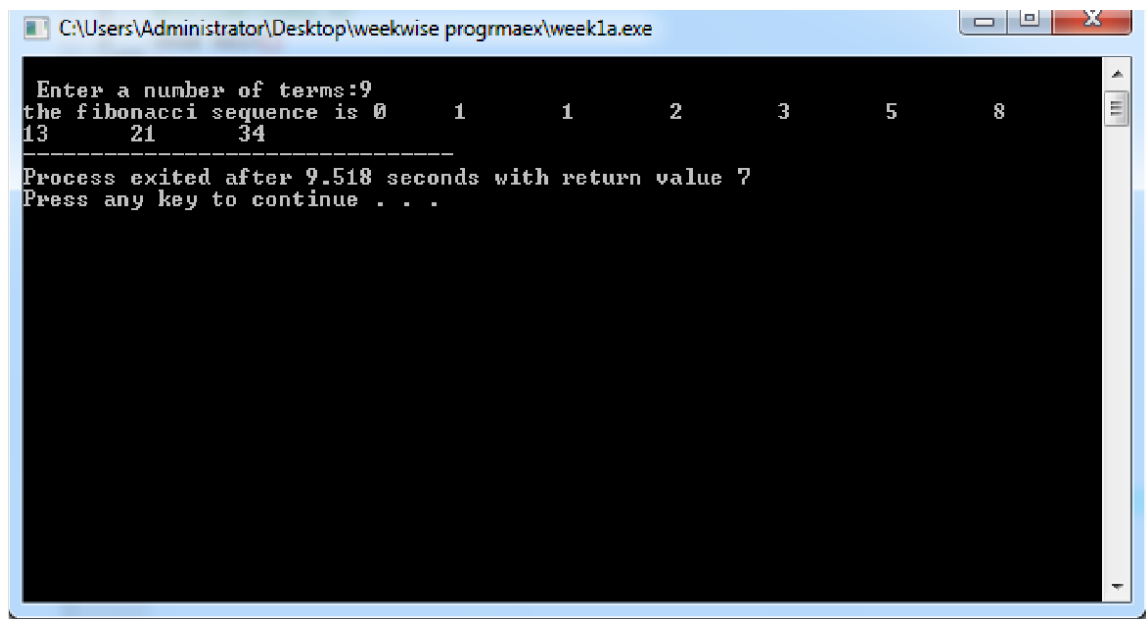   printf("The seller had no profit no loss");

}

INPUT/OUTPUT*:*

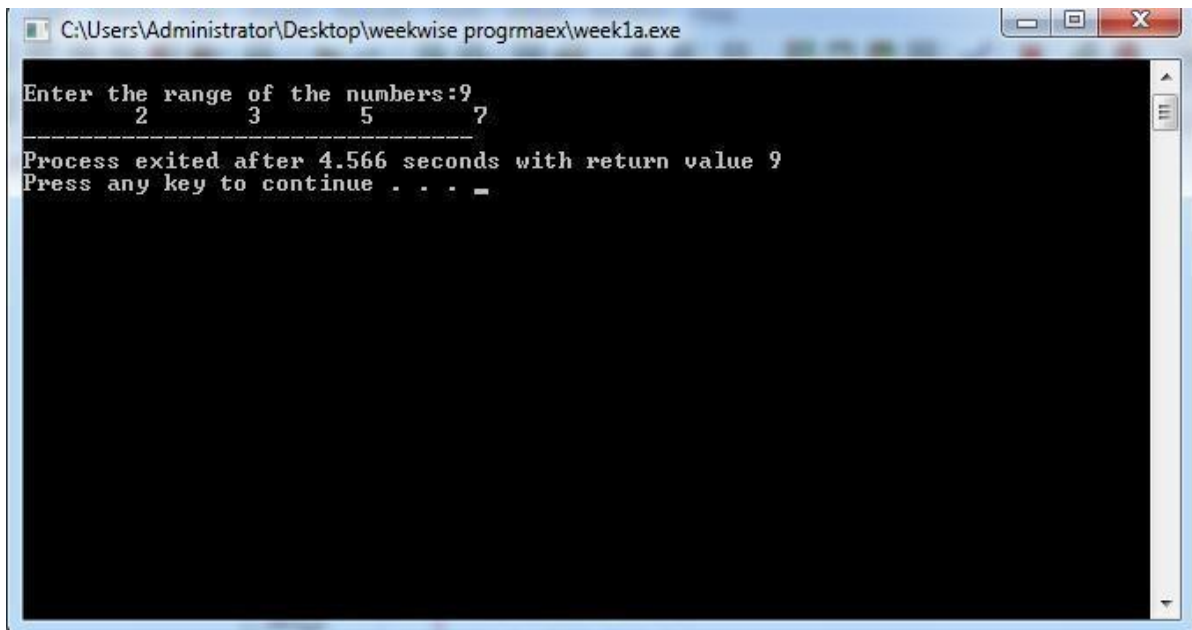**To find the sum of Individual digits of a positive number**

```
 C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

 Enter a number:56
sum of individual digits=11
-----------------------------------
Process exited after 5.501 seconds with return value 27
Press any key to continue . . .
```

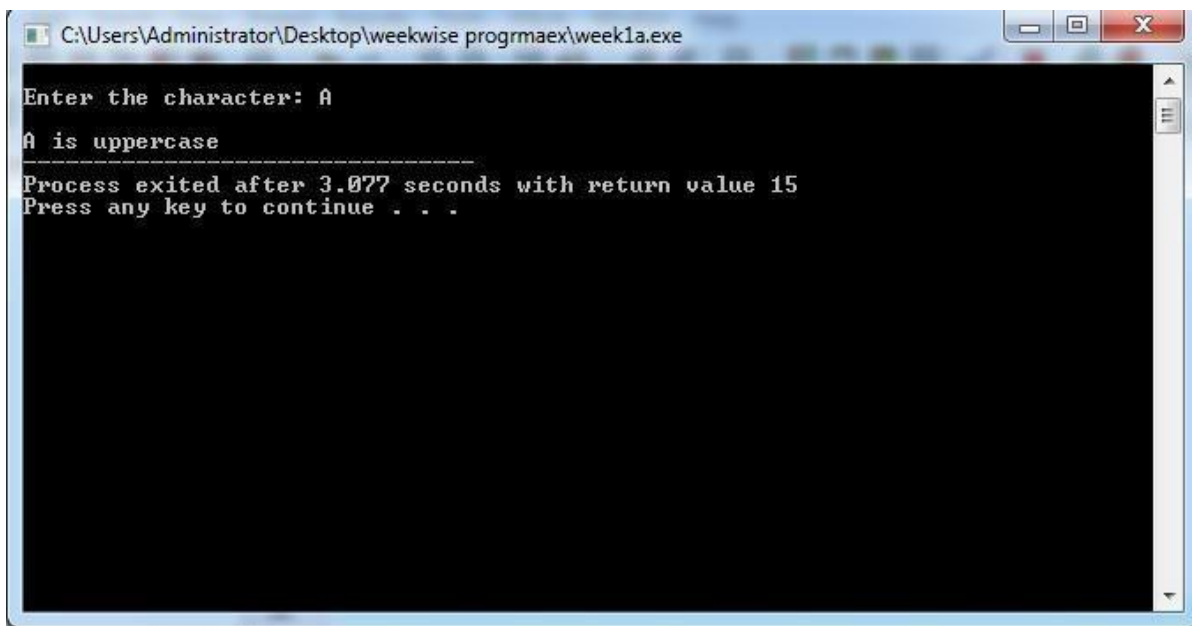**Fibonacci Series**

```
 C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

 Enter a number of terms:9
the fibonacci sequence is 0     1       1       2       3       5       8
13      21      34
-----------------------------------
Process exited after 9.518 seconds with return value 7
Press any key to continue . . .
```

Generate Prime Number


```
 C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

Enter the range of the numbers:9
        2       3       5       7
------------------------------------------
Process exited after 4.566 seconds with return value 9
Press any key to continue . . . _
```
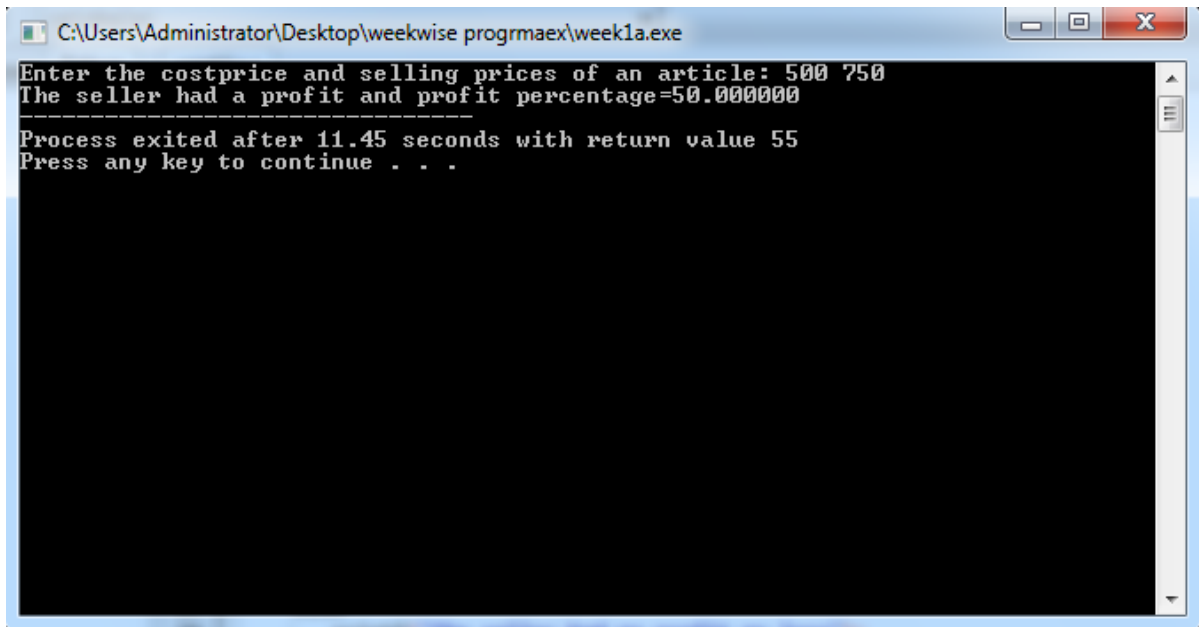
To determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol


```
 C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

Enter the character: A

A is uppercase
------------------------------------------
Process exited after 3.077 seconds with return value 15
Press any key to continue . . .
```

To determine how much profit or loss incurred in percentage


```
C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

Enter the costprice and selling prices of an article: 500 750
The seller had a profit and profit percentage=50.000000
--------------------------------
Process exited after 11.45 seconds with return value 55
Press any key to continue . . .
```

PRE LAB VIVA QUESTIONS:

1. What are the two types of flow control used?
2. What do you mean by looping?
3. What is the difference between while and do while loop?
4. Which loop is known as entry controlled loop?
5. Which loop is known as exit control loop?
6. What are the two commands to control the loop?
7. In which loop the test condition is tested at the end of the loop?
8. What is a prime number?
9. Which decision making statement is used to check the determinant value of a quadratic equation?
10. Using which operator we can write multiple conditions in an if statement?

LAB ASSIGNMENT:

1. Any character is entered through the keyboard; write a program to determine whether the character entered is a capital letter, a small case letter, a digit, or a special symbol.
2. Write a C program to display the following in triangular form

             *
             *   *
             *   *   *
             *   *   *   *

3. Write a program to display the triangular number where a triangular number is nothing but summation of 1 to given no N.

4. Read a 3 digit number N from keyboard and find individual digits in units place (U), ten's place (T) and hundred's place (H). check $U^3 + T^2 + H = N$ (given no)
5. Check whether a year is leap year or not?
6. Display the largest among three numbers using if else statement?
7. Write a C program to calculate the sum of natural numbers 1+2+3+4+…………….+n
8. Write a C program to reverse a given number?
9. Write a C program to display the series 1 3 5 7 9 11………………
10. Write a C program to display all the ASCII values and their equivalent characters using while loop?

POST LAB VIVA QUESTIONS:
1. Can we initialize more than one variable in for loop?
2. Give one example of for loop without increment/decrement operation?
3. Is the following code for(; ;) represents an infinite loop ?
4. What is the order of movement of control in for loop?
   for(expression1; expression2; expression3)

   {

           Block of statements;

   }

5. Can we write more than one test condition in for loop?

6. What is the output of the following code?

   ```
   #include<stdio.h>

   void main()

   {

           int i=1;

           for(;i++;) printf("%d",i);

   }
   ```

7. Can you write for loop without body, if yes then what is the output of the following code?
   ```
   #include<stdio.h>

   int main()

   {

       int i;

       for(i=0;i<=10;i++);

       printf("%d",i);

       return 0;

   }
   ```

8. What is the output of the following program ?
   ```
   #include<stdio.h>

   int main()

   {

       int i,j=2;
   ```

29

```c
        for(i=0;j>=0,i<=5;i++)
        {
                printf("%d ",i+j);
                 j--;
        }
        return 0;
    }
```

9. What is the output of the following program?
```c
#include<stdio.h>
int main()
{
    int i;
    for(;i=0,i<=3 ;i++)
    {
            printf("%d ",i);
    }
    return 0;
}
```

10. What is the output of the following program?
```c
#include<stdio.h>
int main()
{
    int i;
    for(i=0;-5 ;i++)
    {
            printf("%d ",i);
            if(i==3)
                    break;
    }
    return 0;
 }
```

WEEK- 3

CONTROL STRUCTURES

OBJECTIVE:

1. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).

2. Write a C program to calculate the following sum:

$$sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$

3. Write a C program to find the roots of a quadratic equation.

4. Write a C program to check whether a given 3 digit number is Armstrong number or not.

5. Write a C program to print the numbers in triangular form

```
    1
    1  2
    1  2  3
    1  2  3   4
```

RESOURCES:

Dev C++ 5.11

PROGRAM LOGIC:

<u>Arithmetic Operations using switch case</u>

1. Start

2. Read two numbers a and b

3. Read your choice of operator ch

4. If ch = „+" then calculate add = a + b and display the addition result.

5. If ch= „-„ then calculate sub = a – b and display t he subtraction result.

6. If ch= „*" then calculate mul = a * b and display t he multiplication result.

7. If ch= „/" then calculate div = a / b and display t he division result.

8. If ch="%" then calculate mod = a % b and display th e modulus result.

9. Otherwise display invalid operator

10. Stop

Sum=$1-x^2/2! +x^4/4!-x^6/6! +x^8/8!-x^{10}/10!$

1. Start

2. Read x value.

3. Calculate sum=$1-x^2/2! +x^4/4!-x^6/6! +x^8/8!-x^{10}/10!$.

4. Print sum.

5. Stop

Roots of Quadratic Equation

1. Start

2. Read the coefficients of a quadratic equation a, b, c

3. Calculate determinant d = b*b – 4*a*c

4. If d > 0 calculate two real roots r1 = (-b + sqrt(d)) / (2*a) and r2 = (-b + sqrt(d)) /(2*a)

5. If d=0 then roots r1 and r2 are equal and display r1 = r2 = -b /(2*a)

6. If d < 0 then roots are imaginary and display real root= -b /(2 * a) and img root =sqrt(-d) /(2*a)

7. Stop

To print the numbers in triangular form

1. Strat

2. Declare i, j, rows

3. Enter number of rows

4. Read rows

5. for(i=1;i<=rows;++i)

6. for(j=1;j<=i;++j)

7. Display j

8. Stop

PROCEDURE:
1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.

2. Compile: F9

3. Execute: F10

SOURCE CODE:
Arithmetic Operations using switch case

```
#include<stdio.h>
void main()
{
```

```c
        int a,b;
        char op;
        printf("\n Enter two number a,b,an operator: ");
        scanf("%d %d %c",&a,&b,&op);
        switch(op)
        {
                case'+':printf("\n Sum=%d",a+b);break;
                case'-':printf("\nDifference=",a-b);break;
                case'*':printf("\nProduct=",a*b);break;
                case'/':printf("\nQuotient=",a/b);break;
                case'%':printf("\nRemainder=",a%b);break;
                default:printf("\n Please enter a valid input");
                break;
        }
}
```

$Sum=1-x^2/2! +x^4/4!-x^6/6! +x^8/8!-x^{10}/10!$

```c
#include<stdio.h>
#include<math.h>
void main()
{
        int i = 2, n, s = 1, x, pwr = 1, dr;
        float nr = 1, x1, sum;
        printf("\n\n\t enter the angle...: ");
        scanf("%d", &x);
        x1 = 3.142* (x /180.0);
        sum = x1;
        printf("\n\t enter the number of terms...: ");
        scanf("%d", &n);
        While ( i <= n )
         {
                pwr = pwr + 2;
                dr = dr * pwr * (pwr - 1);
                sum = sum + (nr / dr) * s;
                s = s * (-1);
                nr = nr * x1 * x1; i+= 2;
        }
```

33
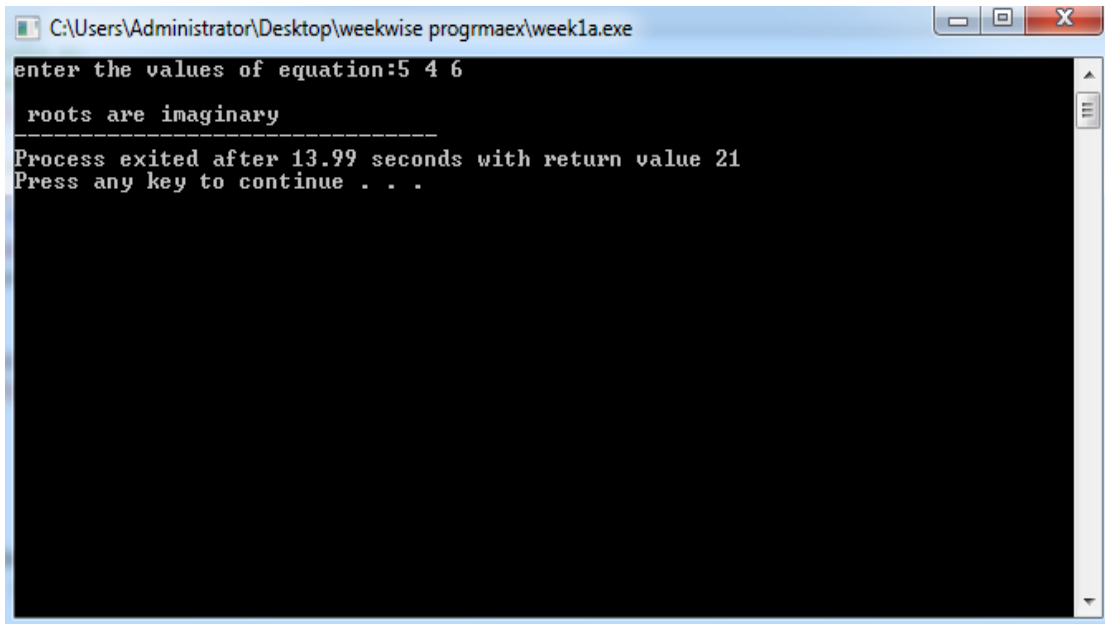
```c
        printf("\n\t the sum of the sine series is..: %0.3f",sum);
    }
```

<u>Roots of Quadratic Equation</u>

```c
#include<stdio.h>
#include<math.h>
void main()
{
        float a,b,c,r1,r2,d;
        printf("enter the values of equation:");
        scanf("%f%f%f",&a,&b,&c);
        if(a==0)
          printf("\n enter non zero values");
        else
        {
                d=b*b-4*a*c;
                if(d>=0)
                {
                        r1=((-b+sqrt(d))/(2*a));
                        r2=((-b-sqrt(d))/(2*a));
                        printf("\n the roots are=\t%f\t%f",r1,r2);
                }
                else
                 printf("\n roots are imaginary");
    }
}
```

<u>To print the numbers in triangular form</u>

```c
#include<stdio.h>
void main()
{
        int i,j,n;
        printf("\n Enter the number of rows:");
        scanf("%d",&n);
        for(i=1;i<=n;i++)
        {
                for(j=1;j<=i;j++)
                {
```

34

```c
                    printf("%5d",j);
            }
            printf("\n");
        }
}
```

INPUT/OUTPUT:
<u>Arithmetic Operations using switch case</u>

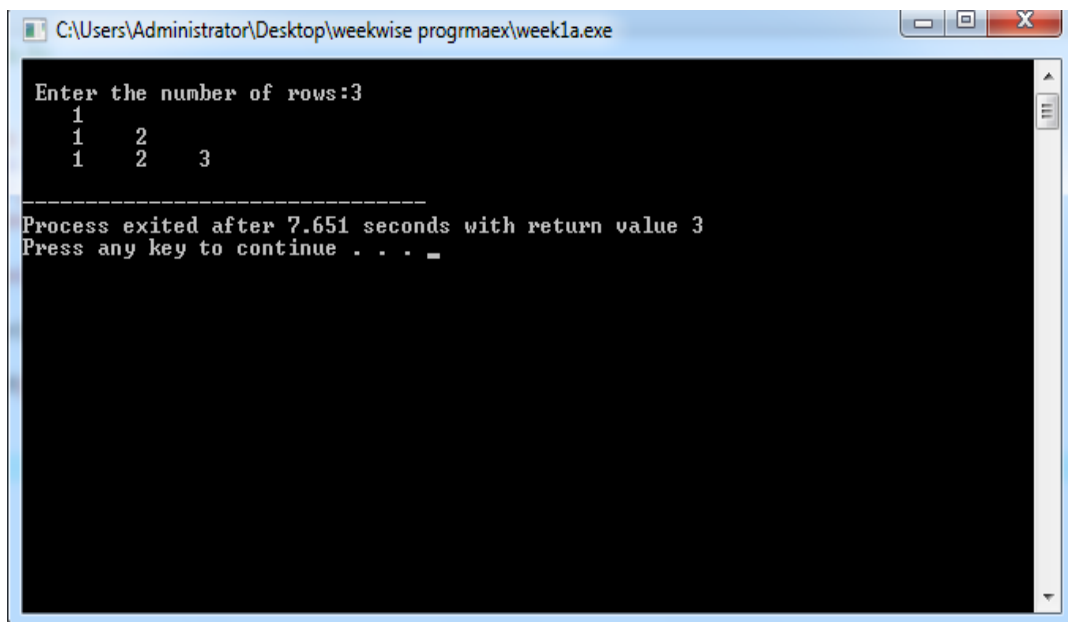**<u>Sum=1-x^2/2! +x^4/4!-x^6/6! +x^8/8!-x^{10}/10!</u>**

Roots of Quadratic Equation


```
C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

enter the values of equation:5 4 6

 roots are imaginary
-----------------------------------
Process exited after 13.99 seconds with return value 21
Press any key to continue . . .
```

To print the numbers in triangular form


```
C:\Users\Administrator\Desktop\weekwise progrmaex\week1a.exe

 Enter the number of rows:3
   1
   1    2
   1    2    3

-----------------------------------
Process exited after 7.651 seconds with return value 3
Press any key to continue . . . _
```

PRE-LAB VIVA QUESTIONS:

1. What is a null statement?
2. How would you decide the use of one of the three loops in C for a given problem?
3. Give a typical example where we find the application of goto necessary?
4. How can we use for loops when the number of iterations are not known?

5. Compare in terms of their functions, between while and do…while loops?

6. In an exit-controlled loop, if the body is executed n times, then the test condition is evaluated how many times?

7. Do you think in a for loop expression, the starting value of the control variable must be less than its ending value?

8. Do you think the use of continue statement is considered as unstructured programming?

9. Write a for statement to print each of the sequences of integers 1, 2, 4, 8, 16, 32?

10. Change the following for loop to while loop

for(m = 1;m < 10; m = m + 1)

printf(m)

LAB ASSIGNMENT:

1. Write a C program to display the friendly numbers between 1 to N?
2. Write a C program to display the series $1 + 2/2! + 3/3! + 4/4! + \ldots\ldots$
3. Write a C program to check whether the given number is palindrome or not?
4. Write a C program to display the right most digit of any integer?
5. Write a C program to read a set of single digits n and convert them into a single decimal number. E.g read a given set of number { 7, 4, 9, 3} and return 7493.
6. Write a C program to generate all combination of numbers using 1, 2, 3?
7. Write a C program to print Pascal triangle?
8. Write a C program to print Floyd"s triangle?
9. Write a C program to find LCM and GCD of two given numbers?
10. Write a C program to print the diamond pattern?

```
            *
          *   *   *
      *   *   *   *   *
          *   *   *
            *
```

POST-LAB VIVA QUESTIONS:

1. What is the output of the following code?

```c
#include <stdio.h>

int main()
{
        unsigned int a = 10;
        a = ~a;
    printf("%d\n", a);
}
```

2. What is the output of the following code?

```c
int i=40;

extern int i;

int main()
{
    do
```

```c
        {
                printf("%d",i++);
        }while (5, 4, 3, 2, 1, 0);


        return 0;
    }
```

3. What is the output of the following code?
```c
    int main()
    {
        int i;
        for(i=10;i<=15;i++)
        {
                while(i)
                {
                        do
                        {
                          printf("%d ",1);
                                if(i>>1)
                                        continue;
                        }while(0);
                    break;
                }
        }
        return 0;
    }
```

4. What is the output of the following code?
```c
    void main()
    {
        double k = 0;
            for (k = 0.0; k < 3.0; k++)
                    printf("Hello");
    }
```

5. What is the output of the following code?
```c
    void main()
    {
```

```
        int i = 0;
            for (i++; i == 1; i = 2)
                    printf("In for loop ");
                    printf("After loop\n");
    }
```
6. What is the output of the following code?

```
    void main()
    {
      int i = 0;
        while (i < 10)
         {
          i++;
          printf("hi\n");
          while (i < 8)
          {
                            i++;
                            printf("hello\n");
          }
        }
    }
```
7. What is the output of the following code?

```
    void main()
    {
      int i = 0, j = 0;
        while (i < 5, j < 10)
        {
              i++;
              j++;
        }
        printf("%d, %d\n", i, j);
    }
```
8. What is the output of the following code?

```
    void main()
    {
      int i, j;
        for (i = 0;i < 5; i++)
```

```c
        {
            for (j = 0;j < 4; j++)
            {
                if (i > 1)
                    break;
            }
            printf("Hi \n");
        }
    }
```

9. What is the output of the following code?

```c
    void main()
    {
      int i, j;
        for (i = 0;i < 5; i++)
        {
            for (j = 0;j < 4; j++)
            {
                if (i > 1)
                    continue;
                printf("Hi \n");
            }
        }
    }
```

10. What is the output of the following code?

```c
    void main()
    {
            int i;
            for(i = 2;i += 2; i <= 9; i +=2)
                    printf("%d\n", i);
    }
```

40

OBJECTIVE:

1. Write a C program to find the second largest integer in a list of integers.
2. Write a C program to perform the following:
    i.   Addition of two matrices
    ii. Multiplication of two matrices
3. Write a C program to count and display positive, negative, odd and even numbers in an array.
4. Write a C program to merge two sorted arrays into another array in a sorted order.
5. Write a C program to find the frequency of a particular number in a list of integers.

RESOURCES:

Borland C++ 5.02

PROGRAM LOGIC:

Find the second largest integer in a list of integers

1. Read an array of size n.
2. Read elements into the array a[n].
3. Assume big = a[0].
4. Compare each element of array a[i] with big and swap a[i]=big if any element is larger than big.
5. Repeat step 4 until all elements of array are compared with big.
6. Once the array is sorted, find secondbig = a[size-j-1].
7. Display the second largest element.

Addition of two matrics

1. Read the no. of rows (r1) and cols (c1) of a matrix a[3][3].
2. Read the no. of rows (r2) and cols. (c2) of matrix b[3][3].
3. If c1 = c2 and r1 = r2 then read the elements into both the matrices a and b
4. Add the elements of first matrix with the elements of second matrix according to their index position.
5. Display the resultant matrix.

Multiplication of two matrics

1. Read the no. of rows (r1) and cols (c1) of a matrix a[3][3].

2. Read the no. of rows (r2) and cols. (c2) of matrix b[3][3].

3. If c1=r2 then display matrix multiplication is possible otherwise display impossible

4. If c1=r2 then read the elements into both the matrices a and b.

5. Initialize a resultant matrix c[3][3] with 0.

6. Calculate c[i][j] = c[i][j] + a[i][k] * b[k][j].

7. Display the resultant matrix.

Count and display of positive, negative, odd and even numbers in an array

1. Declare and read variables n, i

2. Read elements into an array

3. If(a[i] > 0) then display number is positive

4. If(a[i]%2==0) then display number is even

5. If(a[i] < 0) then display number is negative

6. If(a[i]%2!=0) then display number is odd

Merge two sorted arrays into another array in a sorted order

1. Declare 3 matrices a[50], b[50], c[100]

2. Read number of rows and columns m, n.

3. Read elements for matrix a and b.

4. Sort the matrices if it is not sorted.

5. Copy the elements of matrix a into matrix c.

6. Then copy the elements of matrix b into matrix c.

7. Sort the elements of matrix c.

PROCEDURE:
1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.

2. Compile: F9

3. Execute: F10

SOURCE CODE:

Program to find the second largest element in an array

```
#include<stdio.h>
void main()
{
```

```c
        int a[10],i,j,t;
    printf(" enter 10 nos\n");
    for(i=0;i<10;i++)
     {
            scanf("%d",&a[i]);
     }
    for(i=1;i<10;i++)
    {
            for(j=0;j<10;j++)
     {
            if(a[j]>a[i])
             {
            t=a[i];
                    a[i]=a[j];
                    a[j]=t;


                    }
             }
     }
     printf("\n second largest no.=%d",a[8]);

}
```

Addition of two matrics

```c
#include<stdio.h>
void main()
{
 int a[10][10],b[10][10],i,j,m,n,p,q;
 printf(" enter row & column of Mat1\n");
 scanf("%d%d",&m,&n);
 printf(" enter row & column of Mat2\n");
 scanf("%d%d",&p,&q);
   if(m==p&&n==q)
{
        printf(" enter Mat1\n");
        for(i=0;i<m;i++)
        {       for(j=0;j<n;j++)
```

43

```c
            {       scanf("%d",&a[i][j]);
                }
        }
        printf(" enter Mat2\n");
        for(i=0;i<p;i++)
        {       for(j=0;j<q;j++)
                {       scanf("%d",&b[i][j]);
                }
        }
        printf("\n sum of the matrices\n");
        for(i=0;i<m;i++)
        {       for(j=0;j<n;j++)
                {       printf("%8d",a[i][j]+b[i][j]);
                }
                printf("\n");
        }
        printf("\n difference of the matrices\n");
        for(i=0;i<m;i++)
        {       for(j=0;j<n;j++)
                {       printf("%8d",a[i][j]-b[i][j]);
                }
                printf("\n");
        }
 }
 else
 printf("\n operations not possible...");
}
```

Multiplication of two matrics

```c
 #include<stdio.h>
 void main()
 {      int a[10][10],b[10][10],c[10][10],i,j,k,m,n,p,q;
        printf(" enter row & column of Mat1\n");
        scanf("%d%d",&m,&n);
        printf(" enter row & column of Mat2\n");
```

```c
            scanf("%d%d",&p,&q);
            if(n==p)
            {
                    printf(" enter Mat1\n");
                    for(i=0;i<m;i++)
                    {
                            for(j=0;j<n;j++)
                            {
                            scanf("%d",&a[i][j]);
                            }
                    }
                    printf(" enter Mat2\n");
                    for(i=0;i<p;i++)
                    {       for(j=0;j<q;j++)
                            {       scanf("%d",&b[i][j]);
                            }
                    }
                    printf(" \n multiplied matrix\n");
                    for(i=0;i<m;i++)
                    {       for(j=0;j<q;j++)
                            {       c[i][j]=0;
                                    for(k=0;k<n;k++)
                                    {       c[i][j]=c[i][j]+a[i][k]*b[k][j];
                                    }       printf("%8d",c[i][j]);
                            }       printf("\n");
                    }
            }
            else
            printf(" \n multiplication is not possible...");
 }
```

Count and display of positive, negative, odd and even numbers in an array

```c
 #include<stdio.h>
 void main()
 {
        int a[10],i,o=0,p=0,e=0,n=0;
 printf(" enter 10 nos\n");
```

45

```c
        for(i=0;i<10;i++)
        {
                scanf("%d",&a[i]);
        }
        for(i=0;i<10;i++)
        {
                if(a[i]%2==0)
                {
        e++;
                }
                else
                {
        o++;
                }
        if(a[i]>=0)
                {
        p++;
                }
                else
                {
        n++;
                }
        }
        printf("\n even nos.=%d",e);
        printf("\n odd nos.=%d",o);
        printf("\n +ve nos.=%d",p);
        printf("\n -ve nos.=%d",n);
        }
 }
```

Merge two sorted arrays into another array in a sorted order

```c
#include<stdio.h>
#include<conio.h>
void main( )
{
        int n,m,i,j,k,c[40],a[20],b[20];
        printf("Enter how many elements for array A?:\n");
```

```c
 scanf("%d",&n);
 printf ("Enter how many elements for array B?:\n");
scanf("%d",&m);
 printf("Enter elements for A:-\n");
 for(i=0;i<n;i++)
 scanf("%d",&a[i]);
 printf("Enter elements for B:-\n");
 for(j=0;j<m;j++)
 scanf("%d",&b[j]);
 i=j=k=0;
 while(i<n&&j<m)
 {
     if(a[i]<b[j])
     c[k++]=a[i++];
     else
     if(a[i]>b[j])
     c[k++]=b[j++];
     else

     {
       c[k++]=b[j++];
       i++;
        j++;
     }
 }
 if(i<n)
 {
     int t;
     for(t=0;t<n;t++)

     c[k++]=a[i++];
   }
 if(j<m)
 {
     int t;
     for(t=0;t<m;t++)
```

47

```
                    {
                        c[k++]=b[j++];
                    }
                }
            printf("\n\n Merged Array C:\n\n")
            for(k=0;k<(m+n);k++)
                printf("\t \n %d ",c[k]);
    }
```

INPUT/OUTPUT:

Program to find the second largest element in an array

Matrix Addition

48

Matrix Multiplication


```
enter row & column of Mat1
2
2
enter row & column of Mat2
2
2
enter Mat1
1
1
1
1
enter Mat2
2
2
2
2

multiplied matrix
      4          4
      4          4

--------------------------------------
Process exited after 29.35 seconds with return value 2
Press any key to continue . . .
```

Count and display of positive, negative, odd and even numbers in an array
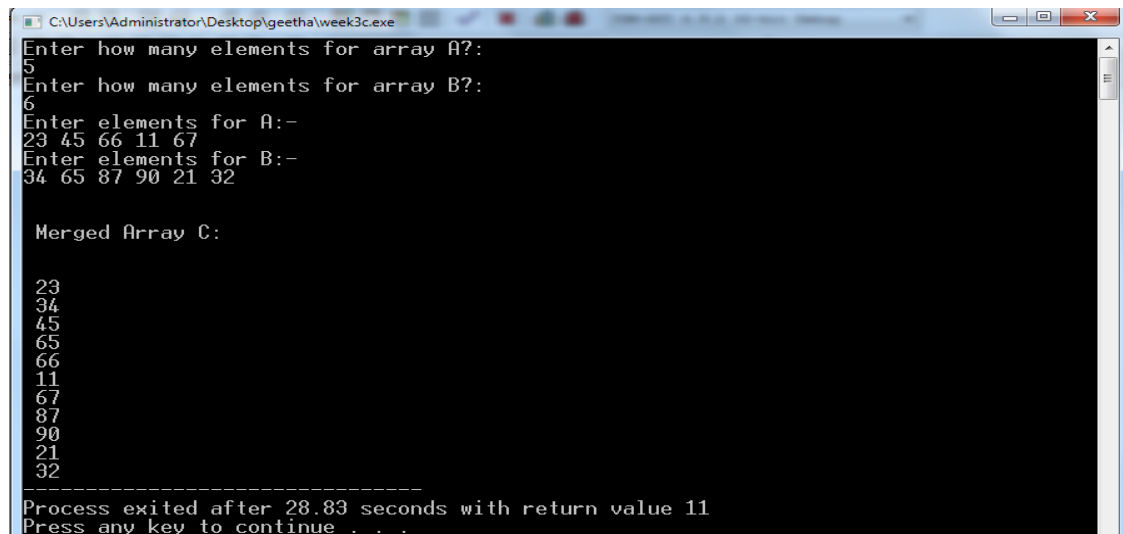

```
enter 10 nos
1
2
3
-1
-2
4
7
9
11
15

even nos.=3
odd nos.=7
+ve nos.=8
-ve nos.=2
--------------------------------------
Process exited after 31.1 seconds with return value 12
Press any key to continue . . . _
```

Merge two sorted arrays into another array in a sorted order

PRE LAB VIVA QUESTIONS:

1. What will happen if in a C program you assign a value to an array element whose subscript exceeds the size of array?

2. What does the following declaration mean?
   int (*ptr)[10];

3. What is the output of the following program?
   int a[6] = {2, 7, 3, 1, 5, 9};
   printf("%d",a[5] + 6);

4. What will be the output of the following code ?
   ```
   void main()
   {
      int a[5]={3,5,6,2,7};
         int i=3;
      if(a[i]==a[i+3])
          printf("true");
      else
          printf("false");
   }
   ```

5. What will be the output of the following code ?
   ```
   void main()
   {
        int a[5] = {5,7,3,1,2};
        a[2]=a[1];
        a[1]=a[3];
        a[2]=a[2]+a[3];
        printf("%d\t%d", a[1],a[2]);
   }
   ```

6. Distinguish Lvalue and Rvalue of an array element?

7. Write the output of the following code?
   ```
   void main()
   {
        int a[3][2] = {10. 20, 30, 40, 50, 60};
        printf("%d", a[0][4]);
   }
   ```

50

8. Which of the following multi-dimensional array declaration is correct for realizing a 2x3 matrix?
   a. int m[2][3]
   b. int m[3][2]
   c. int m[3],m[2]

9. Which of the following is the correct syntax for initialization of twodimensional array?

   a. table[2][3]={0,0,0,1,1,1};

   b. table[2][3]={ {0,0,0} {1,1,1} };

   c. table[2][3]={0,1},{0,1},{0,1};

10. Write the output of the following code?

    void main()

    {

       int x[10] = {5};

       printf("%3d%3d", x[1], x[9]);

    }

LAB ASSIGNMENT

1. Read a matrix and find the transpose of the matrix?.

2. Formulate a C-program that makes the following tasks:

   i.   Check whether matrix is magic square or not ?
   ii.   Print square of each element of 2D array matrix
   iii. Add the elements of lower triangular matrix
   iv.   Calculate sum of upper triangular matrix elements
   v.   Addition of diagonal elements in matrix
   vi.   Addition of all elements in matrix
   vii. Find the inverse of 3 x 3 matrix

3. Write a C program to reverse the contents of an array?

4. Given an array of n elements. Read n elements into array. Formulate a C-program for finding smallest element in array using pointers.

5. Write a C program to find the determinant of a matrix.

POST LAB VIVA QUESTIONS:

1. Find the output of the following code?
   ```
   void main()
   {
       int a[2][3] = {1, 2, 3, 4, 5};
       int i = 0, j = 0;
       for (i = 0; i < 2; i++)
               for (j = 0; j < 3; j++)
                               printf("%d\t", a[i][j]);
   }
   ```
2. Find the output of the following code?
   ```
   void main()
   {
       int a[2][2] = {{2,3},{1,6}};
       printf("%d", &a[0][1] - &a[0][0]);
   ```

}
3. What is the size of the array arr if it is declared as, float arr[3][2][2]?
4. Find the output of the following code?

```
void main()
{
    char data[2][3][2]={0,1,2,3,4,5,6,7,8,9,10,11};
    printf("%o",data[0][2][1]);
}
```

5. Find the output of the following code?

```
void main()
{
    short num[3][2]={3,6,9,12,15,18};
    printf("%d %d",*(num+1)[1],**(num+2));
}
```

6. Find the output of the following code?

```
void main()
{
    char *ptr="c programming";
    printf("%c",3[ptr]);
}
```

7. Find the output of the following code?

```
void main()
{
    int array[2][3]={5,10,15,20,25,30};
    int (*ptr)[2][3]=&array;
    printf("%d\t",***ptr);
    printf("%d\t",***(ptr+1));
    printf("%d\t",**(*ptr+1));
    printf("%d\t",*(*(*ptr+1)+2));
}
```

8. Find the output of the following code?

```
void main()
{
    int arr[][3]={{1,2},{3,4,5},{5}};
    printf("%d %d %d",sizeof(arr),arr[0][2],arr[1][2]);
}
```

9. Find the output of the following code?

```
void main()
{
    char arr[20]="Mahendra Singh Dhoni";
    printf("%d",sizeof(arr));
}
```

10. Find the output of the following code?

```
void main()
{
    int a[5] = {5, 1, 15, 20, 25};
    int i, j, m;   i = ++a[1];   j = a[1]++;
    m = a[i++];   printf("%d, %d, %d", i, j, m);
}
```

OBJECTIVE:

1. Initialize l=0, Flag=0
2. While String[l] != NULL
3. Increment l
4. Initialize i=0, j =l-1
5. While i < (l/2)+1
6. If String[i] equal to String[j]
7. Flag=0
8. else
9. Flag=1
10. Increment i , Decrement j
11. If Flag==0
12. Display the string a Palindrome
13. else
14. Otherwise the string isnot a Palindrome

Find a string within a sentence and replace it with another string

1. Declare 2 matrices str[100] and find[100].
2. Initially count=0, i, j, flag
3. Read a string
4. Read the string that you want to replace
5. Replace each character of original string with the new string
6. Once all characters are replaced make flag = 1 and count the characters.

Reads a line of text and counts all occurrence of a particular word

1. Read the string and then displayed
2. Read the string to be searched and then displayed
3. Searching the string T in string S and then perform the following steps
i. found = strstr(S, T)
ii. if found print the second string is found in the first string at the position. If not gotostep5
4. Print the -1
5. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .C extension.

2. Compile: Alt F9

3. Execute: Ctrl F9

SOURCE CODE:

<u>To insert a sub string into a given main string from a given position</u>

```c
#include <stdio.h>
#include <string.h>
int main() {
        int i,j,p,s1=0,s2=0,tem=0;
        char str1[100],str2[100],temp[100];
        printf("Enter the first string : ");
        gets(str1);
        printf("Enter the second string : ");
        gets(str2);
        printf("Enter the position to insert the second string : ");
        scanf("%d",&p);
        for(i=0;str1[i]!='\0';i++)
         {
                s1++;
        }
        for(i=0;str2[i]!='\0';i++)
        {
                s1++;
        }
        for(i=0;temp[i]!='\0';i++)
         {
                tem++;
        }
        j=0;
        for(i=p;i<s1;i++)
         {
                temp[j] = str1[i];
                j++;
        }
```

54

```c
            str1[p] = '\0';
            j=0;
            for(i=p;i<(s1+s2);i++)
            {
                    str1[i] = str2[j];
                    j++;
            }
            strcat(str1,temp);
            puts(str1);
}
```

To delete n characters from a given position in a given string

```c
#include <stdio.h>
int main() {
        int i,p,j,s1=0,n;
        charstr[100],temp[100];
        printf("Enter the string : ");
        gets(str);
        printf("Enter the position : ");
        scanf("%d",&p);
        printf("Enter the number of characters you want to delete : ");
        scanf("%d",&n);
        for(i=0;str[i]!='\0';i++) {
                s1++;
        }
        j=0;
        for(i=p+n;i<s1;i++) {
                temp[j] = str[i];
                j++;
        }
        str[p] = '\0';
        j=0;
        for(i=p;i<s1-p+n;i++) {
                str[i] = temp[j];
                j++;
        }
        puts(str);
}
```

Determine if the given string is a palindrome or not

```c
#include <stdio.h>
int main() {
        int i,j,s1=0,count=0;
        charstr[100],temp[100];
        printf("Enter a string : ");
        gets(str);
        for(i=0;str[i]!='\0';i++)
        {
                s1++;
        }
        j=0;
        for(i=s1-1;i>=0;i--)
        {
                temp[j] = str[i];
                j++;
        }
        temp[s1] = '\0';
        for(i=0;i<s1;i++)
        {
                if(str[i]==temp[i]&&str[i]!='\0'&&temp[i]!='\0') {
                        count++;
                }
        }
        if(count==s1)
        {
                printf("PALINDROME");
        }
        else
        {
                printf("NOT PALINDROME");
        }
}
```

Find a string within a sentence and replace it with another string

```c
#include <stdio.h>
int main()
{
char str1[50], str2[50], str3[50], temp[50];
int len1, len2, len3, i, j, p, match, k;
printf("\n\n\t ENTER A SENTENCE:");
gets(str1);
printf("\n\n\t ENTER A STRING WHICH YOU WANT TO DELETE: ");
gets(str2);
printf("\n\n\t ENTER A NEW STRING WHICH YOU WANT TO INSERT: ");
gets(str3);
i=0; //Finding the length of sentence
while(str1[i]!='\0')
{
i++;
}
len1 = i-1;
i=0; //Finding the length of string, to delete
while(str2[i]!='\0')
{
i++;
}
len2 = i-1;
i=0; //Finding the length of new string, to replace
while(str3[i]!='\0')
{
i++;
}
len3 = i-1;
for(i=0;i<=len1;i++)
{
match = 1;
for(j=0;j<=len2;j++)
{
```

57

```c
if(str2[j]!=str1[i+j])
{
match = 0;
break;
}
}
if(match){ //When a substring is found, copy remaining String to temporary String
for(k=0,j=i+len2+1;j<=len1;j++,k++){
temp[k] = str1[j];
}
temp[k] = '\0';
for(j=0;j<=len3;j++)
{
str1[i+j] = str3[j];
}
str1[i+j] = '\0';
for(p=0;temp[p]!='\0';p++)
{
str1[i+j+p]=temp[p];
}
str1[i+j+p]='\0';
len1 = len1-len2 +len3; //Update length value
i = i + j;
}
}
printf("\n\n\t OUTPUT IS : ");
puts(str1);
}
```

Reads a line of text and counts all occurrence of a particular word

```c
#include <stdio.h>
int main()
{
char str1[50], str2[50], str3[50], temp[50];
int len1, len2, len3, i, j, p, match, k,count=0;
printf("\n\n\t ENTER A SENTENCE:");
gets(str1);
```

58

```c
printf("\n\t ENTER A STRING WHICH YOU WANT TO COUNT THE TIMES REPEATED: ");
gets(str2);
i=0; //Finding the length of sentence
while(str1[i]!='\0')
{
i++;
}
len1 = i-1;
i=0; //Finding the length of string, to delete
while(str2[i]!='\0')
{
i++;
}
len2 = i-1;
for(i=0;i<=len1;i++)
{
match = 1;
for(j=0;j<=len2;j++)
{
if(str2[j]!=str1[i+j])
{
match = 0;
break;
}
}
if(match)
{
        count++;
}
}
printf("\t\t%s occurred %d times",str2,count);
}
```
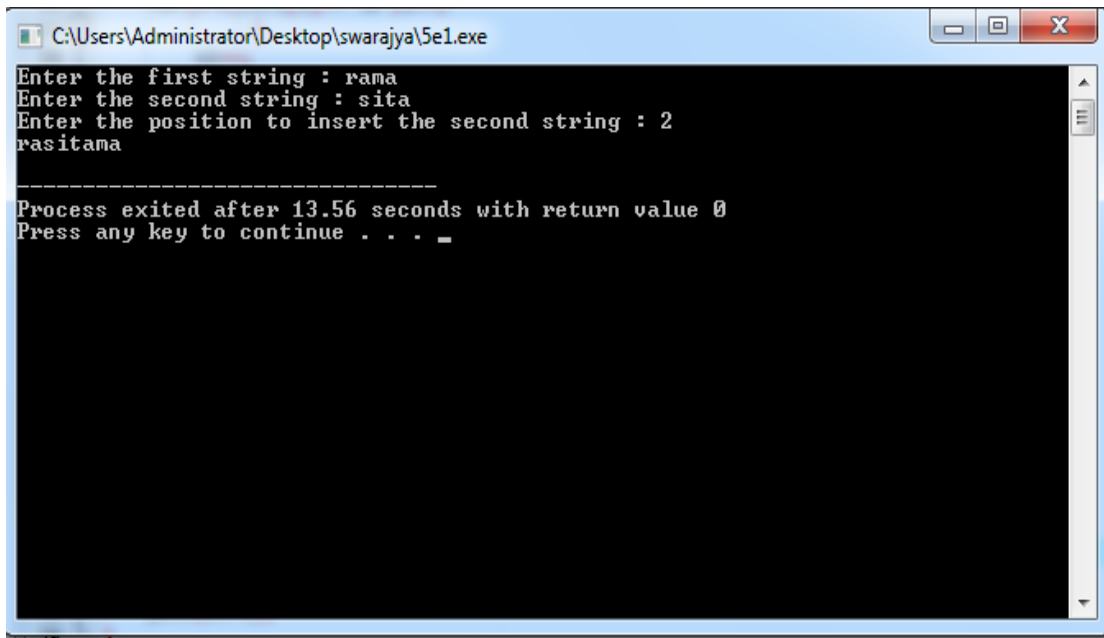
Displays the position or index in the string S where the string T begins, or 1 if S doesn't contain T

```c
#include <stdio.h>
#include<string.h>
#include<conio.h>
void main()
{
char s[30], t[20];
char *found;
puts("Enter the first string: ");
gets(s);
puts("Enter the string to be searched: ");
gets(t);
found = strstr(s, t);
if(found)
{
printf("Second String is found in the First String at %d position.\n", found - s);
}
else
{
printf("-1");
}
getch();
}
```
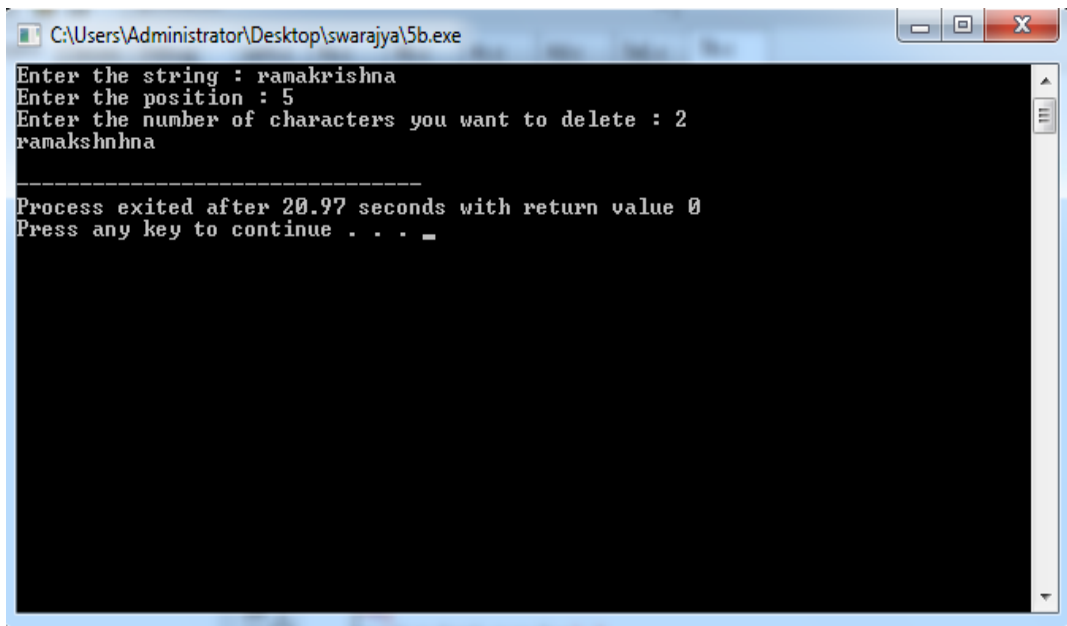
INPUT/OUTPUT:

To insert a sub string into a given main string from a given position
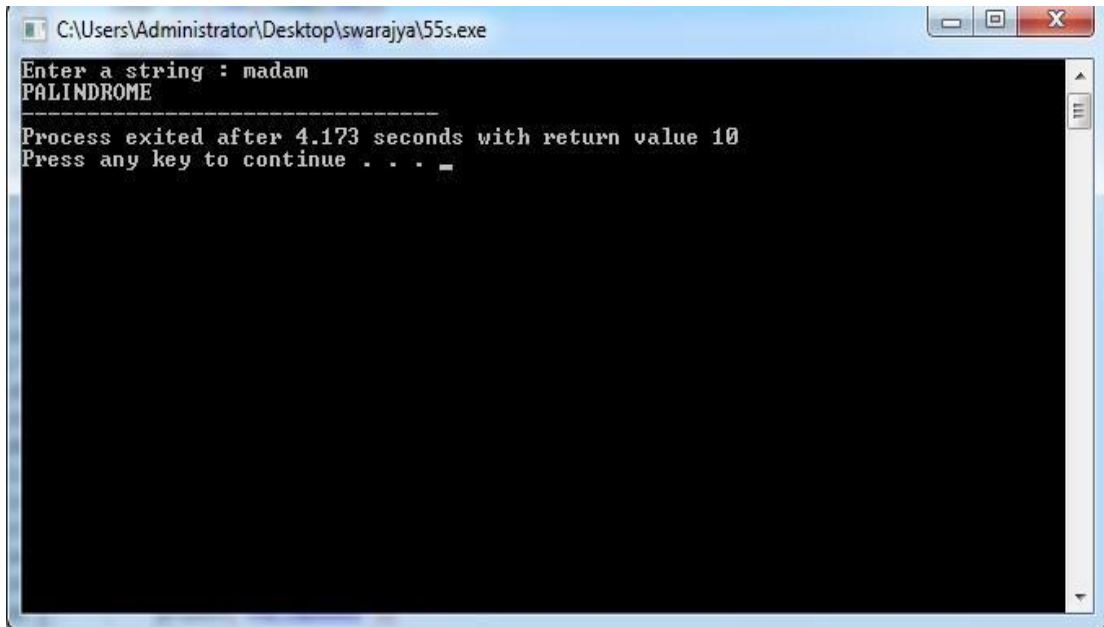

```
C:\Users\Administrator\Desktop\swarajya\5e1.exe

Enter the first string : rama
Enter the second string : sita
Enter the position to insert the second string : 2
rasitama

--------------------------------
Process exited after 13.56 seconds with return value 0
Press any key to continue . . .
```

To delete n characters from a given position in a given string
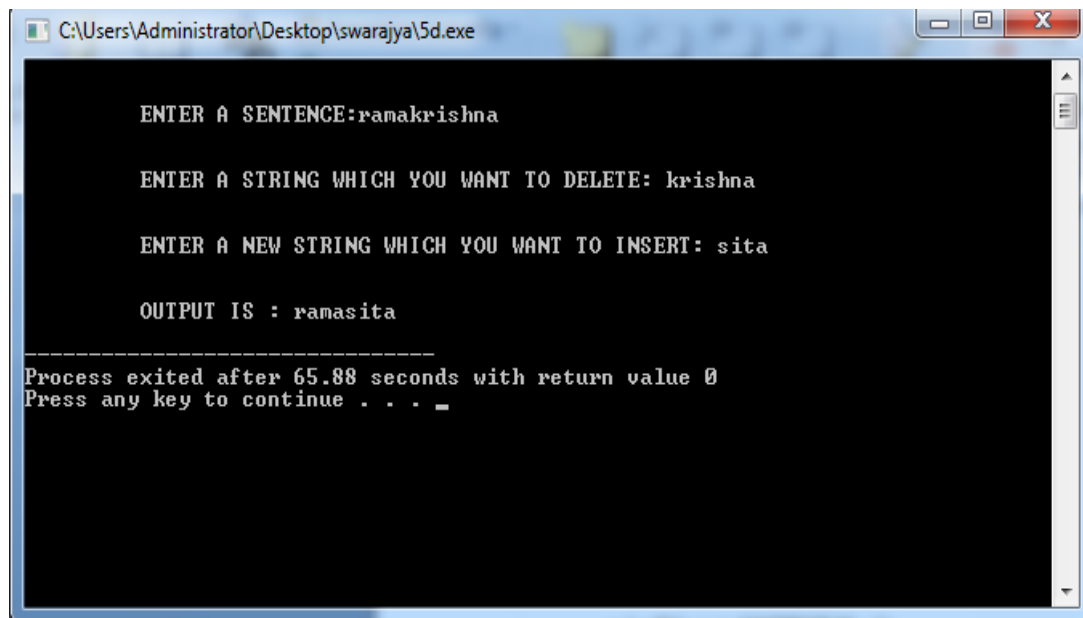

```
C:\Users\Administrator\Desktop\swarajya\5b.exe

Enter the string : ramakrishna
Enter the position : 5
Enter the number of characters you want to delete : 2
ramakshnhna

--------------------------------------
Process exited after 20.97 seconds with return value 0
Press any key to continue . . .
```

Determine if the given string is a palindrome or not

Find a string within a sentence and replace it with another string

Reads a line of text and counts all occurrence of a particular word

Displays the position or index in the string S where the string T begins, or 1 if S doesn't contain T

PRE-LAB VIVA QUESTIONS:

1. Using which function a string "1234" can be converted to a number?
2. Name the different string handling functions?
3. Which command is used to combine the two strings?

4. Which command is used to copy the strings?

5. What is the difference between string copy strcpy() and memory copy memcpy()?

6. How can you copy just a portion of a string?

7. Using which function you can find a substring from a string?

8. Which function is used to compare two strings?

9. How can you remove trailing spaces from a string?

10. How can you remove leading spaces from a string?

LAB ASSIGNMENT:

1. Code a program to convert the given string into lower case to upper case and vice-versa?

2. Read two strings and store them in variables str1, str2. Formulate a C program for finding whether the both strings are equal or not?

3. Program for finding the length of the given string "COMPUTER PROGRAMMING" with and without using string length function?

4. Read two strings and store them in variables str1, str2. Formulate a C program for copying 2 strings to a new variable str3?

5. Formulate a program for concatenating the following two strings with and without using strcat() function. Str1 is "COMPUTER", str2 is "PROGRAMMING".

6. Formulate a program for reversing the given string „REVERSE" with and without using stirng reverse function?

7. Formulate a program for determining whether the given string is palindrome or not?

8. Read two strings, str1 as "goodday" and str2 as "noontime". By using these strings generate a new string str3 as "goodnoon". Now compare str3 with str1 to find the greatest?

9. Accept two strings and compare one string with another string without using string handling functions and find two strings are equal or not.

10. Read a string and delete the duplicate character in the string.

POST-LAB VIVA QUESTIONS:

1. Find the output of the following code?

```c
int main()
  {
     char *str = "hello, world";
     char *str1 = "hello, world";
     if (strcmp(str, str1))
        printf("equal");
     else
        printf("unequal");
```

```
      }
2.   Find the output of the following code?
     void main()
     {
          char *str = "hello";
          char str1[5];
          strcpy(str1, str);
          printf("%s", str1);
     }
3.  Find the output of the following code?
    void main()
    {
          char *str = "hello, world";
          char str1[9];
          strncpy(str1, str, 9);
          printf("%s %d", str1, strlen(str1));
    }
4.  What is the return value of strcmp() function when two strings are identical?
5.  Which library function is used to find the last occurrence of a given string in another strong?
6.   Find the output of the following code?
     int xstrlen(char *s)
     {
        int length=0;
        while(*s!='\0')
        {
                length++;
                s++;
        }
        return (length);
     }
7.  Find the output of the following code?
    int main()
    {
          char str1[20] = "C ", str2[20] = "Programming";
          printf("%s\n", strcpy(str2, strcat(str1, str2)));
          return 0;
    }
```

65

8. Find the output of the following code?

```c
int main()
{
        char *names[] = { "A", "B", "C", "D", "E"};
        int i;
        char *t;
        t = names[3];
        names[3] = names[4];
        names[4] = t;
        for(i=0; i<=4; i++)
           printf("%s\t", names[i]);
        return 0;
}
```

9. Find the output of the following code?

```c
int main()
{
    static char str1[] = "C";
    static char str2[20];
    static char str3[] = "Programming";
    int i;
     i = strcmp(strcat(str3, strcpy(str2, str1)), "Computers");
    printf("%d\n", i);
    return 0;
}
```

10. Find the output of the following code?

```c
int main()
{
        static char s[] = "Hello!";
        printf("%d\n", *(s+strlen(s)));
        return 0;
}
```

FUNCTIONS

OBJECTIVE:

1. Write C programs that use both recursive and non-recursive functions
    i   To find the factorial of a given integer.
    ii   To find the greatest common divisor of two given integers.
2. Write C programs that use both recursive and non-recursive functions
    i.   To print Fibonacci series.
    ii.   To solve towers of Hanoi problem.
3. Write a C program to print the transpose of a given matrix using function.
4. Write a C program that uses a function to reverse a given string.

RESOURCES:

Dev C++5.11

PROGRAM LOGIC:

Factorial of a given number by using Recursive function

1. Start
2. Read a number N
3. Call a function factorial(N) by passing the values of N
4. If N=1 then it returns 1 as the factorial
5. Otherwise it calculates the factorial f = N * factorial(N-1) by calling the same function again and again
6. Display the factorial of number N
7. Stop

Factorial of a given number by using Non-Recursive function

1. Start
2. Read a number N
3. Initialize fact =1
4. Calculate fact = fact * N using a loop and decrement N value till N =1
5. Display the factorial of number N
6. Stop

GCD of a given two integer by using Recursive Function

1. Start
2. Read two numbers a and b
3. Call a function gcd (a, b) by passing the value of a and b
4. Check a != b, then
5. Check a > b then calculate gcd of two numbers by calling the function gcd(a-b, b)
6. Otherwise calculate gcd of two numbers by calling the function gcd(a, b-a)
7. Display the gcd of two numbers
8. Stop

GCD of a given two integer by using Non-Recursive Function

1. Start
2. Read two numbers a and b
3. Check if a != b then
4. Check if a >= b - 1 then set a = a – b otherwise se t b = b – a
5. Display the gcd as the value of a.
6. Stop

To print Fibonacci Series using Non-Recursive function

1. Start
2. initialize the a=0, b=1
3. read n
4. if n== 1 print a   go to step 7. else goto step 5
5. if n== 2 print a, b go to step 7 else print a,b
6. initialize i=3
7. if i<= n do as follows. If not goto step 7
8. c=a+b
9. print c
10. a=b
11. b=c
12. increment i value
13. goto step 6(i)
14. Stop

To print Fibonacci Series using Recursive function

1. Start
2. Declare variables n, i, c
3. Read variable n
4. for (c = 1 ; c <= n ; c++)
5. Display Fibonacci(i)
6. Increment i
7. if (n == 0)
8. return 0
9. else if (n == 1)
10. return 1
11. return (Fibonacci(n-1) + Fibonacci(n-2))
12. Stop

To solve Towers of Hanoi problem using Recursive function

1. Start
2. Initialize the source=a, intermediate=c, destination = d
3. read n
4. call the sub program Hanoi recursion (n value,a ,b, c)
5. stop

Sub program:

1. if n== 1 call the sub program Hanoi recursion (num-1, a, c, b)
2. print the output from a to b
3. call the sub program Hanoi recursion(num-1, b, c, a)
4. return to main program

To reverse a given string using recursion

1. Start
2. Read a sentence
3. Use strrev() function to reverse a sentence
4. Display the reversed sentence
5. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.
2. Compile: Alt F9
3. Execute: Ctrl F9

SOURCE CODE:

<u>Factorial of a given number by using Recursive function</u>

```c
#include<stdio.h>
int fact(int n)
{
  if(n==0)
  return 1;
  else
    return n*fact(n-1);
}
void main()
{
  int n,f;
  printf("\n enter a no.: ");
  scanf("%d",&n);
  f=fact(n);
  printf("\n factorial of %d is %d",n,f);
}
```

<u>Factorial of a given number by using Non-Recursive function</u>

```c
#include<stdio.h>
int fact(int n)
{
int f=1,i;
if((n==0)||(n==1))
return(1);
else
{
for(i=1;i<=n;i++)
f=f*i;
}
return(f);
}
void main()
        {
```

```c
            int n;
            printf("enter the number :");
scanf("%d",&n);
printf("factoria of number%d",fact(n));
}
```

GCD of a given two integer by using Recursive Function

```c
        #include<stdio.h>
int gcd(int m,int n)
{
  if(n==0)
  return m;
  else
    gcd(n,m%n);
}
void main()
{
 int a,b,g,l;
 printf("\n enter a: ");
 scanf("%d",&a);
 printf("\n enter b: ");
 scanf("%d",&b);
 g=gcd(a,b);
 l=(a*b)/g;
 printf("\n GCD of %d and %d : %d",a,b,g);
 printf("\n LCM of %d and %d : %d",a,b,l);
}
```

GCD of a given two integer by using Non-Recursive Function

```c
#include<stdio.h>
int gcd(int,int);
void main()
{
 int a,b,x;
 printf("\n enter a: ");
 scanf("%d",&a);
 printf("\n enter b: ");
 scanf("%d",&b);;
```

71

```c
  x=gcd(a,b);
  printf("G.C.D of %d and %d is %d",a,b,x);
}
int gcd(int a,int b)
{
  int r;
  while(b!=0)
  {
        r=a%b;
    a=b;
        b=r;
  }
  return a;
}
```

To print Fibonacci Series using Recursive function

```c
#include<stdio.h>
void fib(int);
void main()
{
 int n;
 printf("\n enter the limit of the series: ");
 scanf("%d",&n);
 fib(n);
}
void fib(int n)
{
 int x=0,y=1,z,i;
 printf("%5d%5d",x,y);
 for(i=2;i<n;i++)
 {
   z=x+y;
   printf("%5d",z);
   x=y;
   y=z;
 }
}
```

Fibonacci Series using Non-Recursive function

```c
#include<stdio.h>
int fibo(int,int);
void main()
{
  int n,x,i;
  printf("\n enter the no. of terms: ");
  scanf("%d",&n);
  printf("\n the fibonacci sequence is: ");
  for(i=0;i<=n;i++)
  {
          x=fib(i);
    printf("%5d",x);
  }
}
int fib(int n)
{
 if(n==0 || n==1)
   return n;
 else
   return fib(n-1)+fib(n- 2);
}
```

Towers of Hanoi problem using Non-Recursive function

```c
#include<stdio.h>
void Hanoinonrecursion(int num,char sndl,char indl,char dndl)
{
        char stkn[100],stksndl[100],stkindl[100],stkdndl[100],stkadd[100],temp;
        int top,add;
        top=NULL;
        one:
                if(num==1)
                {
                        printf("\n Move top disk from needle %c to needle %c",sndl,dndl);
                        goto four;
                }
        two:
```

73

```
                top=top+1;
stkn[top]=num;
stksndl[top]=sndl;
                stkindl[top]=indl;
                stkdndl[top]=dndl;
                stkadd[top]=3;
                num=num-1;
                sndl=sndl;
                temp=indl;
                indl=dndl;
                dndl=temp;
                goto one;
        three:
                printf("\n Move top disk from needle %c to needle%c",sndl,dndl);
                top=top+1;
                stkn[top]=num;
                stksndl[top]=sndl;
                stkindl[top]=indl;
                stkdndl[top]=dndl;
                stkadd[top]=5;
                num=num-1;
                temp=sndl;
                sndl=indl;
                indl=temp;
                dndl=dndl;
                goto one;

four:
                if(top==NULL)
                        return;
                        num=stkn[top];
                        sndl=stksndl[top];
                        indl=stkindl[top];
                        dndl=stkdndl[top];
                        add=stkadd[top];
                        top=top-1;
```

74

```c
                               if(add==3)
                                        goto three;
                               else if(add==5)
                                        goto four;
   }
void main()
 {
        int no;
         printf("Enter the no. of diss to be transferred:");
         scanf("%d",&no);
         if(no<1)
                 printf("\n There's nothing to move");
         else
                  printf("\n nonrecursive");
                 Hanoinonrecursion(no,'A','B','C');
     }
```

To solve Towers of Hanoi problem using Recursive function

```c
#include<stdio.h>
void Hanoirecursion(int num,char ndl1,char ndl2,char ndl3)
{
        if(num==1)
        {
                 printf("Move top disk from needle %c to needle %c",ndl1,ndl2);
                return;
         }
        Hanoirecursion(num-1,ndl1,ndl3,ndl2);
        printf("Move top dis from needle %c to needlle%c",ndl1,ndl2);
        Hanoirecursion(num-1,ndl3,ndl2,ndl1);
}
void main()
{
        int no;
        printf("Enter the no. of disk to be transferred:");
        scanf("%d",&no);
        if(no<1)
```

75

```
        printf("\n There's nothing to move");
        else
         printf("\n recursive");
        Hanoirecursion(no,'A','B','C');
 }
```

To reverse a given sentence by using recursion
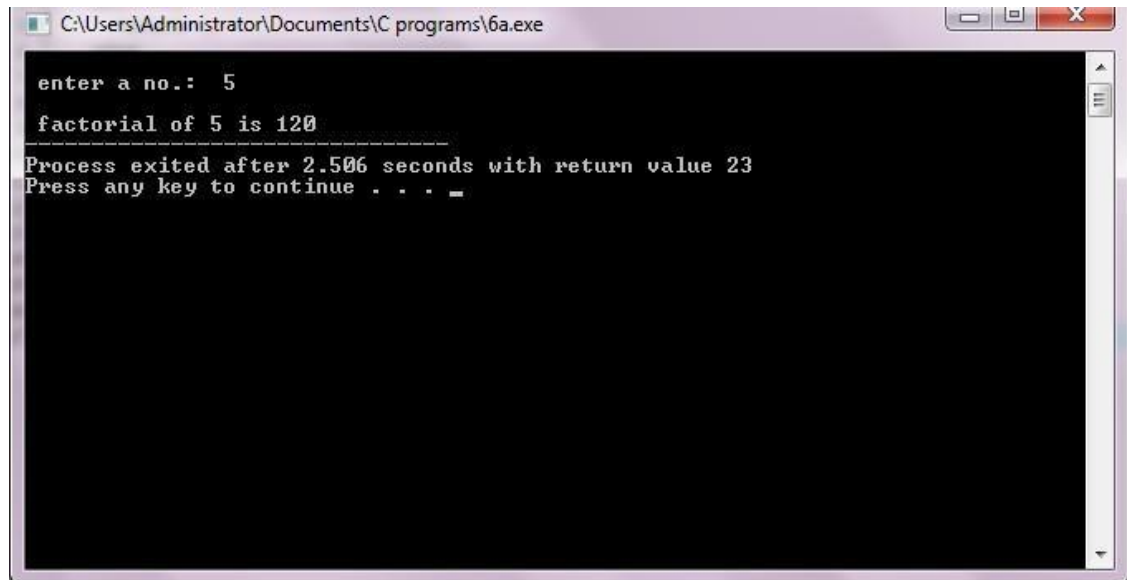
```
#include<stdio.h>
#include<string.h>
void Reverse();
int main()
{
  printf("Enter a sentence: ");
  Reverse();
  return 0;
}
void Reverse()
{
  char c;
  scanf("%c",&c);
  if( c != '\n')
  {
    Reverse();
    printf("%c",c);
  }
}
```

76
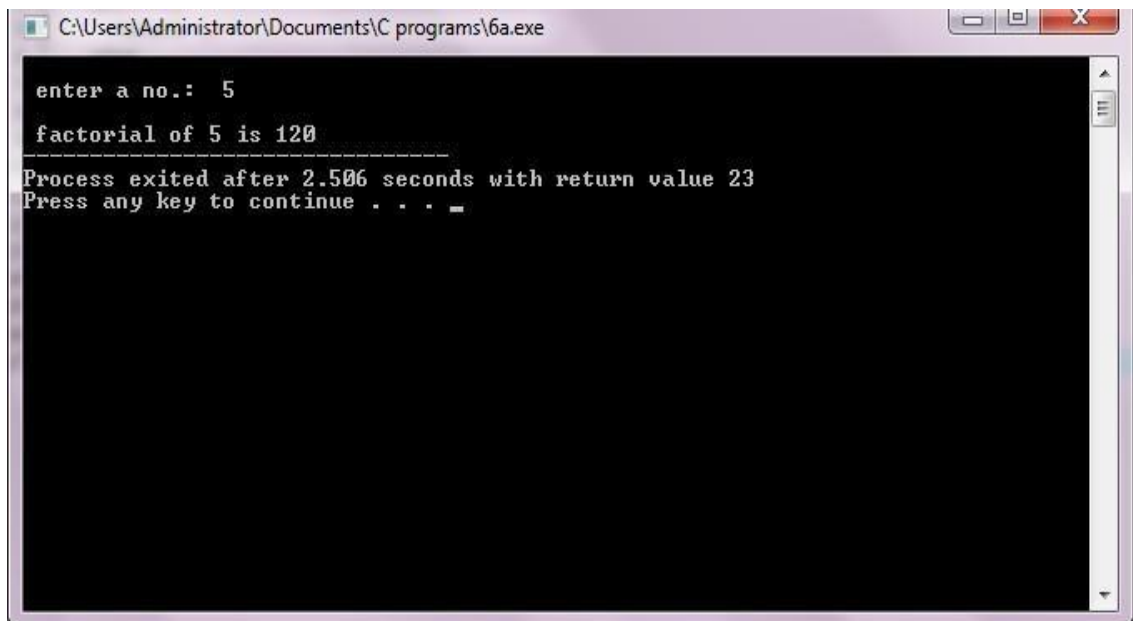
INPUT/OUTPUT:
<u>**Factorial of a given number by using Recursive/Non Recursive function**</u>


```
C:\Users\Administrator\Documents\C programs\6a.exe

 enter a no.:  5

 factorial of 5 is 120
-----------------------------------------
Process exited after 2.506 seconds with return value 23
Press any key to continue . . . _
```

<u>**GCD of a given two integer by using Recursive / Non Recursive Function**</u>
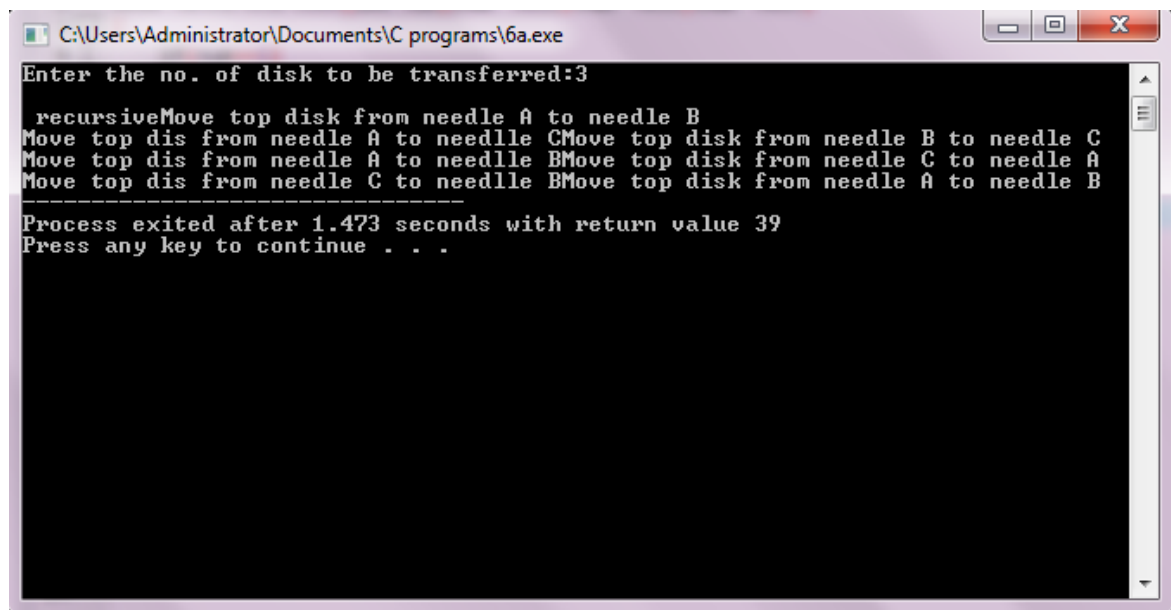

```
C:\Users\Administrator\Documents\C programs\6a.exe

 enter a no.:  5

 factorial of 5 is 120
-----------------------------------------
Process exited after 2.506 seconds with return value 23
Press any key to continue . . . _
```

To print Fibonacci Series using Recursive/Non-Recursive function
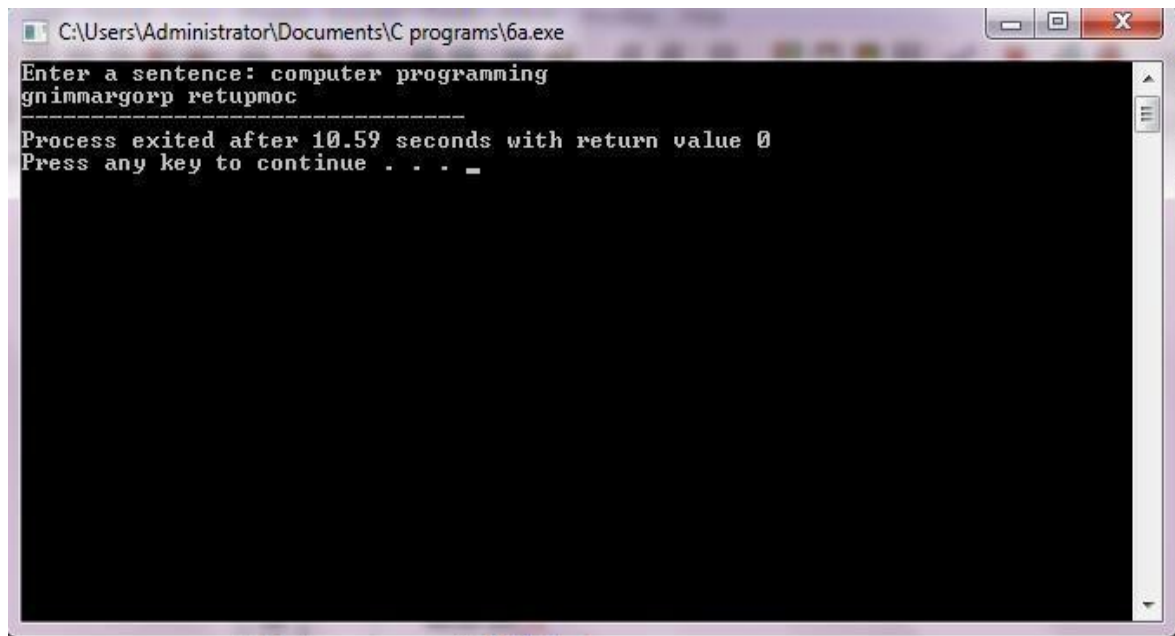
```
C:\Users\Administrator\Documents\C programs\6a.exe

 enter the limit of the series:  5
     0    1    1    2    3
-----------------------------------------
Process exited after 2.109 seconds with return value 5
Press any key to continue . . . _
```

Towers of Hanoi problem using Recursive/Non-Recursive function
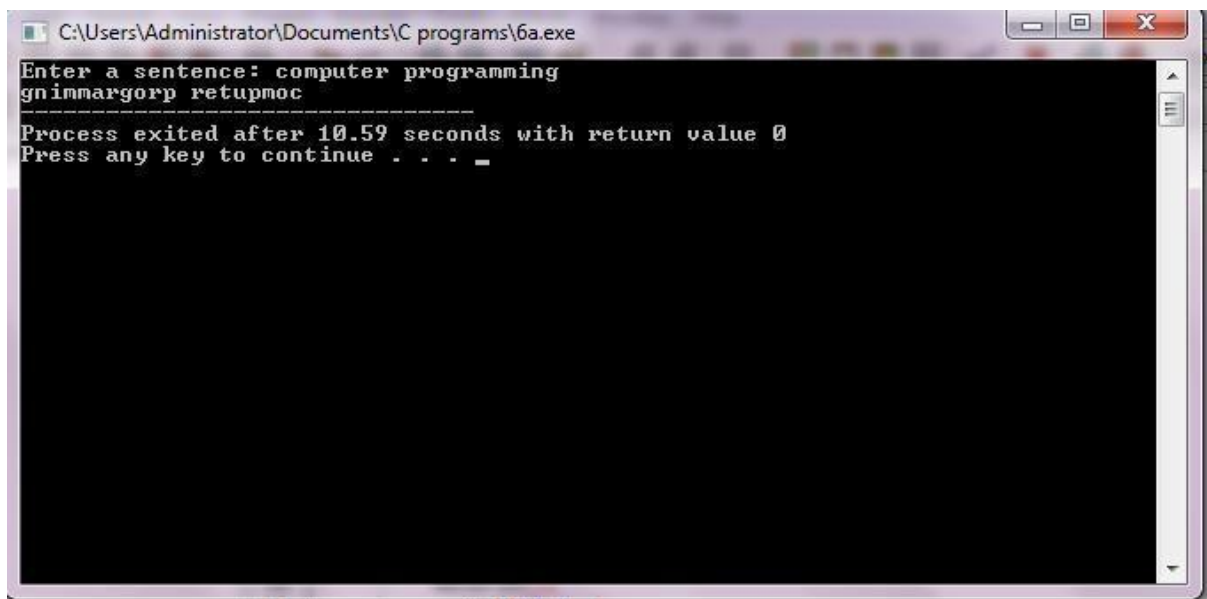
```
C:\Users\Administrator\Documents\C programs\6a.exe

Enter the no. of disk to be transferred:3

 recursiveMove top disk from needle A to needle B
Move top dis from needle A to needlle CMove top disk from needle B to needle C
Move top dis from needle A to needlle BMove top disk from needle C to needle A
Move top dis from needle C to needlle BMove top disk from needle A to needle B
-----------------------------------------
Process exited after 1.473 seconds with return value 39
Press any key to continue . . .
```

78

To reverse a given string

To reverse a given number using recursion

PRE-LAB VIVA QUESTIONS:

1. What do you mean by formal and actual parameters in a function?
2. What is upward and downward communication in functions?
3. Can you pass an entire structure into a function?
4. Can you pass an array to a function?
5. What do you mean by function prototype and why it is used?

6. Can you write a function without any parameters?

7. Can you return multiple values from a function using return statement?

8. Is it mandatory to write a return statement in a function?

9. What are the various ways of writing return statement in a function?

10. Is it possible convert all iterative programs into recursion?

LAB ASSIGNMENT:

1. Generate the prime numbers between 1 to N using recursion?

2. Compute the x to the power y using recursion?

3. Check whether a string is palindrome or not using recursion?

4. Compute the sum of digits of a number using recursion?

5. Compute the sum of n natural numbers using recursion?

6. Convert a decimal number into its equivalent binary using recursion?

7. Compute the multiplication of two matrices using recursion?

8. Perform binary search using recursion?

9. Write a program to convert decimal number to hexadecimal number?

10. Write a program to convert decimal number to binary number?

POST-LAB VIVAQUESTIONS:

1. What is recursion?

2. What is the necessity of creating a user defined function in C?

3. What are the types of functions according to return values and number ofarguments?

4. Can you pass a parameter to a function? If yes, then what are the parameter passing techniques?

5. Which data structure is used in recursion?

6. Give any two differences between recursion and iteration?

7. What do mean by base / stopping criteria in recursion? What is its importance?

8. Differentiate between standard functions & user-defined functions ?

9. How does the function definition differ from function declaration ?

10. In C, if you pass an array as an argument to a function, what actually gets passed?

11. What is output of the following code ?

```c
#include<stdio.h>
int main()
{
    int arr[]={0,10,20,30,40};
```

```
        char *ptr=arr;
        ptr=ptr+2;
        printf("%d",*ptr);
        return 0;
    }
```

12. What is the output of the following code ?

```
    #include<stdio.h>
    int main()
    {
        int a=5,b=8,c=2;
        int *arr[]={&a,&b,&c};
        b=a+c;
        printf("%d",*arr[1]);
        return 0;
    }
```

13. What is the output of the following code ?

```
    #include<stdio.h>
    int main()
    {
        int a[5]={100,200,300};
        int *p1=a;
        char *p2=(char *)a;
        printf("%d %d",*(p1+2),*(p2+3));
        return 0;
    }
```

WEEK-7

POINTERS

OBJECTIVE:

1. Write a C program to concatenate two strings using pointers.
2. Write a C program to find the length of string using pointers.
3. Write a C program to compare two strings using pointers.
4. Write a C program to copy a string from source to destination using pointers.
5. Write a C program to reverse a string using pointers.

RESOURCES:

Dev C++ 5.11

PROGRAM LOGIC:

To concatenate two strings using pointers

1. Start
2. Read two strings str1 & str2
3. Repeat loop until end of the character in first string str1 and copy each character into third string str3.
4. Repeat loop until end of the character in second string str2 and copy each character into third string str3.
5. Add last character as NULL character („\0")
6. Print third string
7. Stop

To find the length of string using pointers

1. Start
2. Read one string p
3. Assign p pointer to p1 pointer
4. Repeat loop until end of the character in the string p1 and each time increment length
5. Print length of the string
6. Stop

To compare two strings using pointers.

1. Start

2. Read two strings str1 & str2

3. Repeat loop until first string character and second string character equals

4. If first and second reach end of the string then two strings are equal

5. Else two strings are not equal

6. Stop

To copy a string from source to destination using pointers.

1. Start

2. Read one string Source

3. Assign target pointer to t pointer

4. Repeat loop until end of the character in the string source and each character copy into target string

5. Print destination string t

6. Stop

To reverse a string using pointers

1. Start

2. Read one string strptr

3. Repeat loop until end of the character in the string strptr and count the number characters in the string

4. Repeat loop until complete all characters in the string using count variable and copy each character from strptr to revptr

5. Print reverse string revprt

6. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .C extension.

2. Compile: F9

3. Execute: F10

SOURCE CODE:

To concatenate two strings using pointers

```
#include<stdio.h>
#define SIZE 20
```

```c
void concat(char *,char *);
int main()
{
  char string1[SIZE]="\0",string2[SIZE]="\0";
  printf("Enter String 1:\n");
  gets(string1);
  printf("Enter String 2:\n");
  gets(string2);
  concat(string1,string2);
  return 0;
}
void concat(char *str1,char *str2)
{
  char *conc=str1;
  while(*str1!='\0')
     str1++;
  *str1=' ';
  ++str1;
  while(*str2!='\0')
  {
     *str1=*str2;
     str1++,str2++;
  }
  *str1='\0';
  printf("Concatenated String:\n");
  puts(conc);
}
```

To find the length of string using pointers

```c
#include<stdio.h>
#include<string.h>
void main()
{
        char a[10],*ptr;
        int i=0;
        printf("\n enter a string: ");
        gets(a);
```

```
                ptr=a;
                while(*ptr!='\0')
                {
                        i++;
                        ptr++;
                }
                printf("\n length of a string is %d",i);
}
```

To compare two strings using pointers.

```
#include<stdio.h>
#include<string.h>
int compare_strings(char *,char *);
void main()
{
        char s1[50],s2[50],*p1,*p2;
        int res;
        printf("\n enter a string s1: ");
        gets(s1);
        printf("\n enter a string s2: ");
        gets(s2);
        res=compare_strings(s1,s2);
        if(res==0)
          printf("\n both the strings are identical");
        else
          printf("\n both the strings are not identical");
}
int compare_strings(char *p1,char *p2)
{
        while(*p1==*p2)
        {
                if(*p1=='\0'|| *p2=='\0')
                        break;
                p1++;
                p2++;
        }
        if(*p1=='\0'|| *p2=='\0')
```

85

```
            return 0;
          else
            return -1;
}
```

To copy a string from source to destination using pointers.

```c
#include <stdio.h>
int main()
{
  char s1[100], s2[100], i;
  printf("Enter string s1: ");
  scanf("%s",s1);
  for(i = 0; s1[i] != '\0'; ++i)
  {
    s2[i] = s1[i];
  }
  s2[i] = '\0';
  printf("copied string: %s", s2);
  return 0;
getch();
}
```

To reverse a string using pointers.
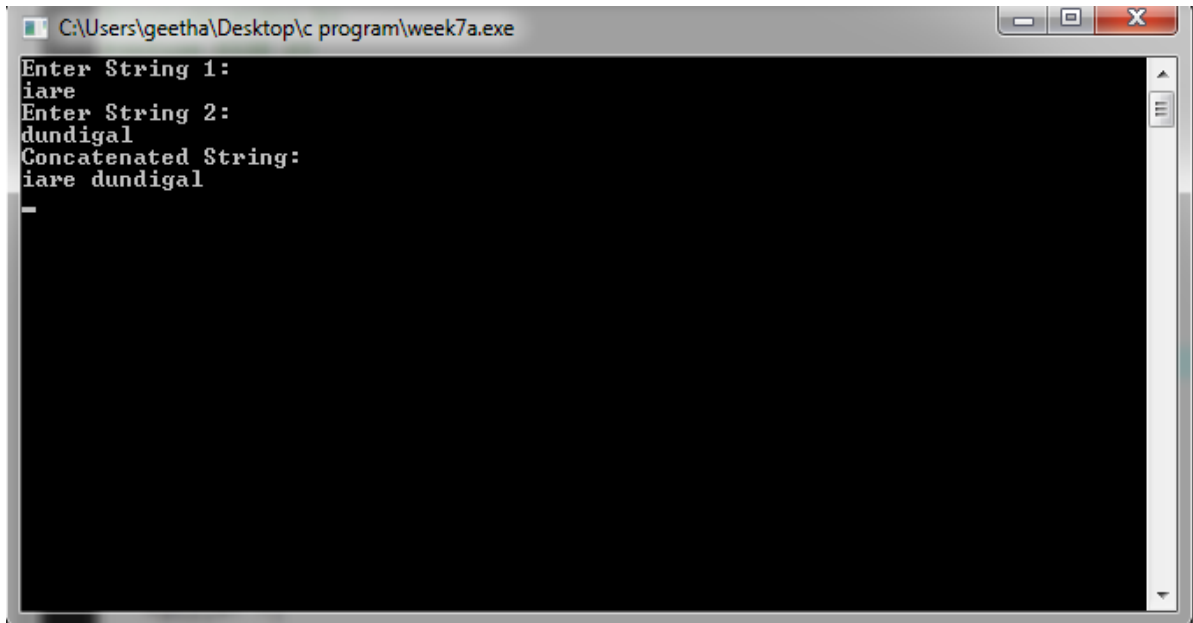
```c
##include<stdio.h>
#include<string.h>
void main()
{
       char *cp,s[30];
       int i,length;
       printf("\n enter a string: ");
       gets(s);
       cp=s;
       length=strlen(s);
       printf("\n the reverse of the string is : ");
       for(i=length;i>=0;i--)
       printf("%c",*(cp+i));
}
```

```
    printf("\n\n Reversed string is:%s",rev);

    getch();

}
```

INPUT/OUTPUT:
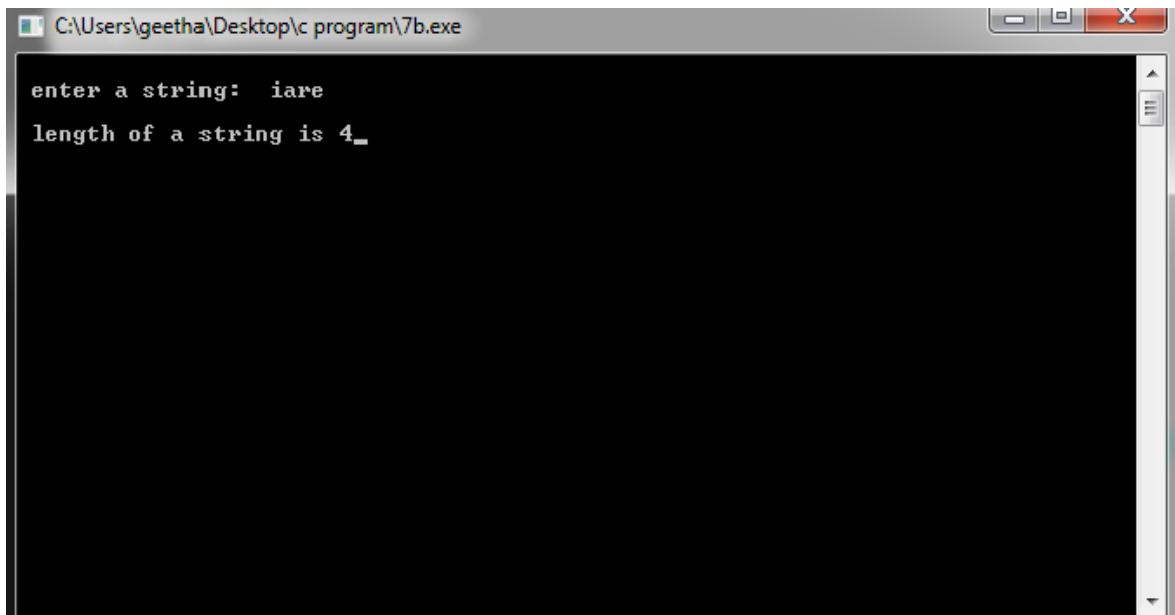
To concatenate two strings using pointers

To find the length of string using pointers
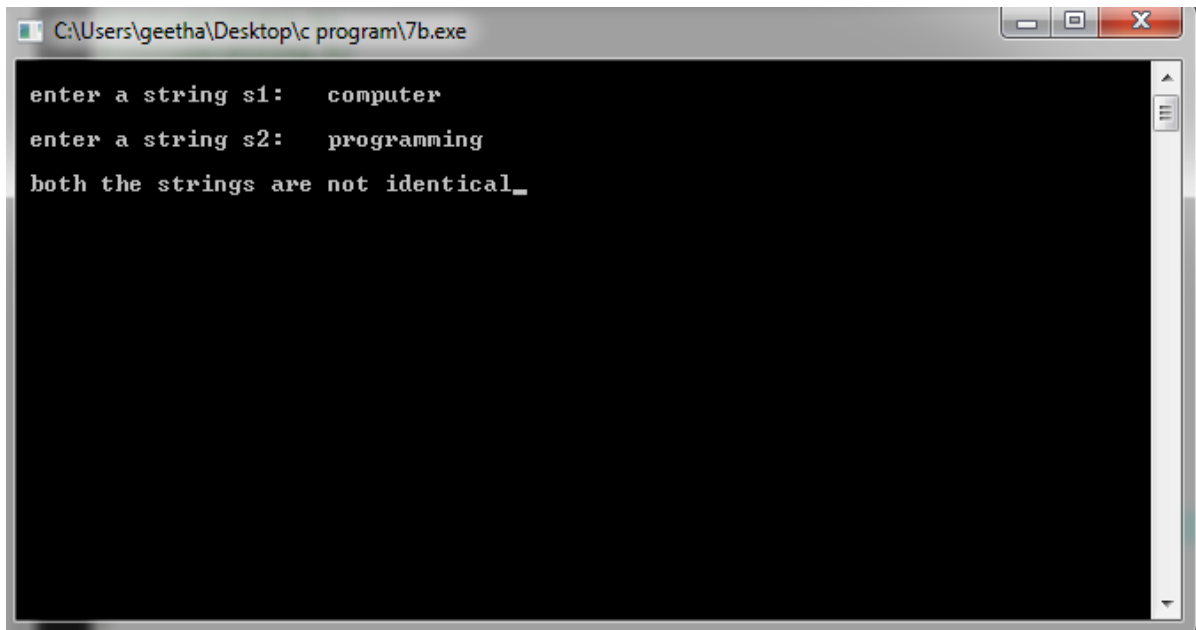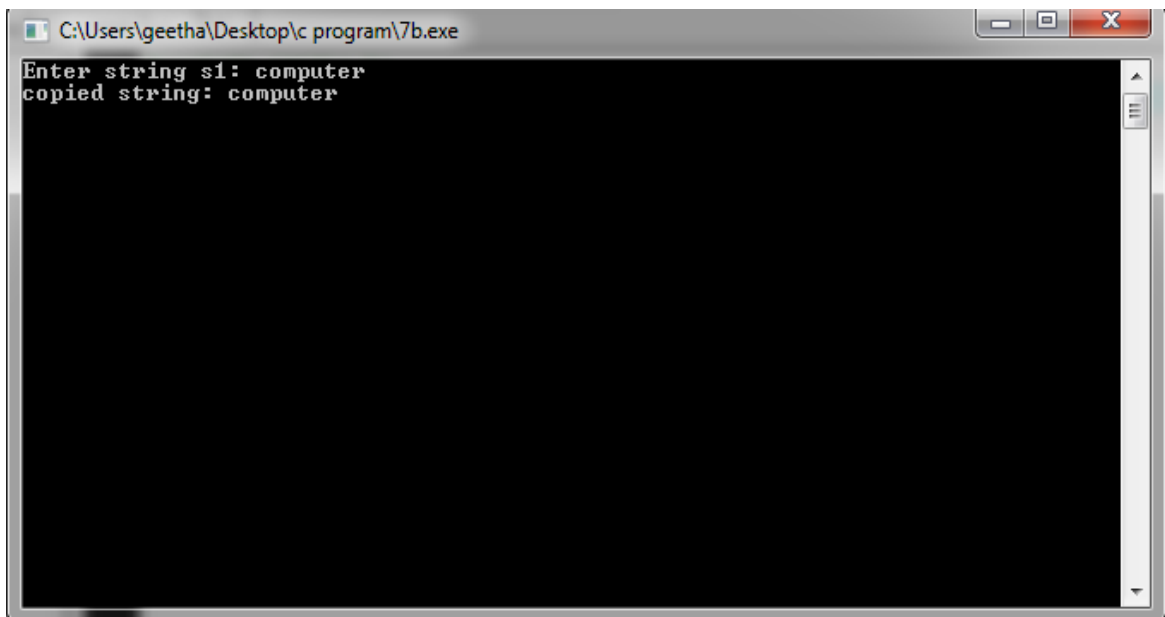
To compare two strings using pointers.

```
C:\Users\geetha\Desktop\c program\7b.exe

enter a string s1:    computer

enter a string s2:    programming

both the strings are not identical_
```
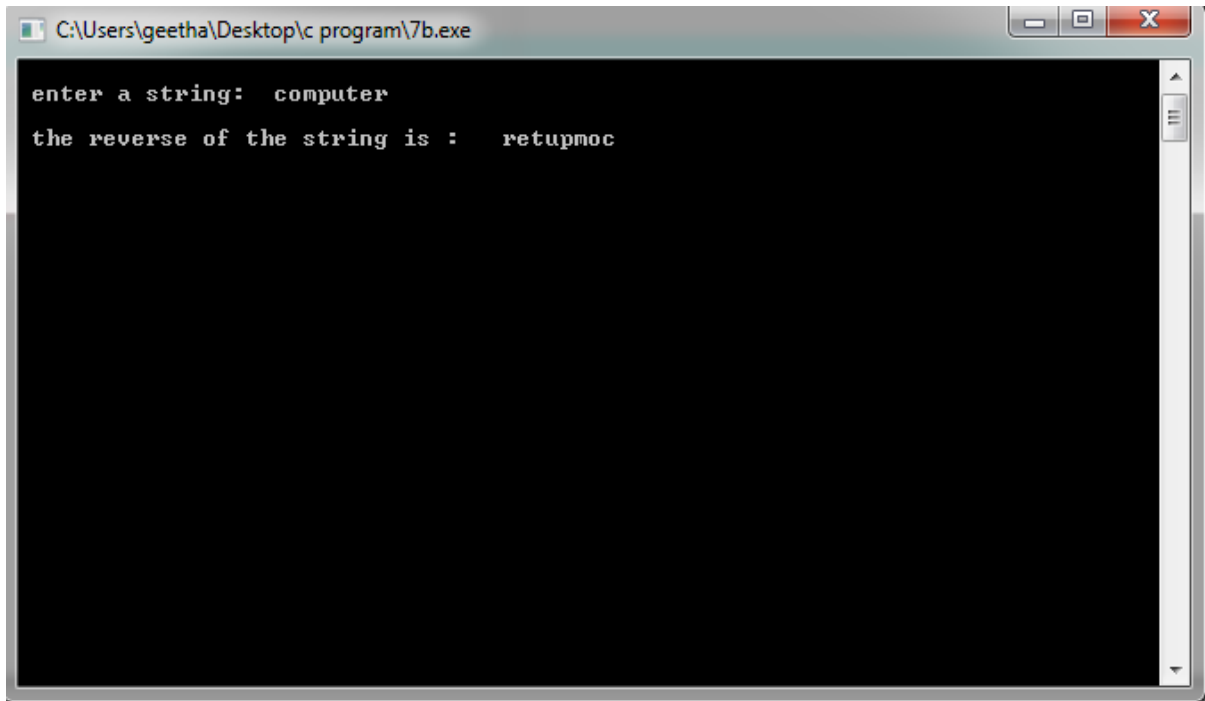
To copy a string from source to destination using pointers.

```
C:\Users\geetha\Desktop\c program\7b.exe

Enter string s1: computer
copied string: computer
```

To reverse a string using pointers


```
C:\Users\geetha\Desktop\c program\7b.exe

enter a string:   computer

the reverse of the string is :     retupmoc
```

PRE-LAB VIVA QUESTIONS:

1. What is the difference between a string copy (strcpy) and a memory copy (memcpy)? When should each be used ?

2. How can I remove the trailing spaces from a string?

3. How can I remove the leading spaces from a string?

4. How to represent a string?

5. What is a null character in strings?

6. How Strlen() works?

LAB ASSIGNMENT:

1. Develop a C program that displays the position or index in the string S where the string T begins, or -1 if S does not contain T.

2. Read a string and delete the duplicate character in the string.

3. Find the count of occurrence of the character in the given string.

4. Accept two strings and compare one String with another String without using String Handling functions and find two strings are equal or not.

5. Write a program to count the lines, words and characters in a given text.

6. Read two strings, str1 as "goodday" and str2 as "no ontime". By using these strings generate a new string str3 as "goodnoon". Now compare str3 with st r1to find the greatest ?

POST-LAB VIVA QUESTIONS:

1. What is the difference between printf() and puts() ?

2. Define pointer variable ?

3. What is use of the strcmp() function ?

4. What is the use of strcat() function ?

WEEK-8

STRUCTURES AND UNIONS

OBJECTIVE:

1. Write a C program that uses functions to perform the following operations:

   i.   Reading a complex number

   ii. Writing a complex number

   iii. Addition and subtraction of two complex numbers

   iv. Multiplication of two complex numbers. Note: represent complex number using a structure.

2. Write a C program to compute the monthly pay of 100 employees using each employee's name, basic pay. The DA is computed as 52% of the basic pay. Gross-salary (basic pay + DA). Print the employees name and gross salary.

3. Create a Book structure containing book_id, title, author name and price. Write a C program to pass a structure as a function argument and print the book details.

4. Create a union containing 6 strings: name, home_address, hostel_address, city, state and zip. Write a C program to display your present address.

5. Write a C program to define a structure named DOB, which contains name, day, month and year. Using the concept of nested structures display your name and date of birth.

RESOURCES:

Dev C++5.11

PROGRAM LOGIC:
To perform the Addition, Substraction, Multiplication and Divison operations between complex numbers

1. Start

2. Declare structure for complex numbers

3. Read the complex number

4. Read choice

5. If choice = 1 then addition operation will perform and it contains following steps

   w.realpart = w1.realpart + w2.realpart;

   w.imgpart = w1.imgpart + w2.imgpart; goto step 4

6. If choice = 2 then multiplication operation will perform and it contains following steps

   w.realpart = (w1.realpart * w2.realpart)-(w1.imgpart * w2.imgpart);

   w.imgpart = (w1.realpart * w2.imgpart)+(w1.imgpart * w2.realpart); goto step 4

7. If choice = 0 then exit operation will perform

8. If w.imgpart > 0 then print realpart+imgpart else Print realpart.

9. Stop

Print the employees name and gross salary

1. Start
2. Declare structure for employee details
3. Read 100 employee details
4. Repeat loop 100 employees and calculate gross salary of each employee
5. Print each employee name and gross salary
6. Stop

To pass a structure as a function argument and print the book details

1. Start
2. Declare structure for book details
3. Assign a book details to structure
4. Pass a structure as argument in function
5. Print the book details from the function
6. Stop

To display your present address using union

1. Start
2. Declare union for address details
3. Assign address to union
4. Print union details
5. Stop

To display your name and date of birth using nested structure

1. Start
2. Declare nested structure for a person
3. Assign person details to structure
4. Print structure details
5. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.
2. Compile: F9
3. Execute: F10

SOURCE CODE:

<u>To perform the Addition, Subtraction, Multiplication and Divison operations between complex numbers</u>

```c
#include<stdio.h>
#include<string.h>
struct complex1
{
        int r;
        inti;
}c1,c2,c3;
void add(struct complex1 c1,struct complex1 c2);
void sub(struct complex1 c1,struct complex1 c2);
void multi(struct complex1 c1,struct complex1 c2);
void main()
{
        printf("\n enter first complex no: ");
        scanf("%d%d",&c1.r,&c1.i);
        printf("\n enter second complex no: ");
        scanf("%d%d",&c2.r,&c2.i);
        printf("\n enter first complex no:%d+i%d",c1.r,c1.i);
        printf("\n enter second complexno:%d+i%d",c2.r,c2.i);
        add(c1,c2);
        sub(c1,c2);
        multi(c1,c2);
}

void add(struct complex1 c1,struct complex1 c2)
{
        c3.r=c1.r+c2.r;
        c3.i=c1.i+c2.i;
        printf("\n addition of two complex numbers is %d+i%d",c3.r,c3.i);
}
void sub(struct complex1 c1,struct complex1 c2)
{
        c3.r=c1.r-c2.r;
        c3.i=c1.i-c2.i;
```

```
            printf("\n subtraction of two complex numbers is        %d+i%d",c3.r,c3.i);
}
void multi(struct complex1 c1,struct complex1 c2)
{
            c3.r=(c1.r*c2.r)-(c1.i*c2.i);
            c3.i=(c1.r*c2.i)+(c1.i*c2.r);
            printf("\n multiplication of two complex numbers is %d+i%d",c3.r,c3.i);
}
```

Print the employees name and gross salary

```
#include<stdio.h>
struct employee
{
 char name[20];
 float basic;
 float da;
 float gross;
}e[5];
void main()
{
 inti;
 for(i=0;i<5;i++)
  scanf("%s%f",e[i].name,&e[i].basic);
 for(i=0;i<5;i++)
 {
 e[i].da=52.0/100*e[i].basic;
 e[i].gross=e[i].da+e[i].basic;
 printf("\n name=%s gross=%f",e[i].name,e[i].gross);
 }
```

To pass a structure as a function argument and print the book details

```
#include<stdio.h>
#include<string.h>
struct book
{
```

```c
        intbookid;
        char title[30];
        char author[20];
        float price;
};
voidprint_book(struct book b1);
void main()
{
        struct book b1;
        printf("\n enter book details: ");
        scanf("%d%s%s%f",&b1.bookid,b1.title,b1.author,&b1.price);
        print_book(b1);
}
voidprint_book(struct book b1)
{
        printf("\n book details:%d\t %s\t %s\t %f",b1.bookid,b1.title,b1.author,b1.price);
}
```

To display your present address using union

```c
#include<stdio.h>
#include<string.h>
union details
{
        char name[20];
        char  home_add[30];
        char hostel_add[30];
        char city[10];
        char state[10];
        int pincode;
}a;
void main()
{
        strcpy(a.name,"rama");
        printf("\n %s",a.name);
        strcpy(a.home_add,"1-83/10,jublie hills");
        printf("\n %s",a.home_add);
        strcpy(a.hostel_add,"iare college");
```

```c
        printf("\n %s",a.hostel_add);
        strcpy(a.city,"hyderabad");
        printf("\n %s",a.city);
        strcpy(a.state,"telangana");
        printf("\n %s",a.state);
        a.pincode=500043;
        printf("\n %d",a.pincode);
        getch();
}
```

To display your name and date of birth using nested structure

```c
#include<stdio.h>
#include<string.h>
void main()
{
        struct person
        {
                charfname[20];
                charlname[10];
                struct dob
                {
                        int day;
                        int month;
                        int year;
                }d;
        }p;
```
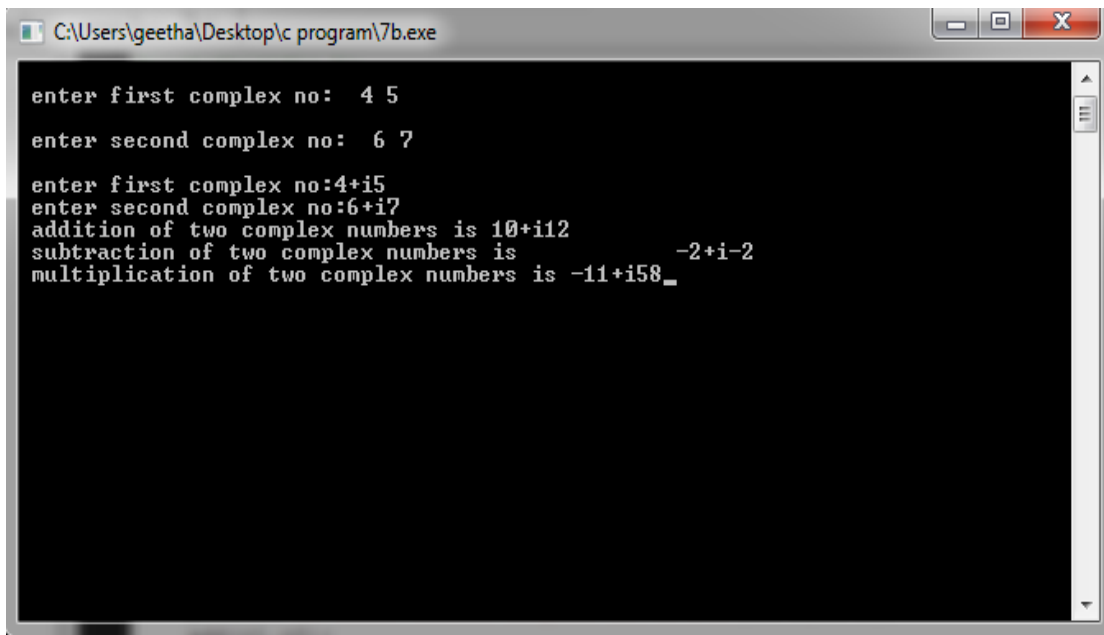
```
        printf("\n enter the person name and dob: ");

        scanf("%s%s%d%d%d",p.fname,p.lname,&p.d.day,&p.d.month,&p.d.year);

        printf("\n my name is %5s %5s",p.fname,p.lname);

        printf("\n my dob is %d-%d-%d",p.d.day,p.d.month,p.d.year);
}
```

INPUT/OUTPUT:

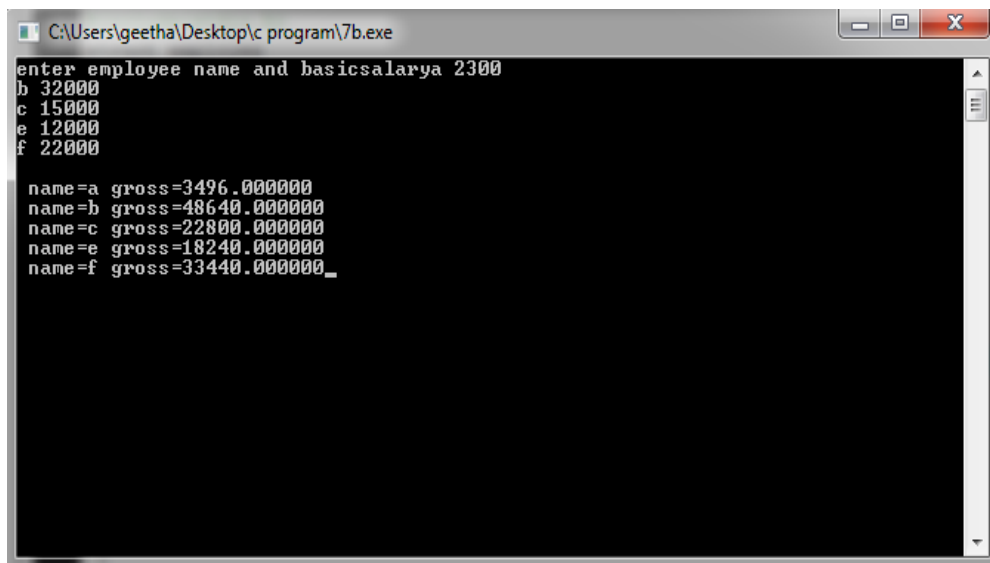**To perform the Addition, Subtraction, Multiplication and Davison operations between complex numbers**
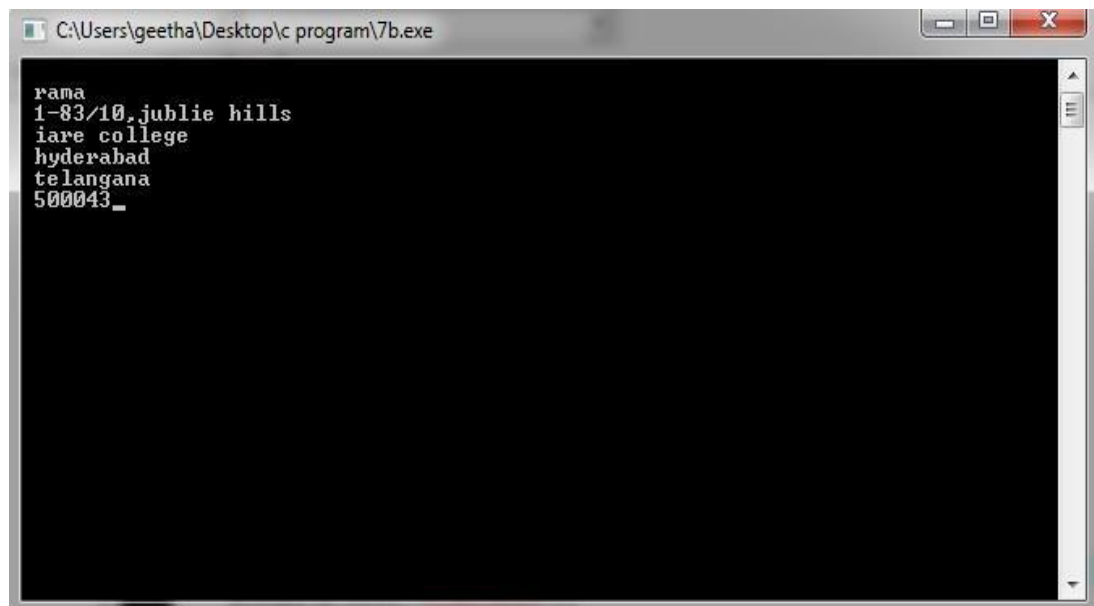

Print the employees name and gross salary

Pass a structure as a function argument and print the book details


```
C:\Users\geetha\Desktop\c program\7b.exe

 enter book details:  201 cprogramming balaguriswamy 230

book details:201        cprogramming     balaguriswamy    230.000000_
```
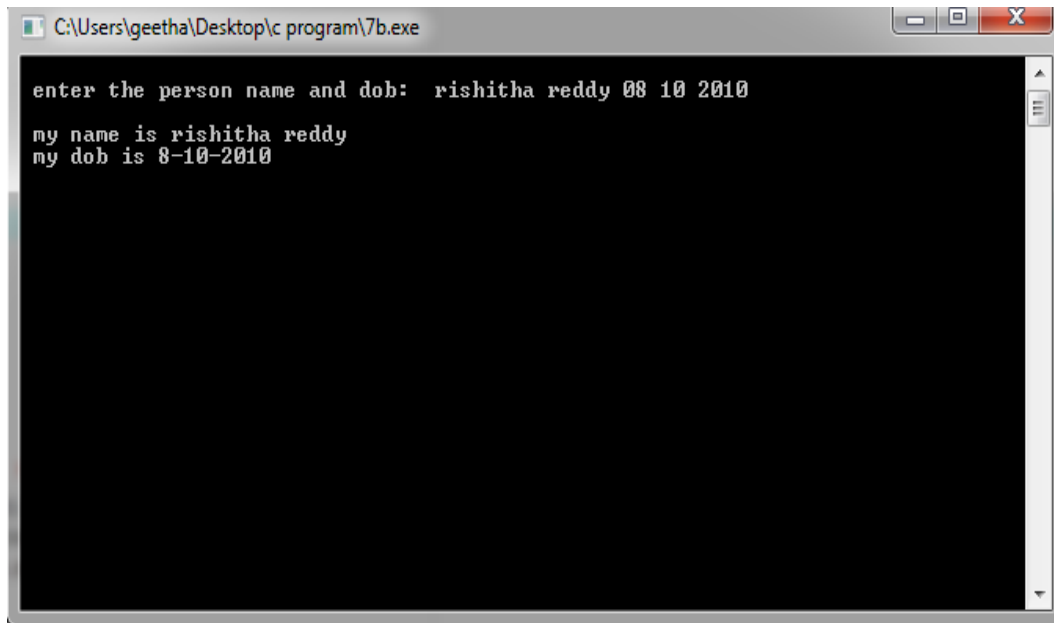
To display your present address using union


```
C:\Users\geetha\Desktop\c program\7b.exe

rama
1-83/10,jublie hills
iare college
hyderabad
telangana
500043_
```

To display your name and date of birth using nested structure

PRE-LAB VIVA QUESTIONS:

1. What is a structure ?
2. Differentiate between array and structure ?
3. How do you access the member of a structure ?
4. What is the difference between structure and union?
5. How to access structure?
6. What is the role of structure?

LAB ASSIGNMENT:

1. Write a C Program to Store Information(name, roll and marks) of a Student Using Structure.

2. Write a C Program to Add Two Distances (in inch-feet) System Using Structures.

3. Write a C Program to Calculate Difference Between Two Time Period using structure.

4. Read 100 students details from the input using structure and sort the records based student name.

5. Read 100 students marks and find total and percentage of each student and display the details.

POST-LAB VIVA QUESTIONS:

1. What is nested structure ?

2. What is the use of dot operator in structures ?

3. Define union ?

4. What are embedded structures ?

5. Differentiate between address operator and dereferencing operator.

WEEK-9

ADDITIONAL PROGRAMS

OBJECTIVE:

1. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots+x^n$. For example: if n is 3 and x is 5, then the program computes $1+5+25+125$. Print x, n, the sum. Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

2. 2"s complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2"s complement of 11100 is 00100. Write a C program to find the 2"s complement of a binary number.

3. Write a C program to convert a Roman numeral to its decimal equivalent. E.g. Roman number CD is equivalent to 400.

RESOURCES:

Dev C++5.11

PROGRAM LOGIC:

To read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots+x^n$

1. Start

2. read values of x and n, sum - 1, i = 1

3. check for n & X

4. if n <= 0 || x <= 0

5. print values are not valid

6. read values of x and n

7. perform the loop operation

8. for(i = 1; i <= n; i++) then follows

9. sum=sum+pow(x, i)

10. print sum

11. Stop

To find the 2's complement of a binary number

1. Start

2. declare the subprogram "complement(char *a)"

3. initialize the variable i

4. read the binary number

100

5. perform the loop operation. if it is true then follows. if not goto step7

6. for(i = 0; a[i]! = '\0'; i)

7. if(a[i] != '0' && a[i]! = '1') then displayed the number is not valid. enter the correct number.

8. Exit the loop

9. call sub program „complemt(a)'

10. Stop

To convert a Roman numeral to its decimal equivalent

1. Start

2. Read roman numbers

3. Repeat loop for all given roman letters and convert each letter into digit and add to variable

4. Print the result

5. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.

2. Compile: F9

3. Execute: F10

SOURCE CODE:

To read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots+x^n$

```c
#include<stdio.h>
#include<math.h>
void main()
{
        int x,n,sum=0,i;
        L:printf("\n enter the value of x and n: ");
        scanf("%d%d",&x,&n);
        if(x<0 || n<0)
        {
```

```
                    printf("\n enter only positive values for x and n");
                    goto L;
            }
            for(i=0;i<=n;i++)
            {
                    sum=sum+pow(x,i);
            }
            printf("\n x=%d,n=%d,sum of G.P=%d",x,n,sum);
            getch();
}
```

To find the 2's complement of a binary number
```
#include<stdio.h>
void twoscomplement(int a[10],int);
void main()
{
        int n,i,a[10];
        printf("\n enter number of bits in the binary number: ");
        scanf("%d",&n);
        printf("\n enter the binary number into the array: ");
        for(i=0;i<n;i++)
         scanf("%d",&a[i]);
        twoscomplement(a,n);
        getch();
}
void twoscomplement(int a[10],int n)
{
        int i,c=1;
        for(i=0;i<n;i++)
        {
                if(a[i]==0)
                 a[i]=1;
                else
                 a[i]=0;
        }
        printf("\n one's complement of the binary number is: ");
```

102

```c
        for(i=0;i<n;i++)
         printf("%5d",a[i]);
        for(i=n-1;i>=0;i--)
        {
                a[i]=a[i]+c;
                if(a[i]==1)
                {
                        c=0;
                        break;
                }
                else{
                        a[i]=a[i]-2;
                        c=1;
                }
        }
        printf("\n 2's complement of the binary number is: ");
        if(c==1)
         printf("%5d",c);
        for(i=0;i<n;i++)
        printf("%5d",a[i]);
}
```

To convert a Roman numeral to its decimal equivalent

```c
#include<stdio.h>
#include<string.h>
void main()
{
        char a[10];
        int total[10],sum=0,i,l;
        printf("\n enter a roman number:    ");
        gets(a);
        l=strlen(a);
        for(i=0;i<l;i++)
        {
                switch(a[i])
                {
```

```c
                case 'M':total[i]=1000;
        break;
        case 'D':total[i]=500;
        break;
        case 'C':total[i]=100;
        break;
        case 'L':total[i]=50;
        break;
        case 'X':total[i]=10;
        break;
        case 'T':total[i]=1;
        break;
        }
        sum=sum+total[i];
}
for(i=0;i<l-1;i++)
{
        if(total[i]<total[i+1])
        {
                sum=sum-2*total[i];
        }
        printf("\n the decimal equivalent is %d",sum);
}
}
```
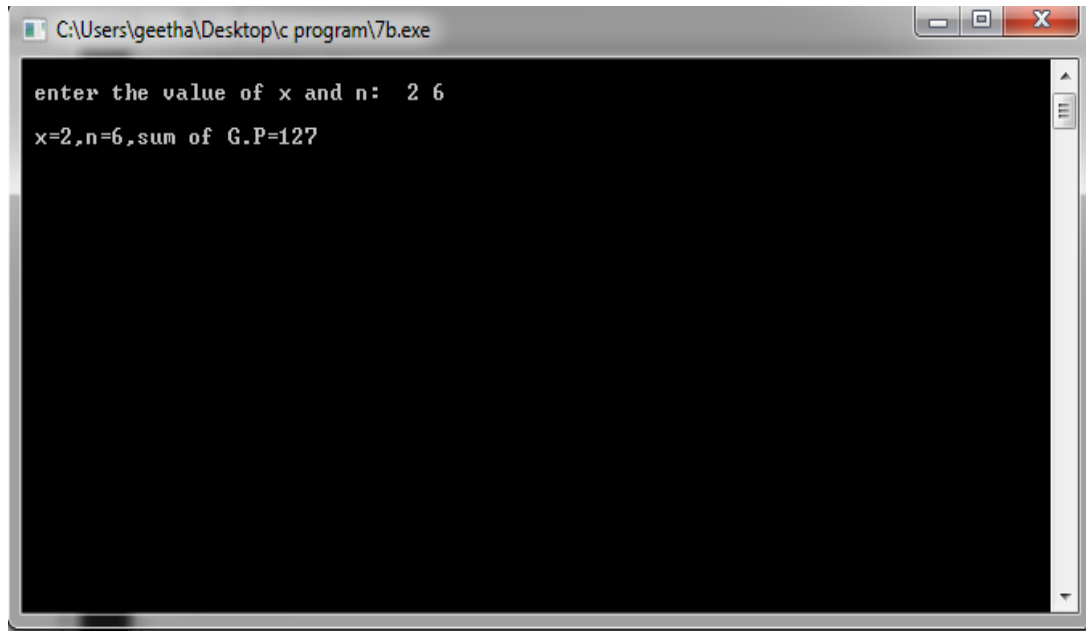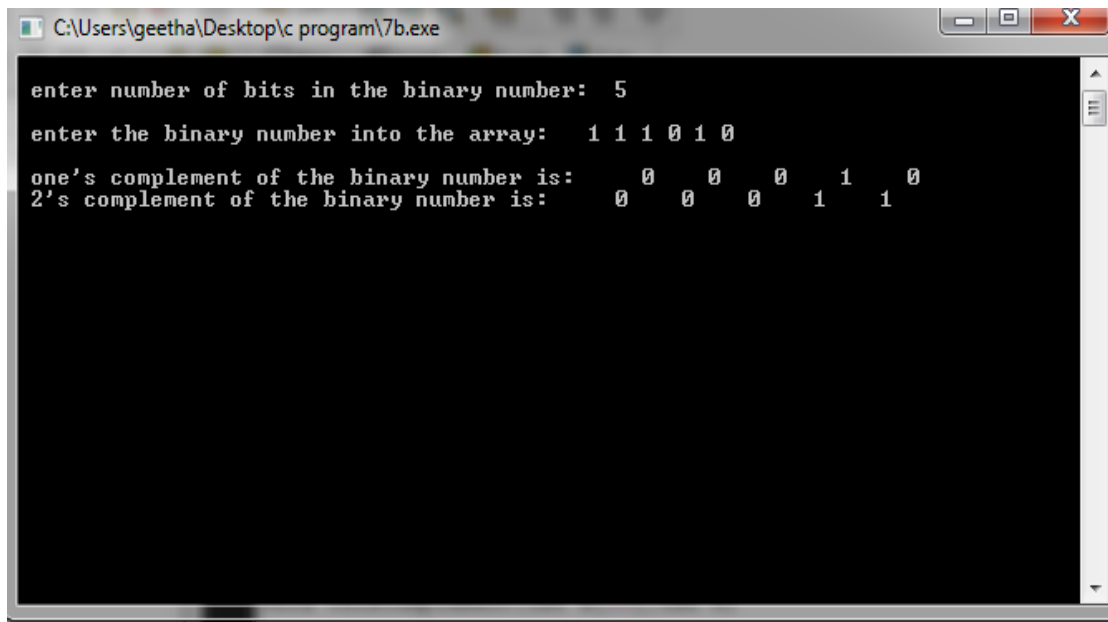
INPUT/OUTPUT:

To read in two numbers, x and n, and then compute the sum of this geometric progression:
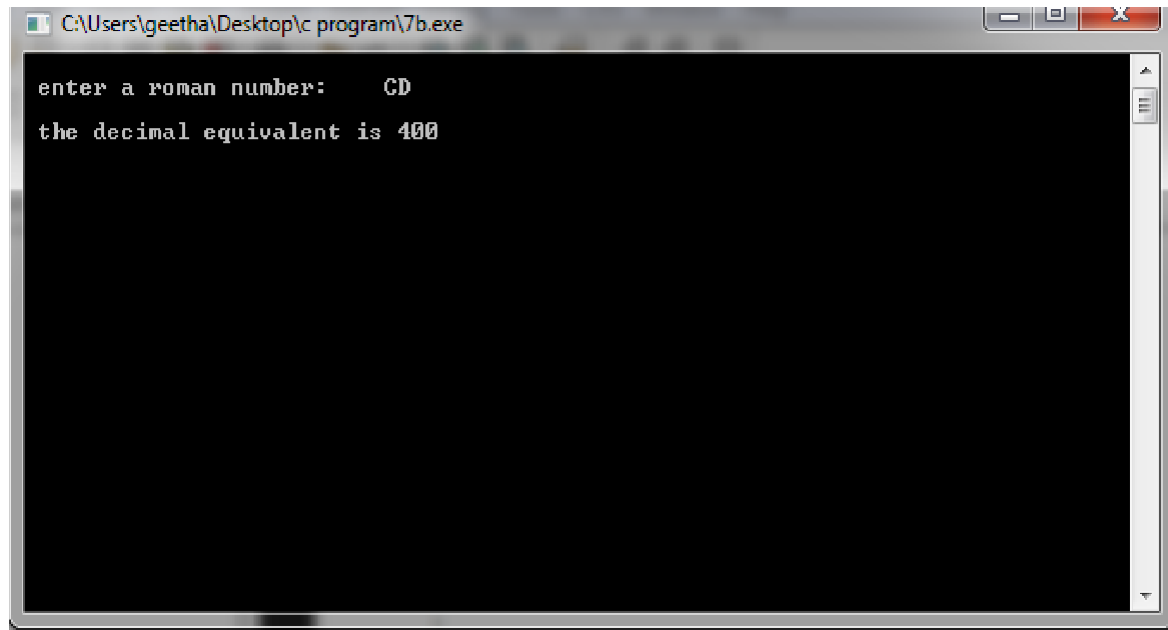$$1+x+x^2+x^3+\ldots\ldots\ldots+x^n$$

```
C:\Users\geetha\Desktop\c program\7b.exe

enter the value of x and n:   2 6

x=2,n=6,sum of G.P=127
```

To find the 2's complement of a binary number

```
C:\Users\geetha\Desktop\c program\7b.exe

enter number of bits in the binary number:  5

enter the binary number into the array:   1 1 1 0 1 0

one's complement of the binary number is:    0    0    0    1    0
2's complement of the binary number is:      0    0    0    1    1
```

To convert a Roman numeral to its decimal equivalent


```
C:\Users\geetha\Desktop\c program\7b.exe

enter a roman number:    CD

the decimal equivalent is 400
```

PRE-LAB VIVA QUESTIONS:

1. What is a pointer ?
2. How do you declare a pointer variable
3. How do you use a pointer to a function ?
4. Difference between array and pointers ?
5. What is void pointer?
6. What is the difference between malloc and realloc functions?
7. How you can free the allocated memory>
8. How pointers are different from normal variables?

LAB ASSIGNMENT:

1. The first few numbers of the Lucas sequence which is a variation on the Fibonacci sequence are:

    1   3   4   7   11 18 29

    Formulate a program to generate the Lucas sequence.

2. Given a= 0, b = 1, and c = 1 are the first three numbers of some sequence. All other numbers in the sequence are generated from the sum of their three most recent predecessors. Compose a C-program to generate this sequence.

3. Write a C-program to evaluate the function sin(x) as defined by

4. Write a C-program to evaluate the function cos(x) as defined by the infinite series expansion the acceptable error from the computation is 10^6.

POST-LAB VIVA QUESTIONS:

1. How structure name is different from a structure variable?
2. How can putchar() can be used to print a string?
3. List out the rules for naming a variable?
4. How is an array represented in memory?
5. Define function? Why are they needed?

WEEK-10

PREPROCESSOR DIRECTIVES

OBJECTIVE:

1. Define a macro with one parameter to compute the volume of a sphere. Write a C program using this macro to compute the volume for spheres of radius 5, 10 and 15 meters.

2. Define a macro that receives an array and the number of elements in the array as arguments. Write a C program for using this macro to print the elements of the array.

3. Write symbolic constants for the binary arithmetic operators +, -, *, and /. Write a C program to illustrate the use of these symbolic constants.

RESOURCES:

Den C++ 5.11

PROGRAM LOGIC:

To compute the volume for spheres of radius 5, 10 and 15 meters

1. Start
2. Define PI constant value 3.14
3. Define macro function to pass a radius value as a argument
4. Call the macro function
5. Print the result
6. Stop

To print the elements of the array

1. Start
2. Define macro function that receive array and number of elements
3. Repeat until all elements in the array complete and print element
4. Call the macro function
5. Stop

To illustrate the use of these symbolic constants

1. Start
2. Define + as ADD
3. Define – as SUB
4. Define * as MUL
5. Define / as DIV

6. Perform addition operation using ADD and print the result
7. Perform subtraction operation using SUB and print the result
8. Perform Multiplication operation using MUL and print the result
9. Perform Division operation using DIV and print the result
10. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.

2. Compile: F9

3. Execute: F10

SOURCE CODE:
To compute the volume for spheres of radius 5, 10 and 15 meters

```c
#include<stdio.h>
#include<math.h>
#define PI 3.142
#define volume(r) ((4/3.0)*PI*pow(r,3))
void main()
{
                int r;
                float v;
        scanf("%d",&r);
                v=volume(r);
                printf("\n volume of the sphere v=%.3f",v);
}
```

To print the elements of the array

```c
#include<stdio.h>
#define PRINTARRAY(a,l)\
         int i=0; \
        while(i<l) \
         { \
        printf("%5d",a[i]);\
        i++;   \
         }
```
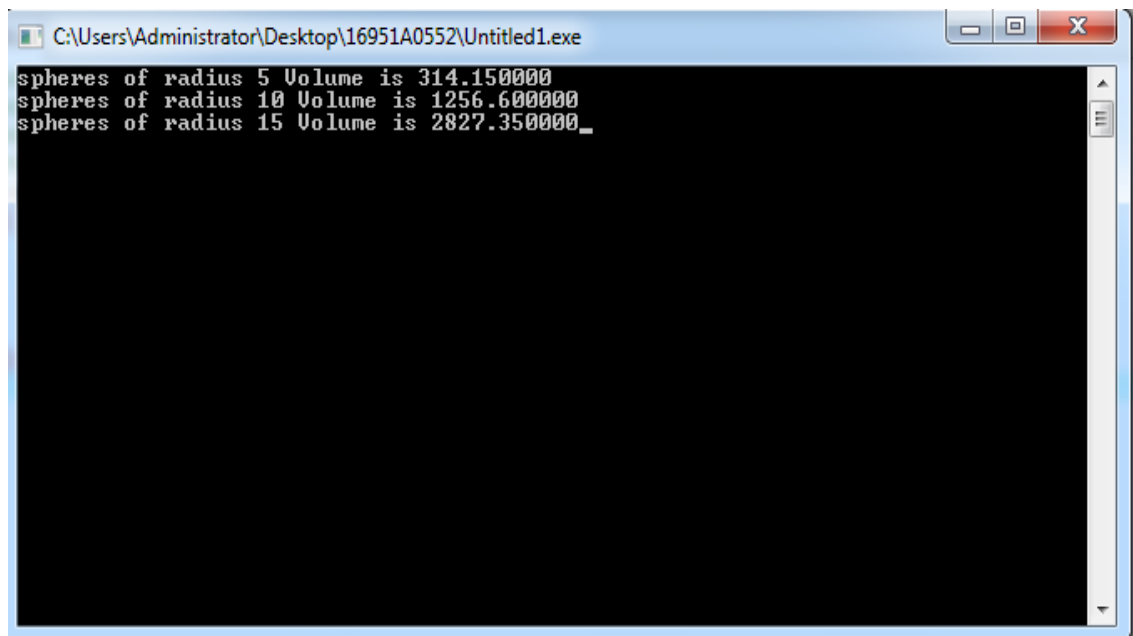
```c
void main()
{
        int a[10]={10,25,47,56,89,34,68,45,28,03};
        PRINTARRAY(a,10);
}
```

To illustrate the use of these symbolic constants

```c
#include<stdio.h>
#define PLUS +
#define MINUS -
#define MUL *
#define DIV /
#define MOD %
void main()
{
                int a=20,b=30;
                printf("\n addition=%d",a PLUS b);
                printf("\n subtraction=%d",a MINUS b);
                printf("\n multiplication=%d",a MUL b);
                printf("\n division=%d",a DIV b);
                printf("\n modulous=%d",a MOD b);
}
```
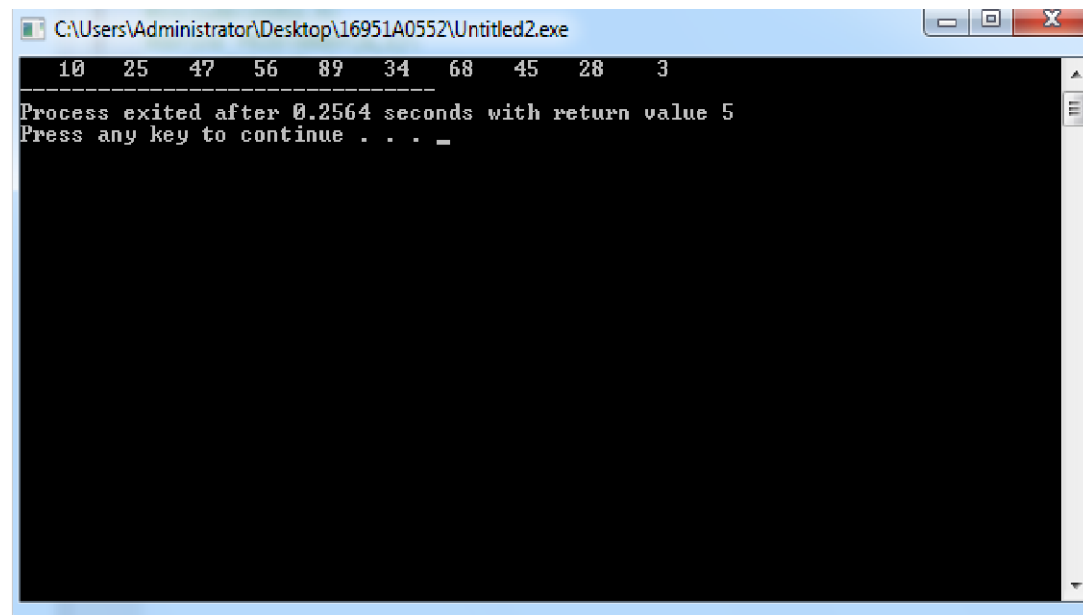
INPUT / OUTPUT :-

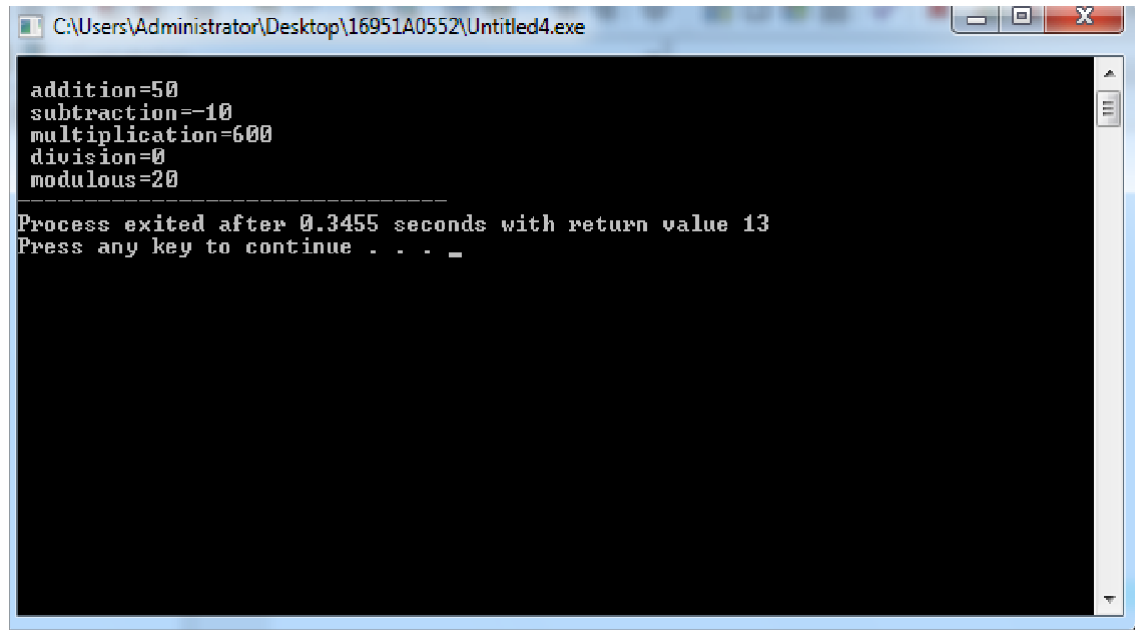**To compute the volume for spheres of radius 5, 10 and 15 meters**

```
C:\Users\Administrator\Desktop\16951A0552\Untitled1.exe

spheres of radius 5 Volume is 314.150000
spheres of radius 10 Volume is 1256.600000
spheres of radius 15 Volume is 2827.350000_
```

To print the elements of the array

```
C:\Users\Administrator\Desktop\16951A0552\Untitled2.exe

  10   25   47   56   89   34   68   45   28   3
-----------------------------------
Process exited after 0.2564 seconds with return value 5
Press any key to continue . . . _
```

To illustrate the use of these symbolic constants


```
C:\Users\Administrator\Desktop\16951A0552\Untitled4.exe

addition=50
subtraction=-10
multiplication=600
division=0
modulous=20
--------------------------------
Process exited after 0.3455 seconds with return value 13
Press any key to continue . . . _
```

PRE-LAB VIVA QUESTIONS:

What is the preprocessor in C ?

1. What is a symbolic constant??

2. What is a macro in C programming??

3. How can you avoid including a header more than once?

4. Can a file other than a .h file be included with #include?

5. What is the benefit of using #define to declare a constant?

6. What is the benefit of using an enum rather than a #define constant?

LAB ASSIGNMENT:

1. Compute area and volume of a cube.

2. Find square root of given number.

3. Convert uppercase character to lower case character and vice versa.

4. Convert the Roman numeral to its decimal equivalent using macros.

5. Use pre-processor statements to replace the following constants 0.312,W and 37

POST-LAB VIVA QUESTIONS:

1. Is it better to use a macro or a function?

2. What is the best way to comment out a section of code that contains comments?

3. What is the difference between #include and #include "file"?

4. Can you define which header file to include at compile time?

5. How do you override a defined macro?

6. How can you check to see whether a symbol is defined?

112

FILES

OBJECTIVE:

1. Write a C program to display the contents of a file.
2. Write a C program to copy the contents of one file to another.
3. Write a C program to reverse the first n characters in a file, where n is given by the user.
4. Two files DATA1 and DATA2 contain sorted lists of integers. Write a C program to merge the contents of two files into a third file DATA i.e., the contents of the first file followed by those of the second are put in the third file.
5. Write a C program to count the no. of characters present in the file.

RESOURCES:

Dev C++5.11

PROGRAM LOGIC:

To display the contents of a file on screen

1. Start
2. Read file name
3. Open file in read mode
4. Repeat until end of the file and print the contents if the file
5. Close the file
6. Stop

Copy the contents from one file to another

1. Start
2. read command line arguments
3. check if no of arguments =3 or not. If not print invalid no of arguments
4. open source file in read mode
5. if NULL pointer, then print source file cannot be open
6. open destination file in write mode
7. if NULL pointer, then print destination file cannot be open
8. read a character from source file and write to destination file until EOF
9. Close source file and destination file
10. Stop

Reverse n character in a file

1. Start
2. read the command line arguments
3. check if arguments=3 or not, If not print invalid no of arguments
4. open source file in read mode
5. if NULL pointer, then print file cannot be open
6. Store no of chars to reverse in k

   K= *argv[2]-48
7. read the item from file stream using fread
8. Store chars from last position to initial position in another string(temp)
9. print the temp string
10. Stop

Merge the contents of two files into third one

1. Open file1.txt and file2.txt in read mode.
2. Open file3.txt in write mode.
3. Run a loop to one by one copy characters of file1.txt to file3.txt.
4. Run a loop to one by one copy characters of file2.txt to file3.txt.
5. Close all files.

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.
2. Compile: F9
3. Execute: F10

SOURCE CODE:

To display the contents of a file on screen

```
#include<stdio.h>
void main()
{
      FILE *fp;
      char ch;
      fp=fopen("file.txt","r");
```

114

```c
            if(fp==NULL)
            {
                    printf("file opening problem");
                    return;
            }
            while(!feof(fp))
            {
                    ch=fgetc(fp);
                    printf("%c",ch);
            }
            fclose(fp);
}
```

Copy the contents from one file to another

```c
#include<stdio.h>
void main()
{
        FILE *fp1, *fp2;
        char ch;
        fp1=fopen("old.txt","r");
        fp2=fopen("new.txt","w");
        if(fp1==NULL||fp2==NULL)
        {
                printf("file opening problem");
                return;
        }
        while(!feof(fp1))
        {
                ch=fgetc(fp1);
                fputc(ch,fp2);
        }
        fclose(fp1);
        fclose(fp2);
        getch();
}
```

Reverse n character in a file

```c
#include <stdio.h>
#include<string.h>
int main()
{
        FILE *fp;
        char a[50];
        int i,n,count=0;
        fp=fopen("program.txt","r");
        if(fp==NULL)
        {
                printf("\n file opening problem");
                return;
        }
        printf("\n enter the no of charcters to reverse: ");
        scanf("%d",&n);
        while(count<n)
        {
                a[count]=fgetc(fp);
                count++;
        }
        a[count]='\0';
        fputs(strrev(a),stdout);
        fclose(fp);
        getch();
}
```
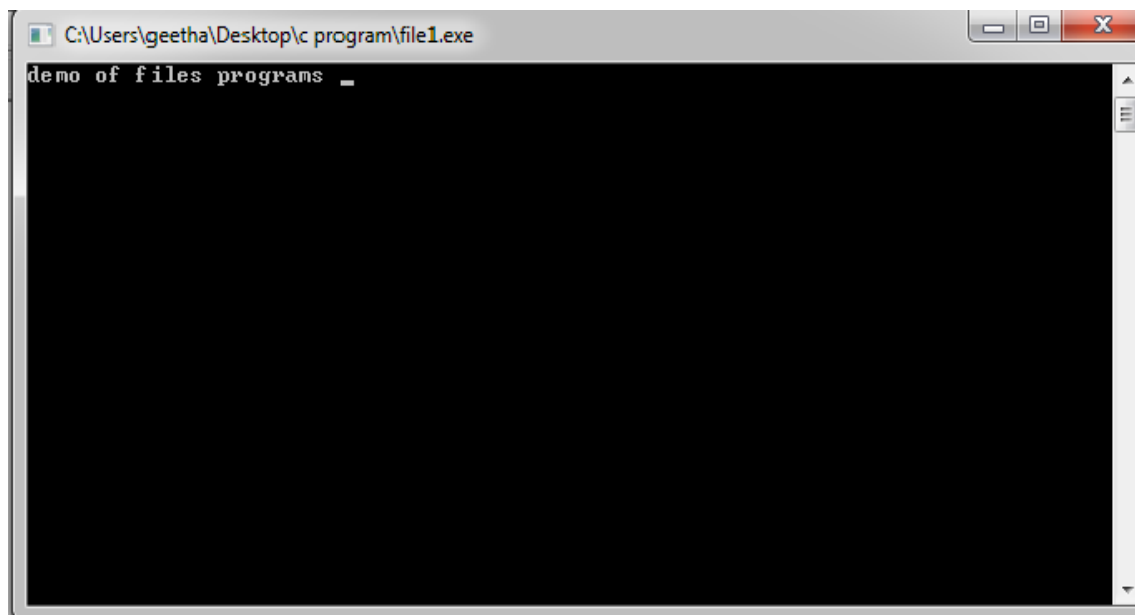
Merge the contents of two files into third one

```c
#include<stdio.h>
void main()
{
        FILE *fp1, *fp2,*fp3;
        char ch;
        fp1=fopen("program.txt","r");
        fp2=fopen("new.txt","r");
```

116

```c
        fp3=fopen("merge.txt","a");
        if(fp1==NULL||fp2==NULL||fp3==NULL)
        {
                printf("file opening problem");
                return;
        }
        while(!feof(fp1))
        {
                ch=fgetc(fp1);
                fputc(ch,fp3);
        }
}
```
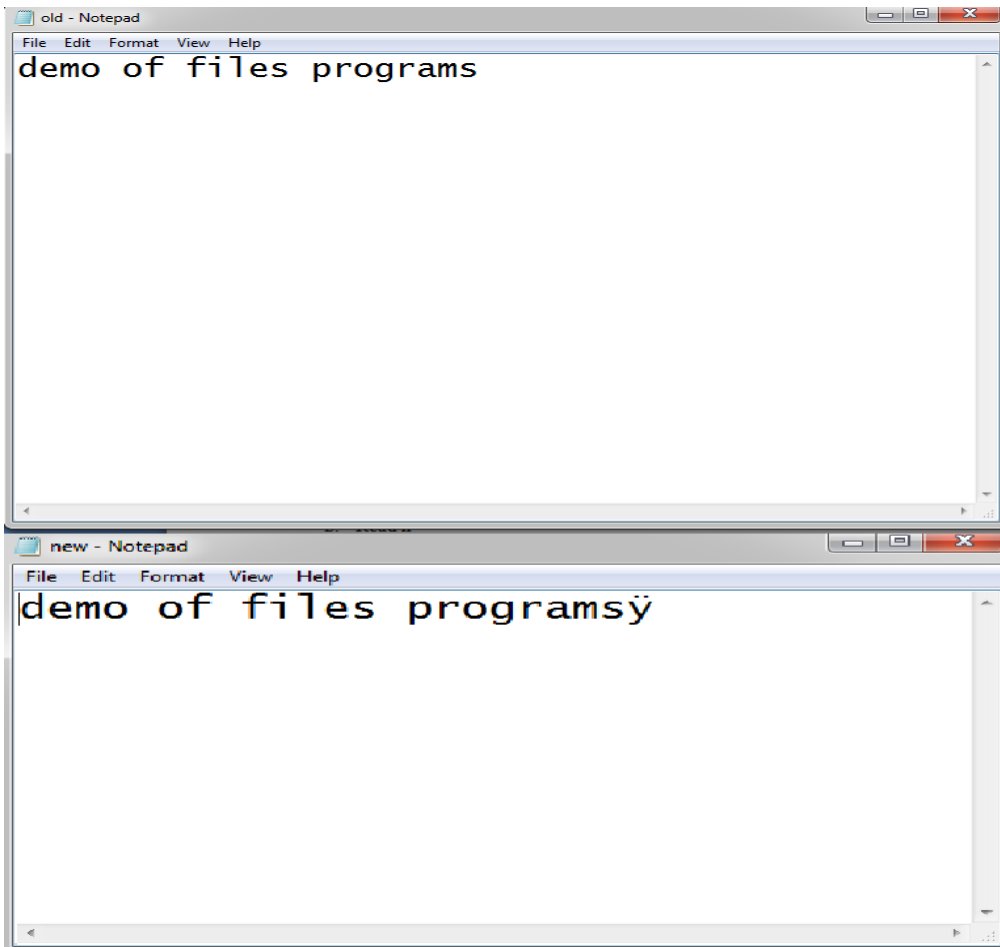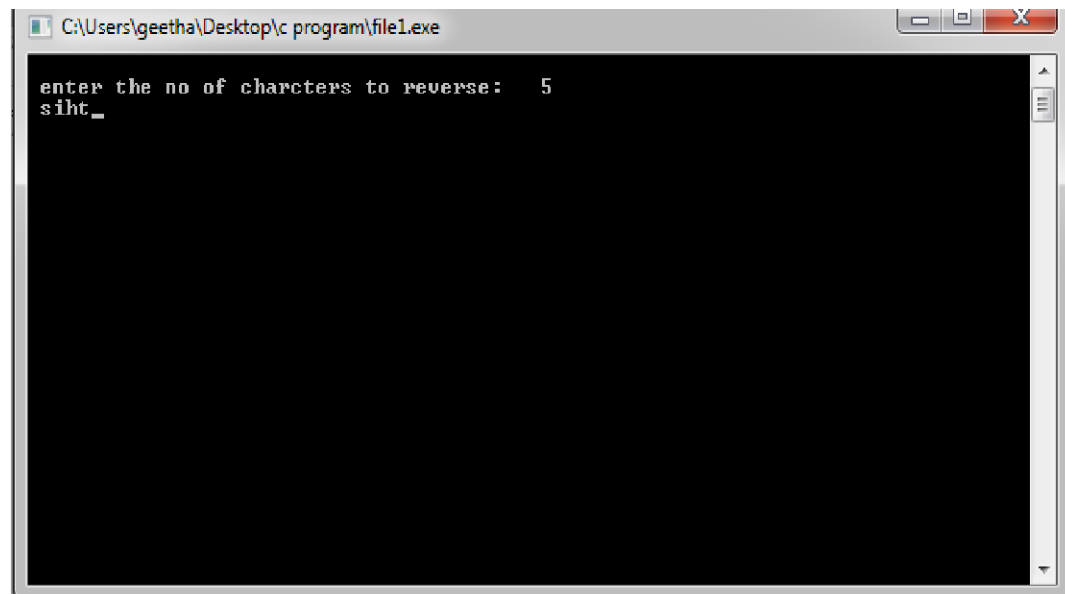
INPUT / OUTPUT:
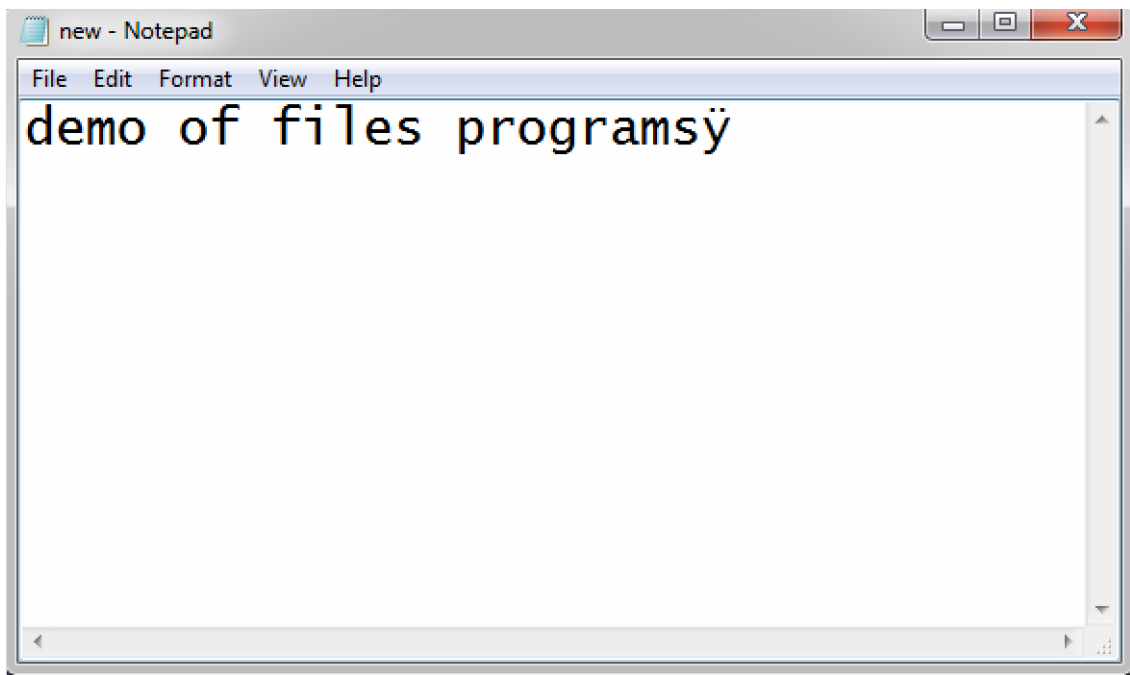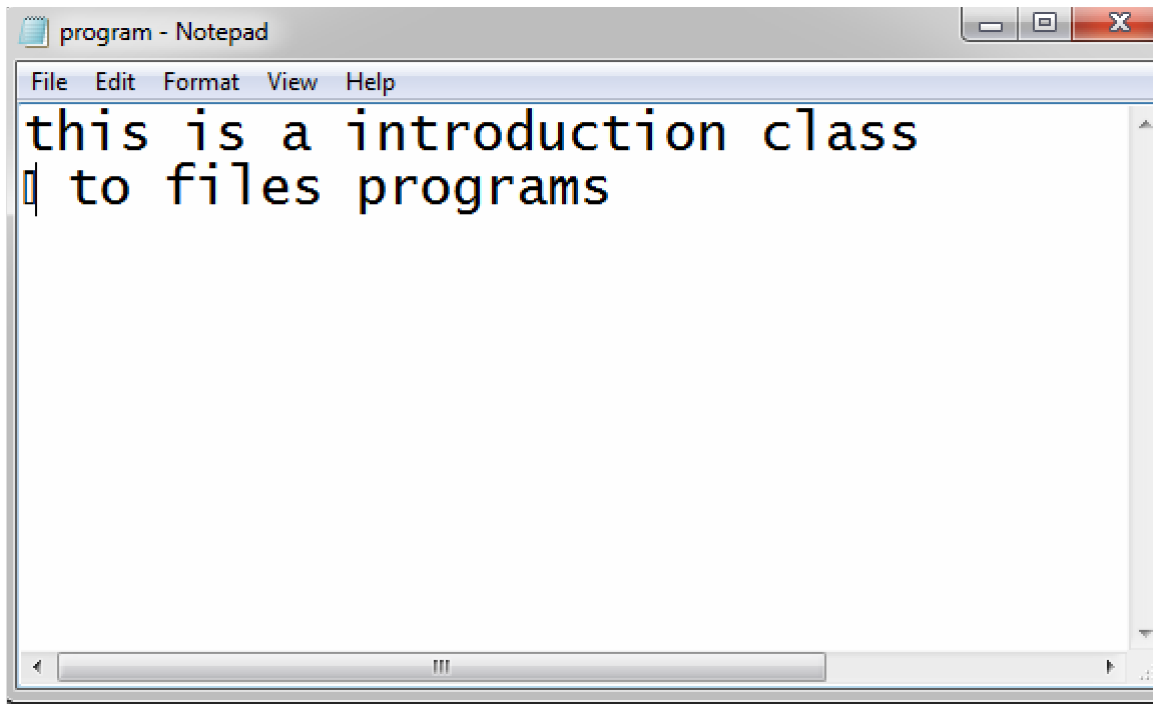
To display the contents of a file on screen

Copy the contents from one file to another

old - Notepad

File   Edit   Format   View   Help

demo of files programs

new - Notepad

File   Edit   Format   View   Help

demo of files programsÿ

Reverse n character in a file

C:\Users\geetha\Desktop\c program\file1.exe

enter the no of charcters to reverse: 5
siht

Merge the contents of two files into third one

```
program - Notepad
File  Edit  Format  View  Help
this is a introduction class
 to files programs
```

```
new - Notepad
File  Edit  Format  View  Help
demo of files programsÿ
```

merge - Notepad

```
this is a introduction class
to files programsÿ
demo of files programsÿÿ
```
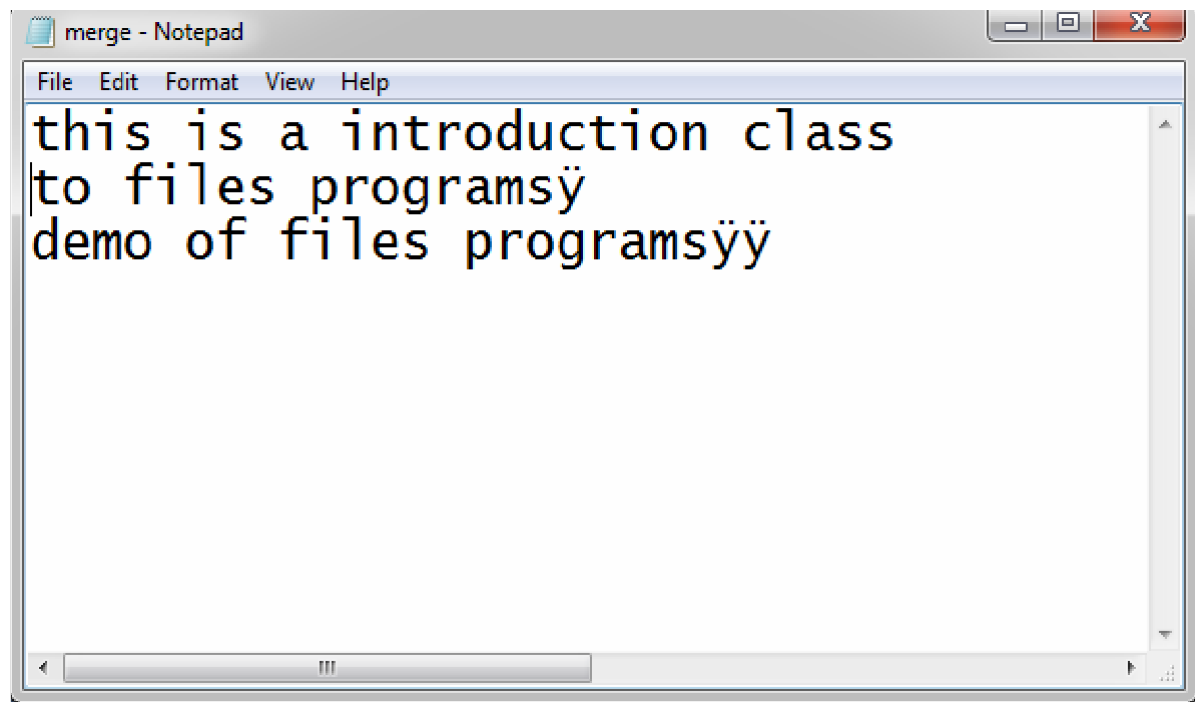
PRE-LAB VIVA QUESTIONS:

1. What do you understand by EOF ?

2. Define the term stream ?

3. Explain the difference between a NULL pointer and Void pointer ?

4. Differentiate between ptr++ and *ptr++ ?

LAB ASSIGNMENT:

1. C Program to Delete a specific Line from a Text File
2. C Program to Append the Content of File at the end of Another
3. C Program to Capitalize First Letter of every Word in a File
4. C Program to Convert the Content of File to LowerCase
5. C Program to Join Lines of Two given Files and Store them in a New file.

POST-LAB VIVA QUESTIONS:

1. What is use of <math.h> header file ?

2. Describe the file opening mode "w+"

3. Is FILE a built-in data type?

4. How can we determine whether a file is successfully opened or not using fopen() function?

5. How can we know read/write permission any given file?

6. How can we know size and drive where file has stored of any given file?

7. What is buffer?

8. What is FILE pointer?

9. What is stream?

COMMAND LINE ARGUMENTS

OBJECTIVE:

1. Write a C program to read arguments at the command line and display it.

2. Write a C program to read two numbers at the command line and perform arithmetic operations on it.

3. Write a C program to read a file name at the command line and display its contents.

RESOURCES:

Dev C++5.11

PROGRAM LOGIC:

To read arguments at the command line and display it

1. Start
2. Pass a to arguments argc and argv in main function
3. Check the condition argc equal to 2 then printf the argv[1] value
4. Else if argc is greter than 2 the print Too many arguments supplied
5. Else One argument expected
6. Stop

To read two numbers at the command line and perform arithmetic operations on it.

1. Start
2. Pass a to arguments argc and argv in main function
3. If argc is equal to 3 then perform addition between the argv[1] and argv[2].
4. Print the sum value
5. Stop

To read a file name at the command line and display its contents

1. Start

2. Read command line arguments

3. Check if no of arguments =2 or not. If not print invalid no of arguments

4. Open file in read mode

5. Repeat until end of the file and print the contents if the file

6. Close the file

7. Stop

PROCEDURE:

1. Create: open Dev C++ 5.11 write a program after that save the program with .Cextension.

2. Compile: Alt F9

3. Execute: Ctrl F9

SOURCE CODE:

To read arguments at the command line and display it

```
#include<stdio.h>
#include<string.h>
void main(int argc,char *argv[])
{
        int i;
        printf("\n total no of arguments=%d",argc);
        for(i=0;i<argc;i++)
          printf("\n args[%d]=%s",i,argv[i]);
}
```

To read two numbers at the command line and perform arithmetic operations on it.

```
#include<stdio.h>
void main(int argc,char * argv[])
{
                int sum=0;
                if(argc<2)
                {
                        printf("\n insufficient arguments");
                        return;
                }
                sum=atoi(argv[1])+atoi(argv[2]);
                printf("\n sum=%d",sum);
                getch();
}
```

To read a file name at the command line and display its contents

```
#include<stdio.h>
void main(int argc,char * argv[])
{
        FILE *fp;
        char ch;
        fp=fopen(argv[1],"r");
```

123

```
            if(fp==NULL)

               {

                     printf("\n opening problem");

                     return;

               }

            while(!feof(fp))

            {

                     ch=getc(fp);

                     printf("%c",ch);

            }

            fclose(fp);

}
```
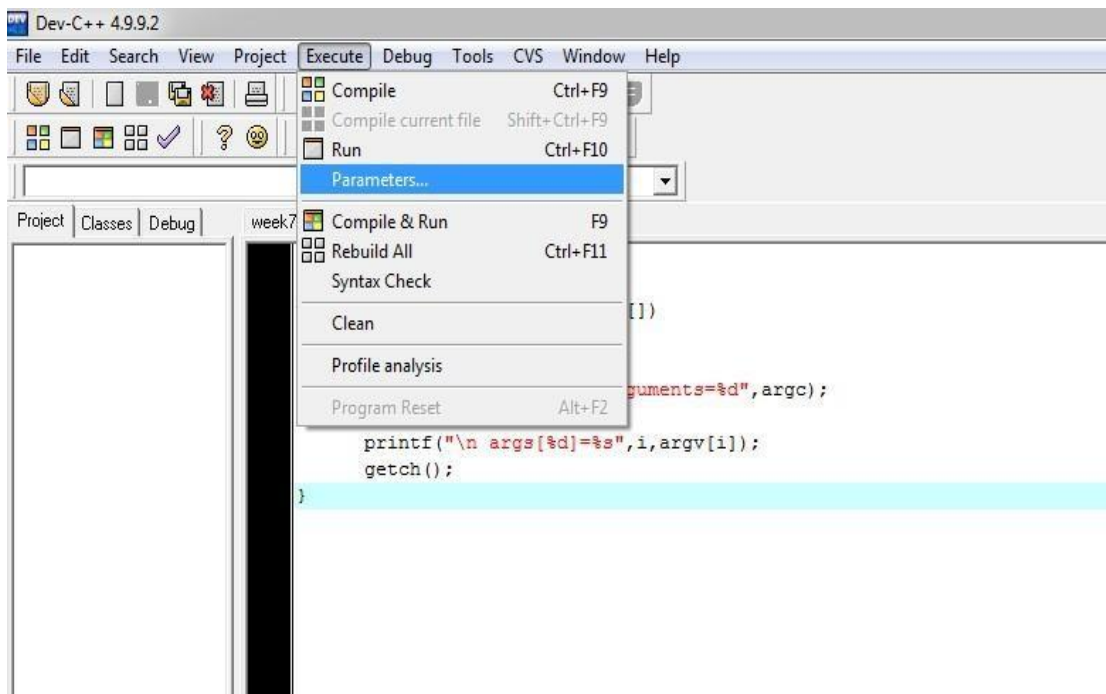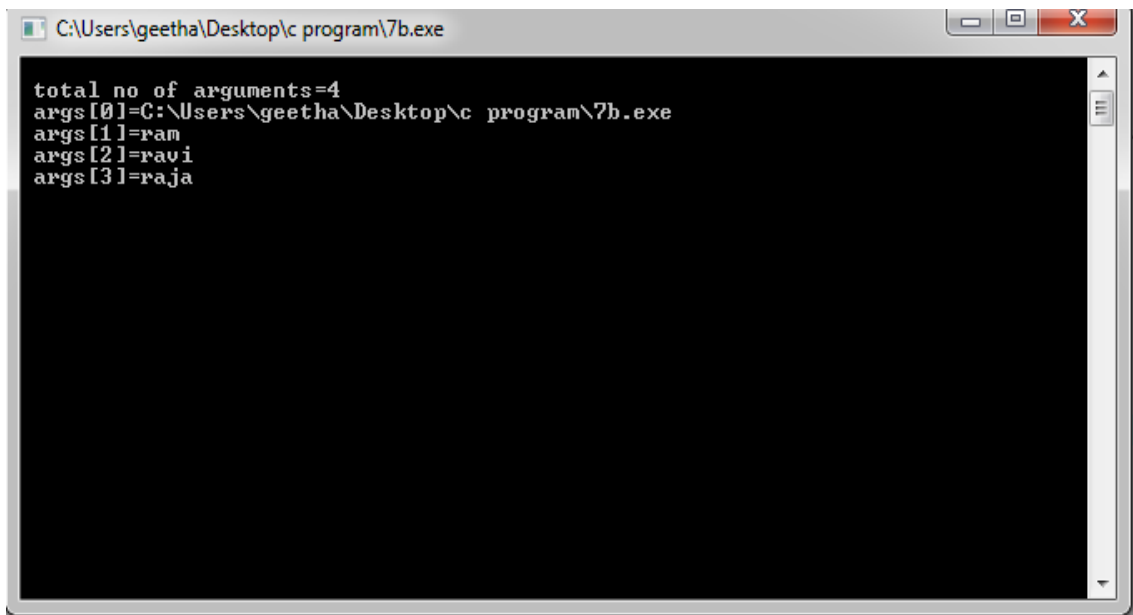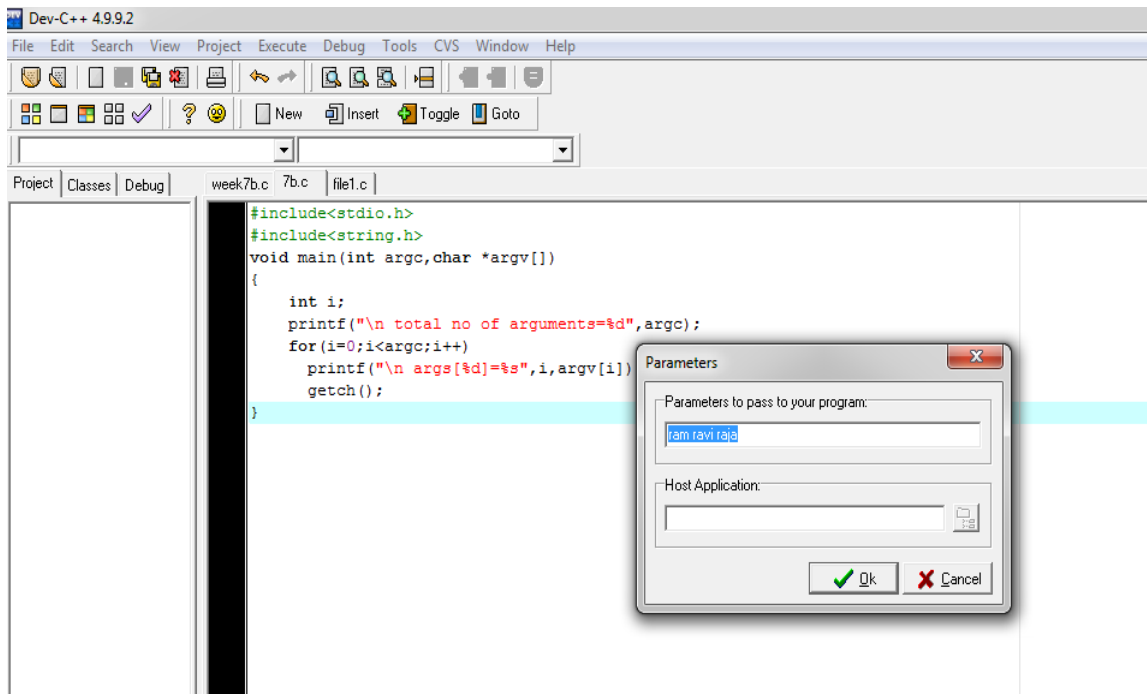
INPUT/OUTPUT:

<u>**To read arguments at the command line and display it**</u>

```
#include<stdio.h>
#include<string.h>
void main(int argc,char *argv[])
{
    int i;
    printf("\n total no of arguments=%d",argc);
    for(i=0;i<argc;i++)
      printf("\n args[%d]=%s",i,argv[i])
      getch();
}
```

Parameters

Parameters to pass to your program:

ram ravi raja

Host Application:

[OK]   [Cancel]

C:\Users\geetha\Desktop\c program\7b.exe

```
total no of arguments=4
args[0]=C:\Users\geetha\Desktop\c program\7b.exe
args[1]=ram
args[2]=ravi
args[3]=raja
```
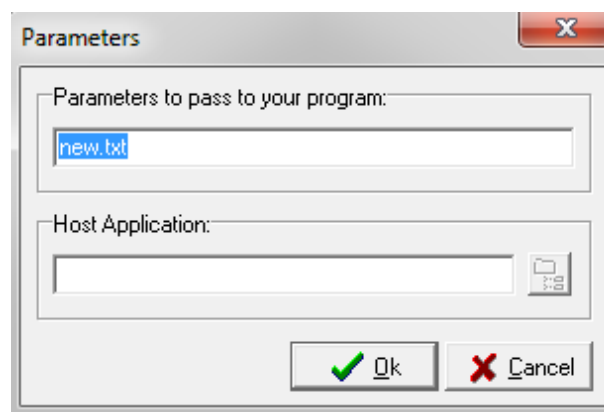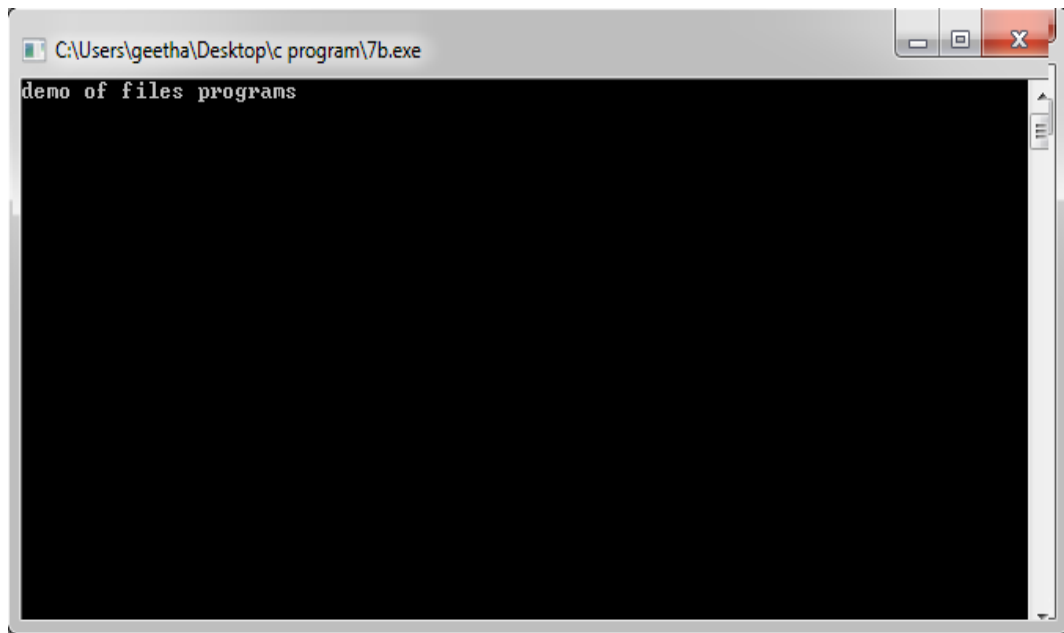
To read two numbers at the command line and perform arithmetic operations on it.

To read a file name at the command line and display its contents
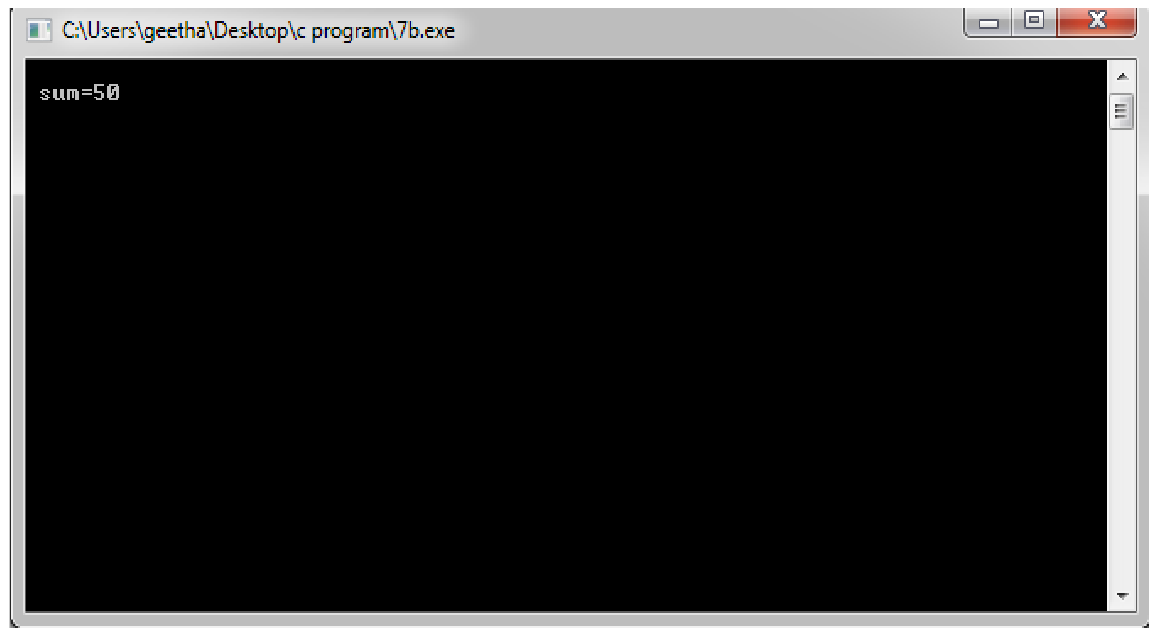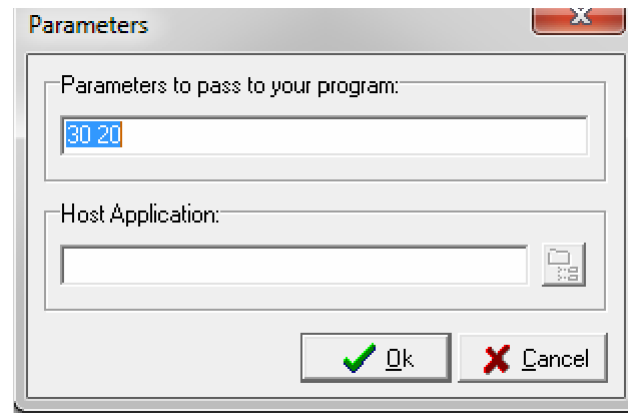
```
C:\Users\geetha\Desktop\c program\7b.exe
demo of files programs
```

PRE-LAB VIVA QUESTIONS:

1. What does argv and argc indicate in command-line arguments?
2. In linux, argv[0] by command-line argument can be occupied by
3. What type of array is generally generated in Command-line argument?
4. What is the benfit of command line arguments?
5. What is the use of fseek () function?

LAB ASSIGNMENT:

1. C Program to find factorial of number using Command Line Arguments.
2. C Program to find given number is prime number or not using Command Line Arguments
3. C Program to arrange given strings in ascending order using Command Line Arguments
4. Read the text file containing some paragraph. Use fseek () and read the text after skipping „n‟ characters from beginning of the file using command line?
5. Write a program to find GCD of given two numbers using command line arguments.
6. C Program to Find Sum of Numbers given in Command Line Arguments Recursively.

POST-LAB VIVA QUESTIONS:

1. What are the applications of command line arguments ?
2. What is the value of argv[0]?
3. How to execute command line arguments?
4. What are the arguments passed in main function if use command line arguments?
5. What is the role of argc argument ?