B.Sc. Hons. Computer Science

SEMESTER 1

Lab Record

Programming Fundamentals

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Roll No. – AC-1216

TABLE OF CONTENTS

Practical-1

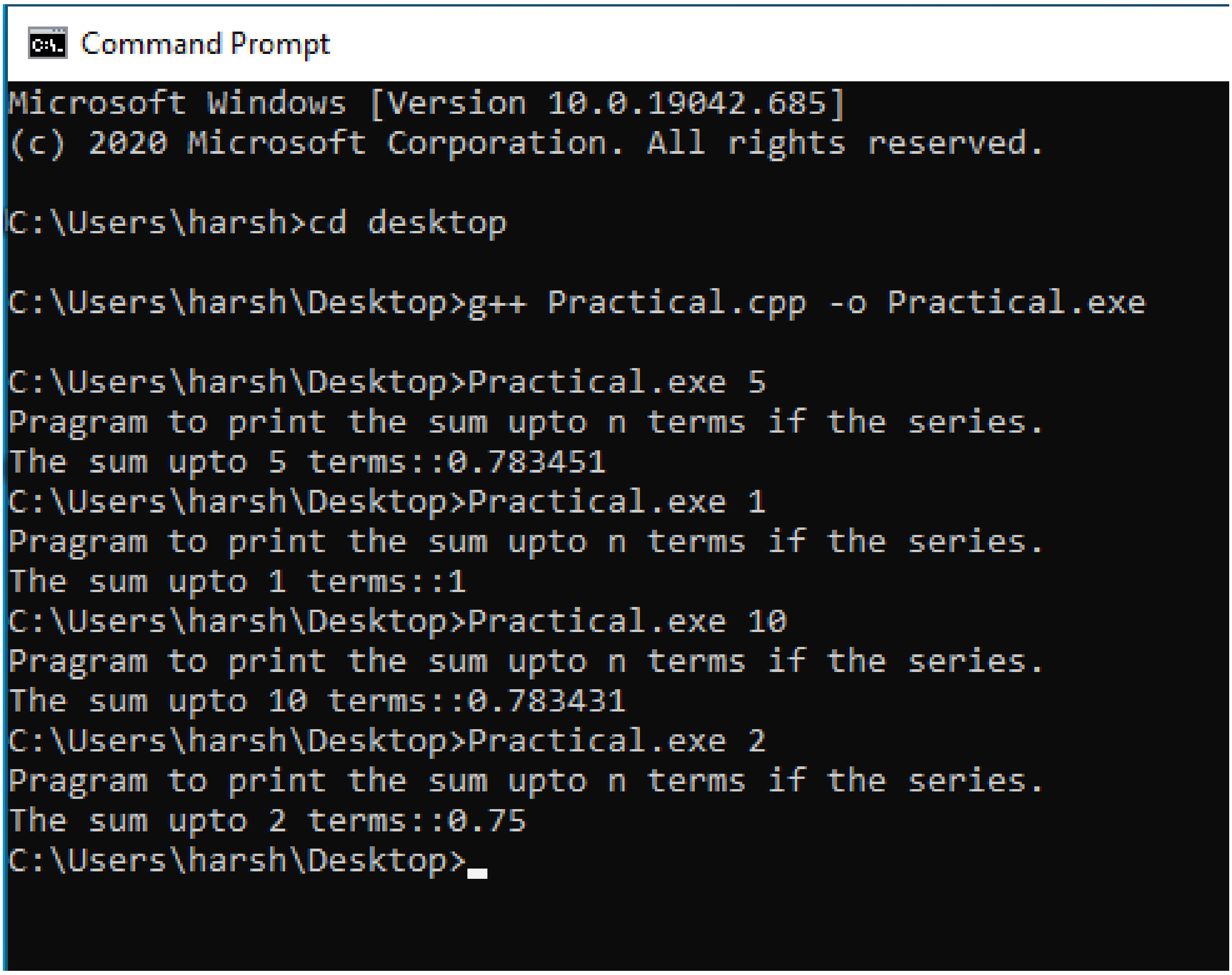
Q1. Program to compute the sum of the first n terms of the series by taking the number of terms in command line argument:-

S=1-1/(2^2)+1/(3^3)-……………1/(n^n).

Code:-

```
//program to calculate the sum of first n terms
#include <iostream>
#include <math.h>
#include <cstdlib>

using namespace std;

int main(int argc , char *argv[])                    //taking input from the command line
{
    double y=0;                                      //declaring variable for calculating sum
    cout << "Pragram to print the sum upto n terms if the series." << endl;
    for(int i=1 ; i<atoi(argv[1])+1 ; i++)
        {

            if(i%2==0)
                {

                    y-=1/pow(i,i);
                }

            else                                   //calculating the sum upto n terms
                {

                    y+=1/pow(i,i);
                }
        }


    cout << "The sum upto " << argv[1] << " terms::" << y;                  //printing the final result
    return 0;
}
```

Output:-



```
Microsoft Windows [Version 10.0.19042.685]
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C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>g++ Practical.cpp -o Practical.exe

C:\Users\harsh\Desktop>Practical.exe 5
Pragram to print the sum upto n terms if the series.
The sum upto 5 terms::0.783451
C:\Users\harsh\Desktop>Practical.exe 1
Pragram to print the sum upto n terms if the series.
The sum upto 1 terms::1
C:\Users\harsh\Desktop>Practical.exe 10
Pragram to print the sum upto n terms if the series.
The sum upto 10 terms::0.783431
C:\Users\harsh\Desktop>Practical.exe 2
Pragram to print the sum upto n terms if the series.
The sum upto 2 terms::0.75
C:\Users\harsh\Desktop>_
```

Practical-2

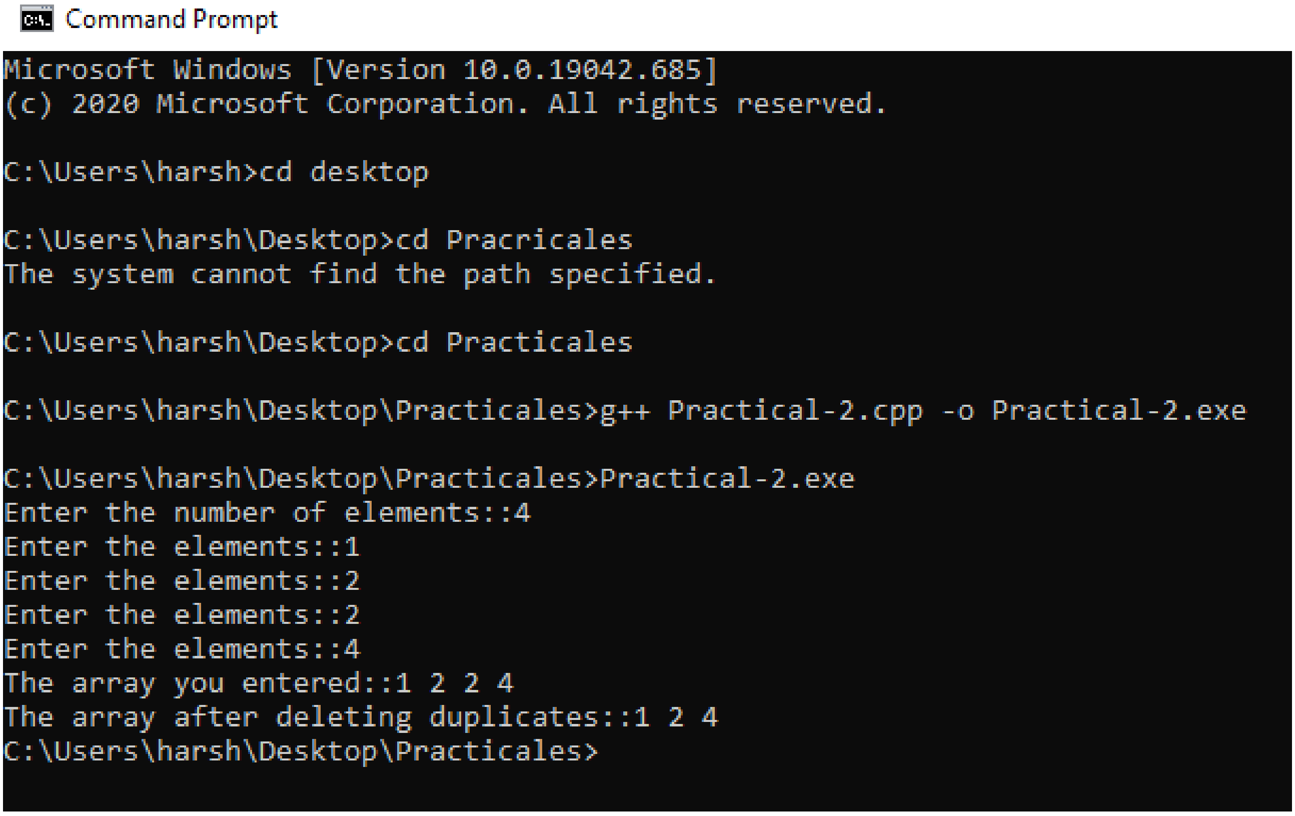
Q2. Program to remove duplicates from an array.

Code:-

```
//program to remove duplicates in an array

#include <iostream>

using namespace std;


int main()


{


   int n ,x=0;
   cout << "Enter the number of elements::";
   cin >> n;                              //taking array from the user

   int arr[n];

   for(int i=0 ;i<n ;i++)
          {
                   cout << "Enter the elements::";

                   cin >> arr[i];

          }


    cout << "The array you entered::";

    for(int i=0 ;i<n ;i++)

          {
                   cout << arr[i] << " ";       //showing the inputed array to users
          }
     for(int i=0 ; i<n ;i++)
          {
                   for(int j=i+1 ; j<n ;j++)
                             {
                                      if(arr[i]==arr[j])                    //checking for duplicate elements
                                                {
```

```
                                        for(int l=j ; l<n ; l++)
                                              {
                                                    arr[l]=arr[l+1];        //removing the duplicates
                                              }
                                        n--;                        //decreasing the length of the array
                                  }
                      }


          }


      cout << endl << "The array after deleting duplicates::";

      for(int i=0 ;i<n ;i++)

          {

                cout << arr[i] << " ";                    //printing the new updated array
          }


      return 0;


  }
```

Output:-



```
Microsoft Windows [Version 10.0.19042.685]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd Pracricales
The system cannot find the path specified.

C:\Users\harsh\Desktop>cd Practicales

C:\Users\harsh\Desktop\Practicales>g++ Practical-2.cpp -o Practical-2.exe

C:\Users\harsh\Desktop\Practicales>Practical-2.exe
Enter the number of elements::4
Enter the elements::1
Enter the elements::2
Enter the elements::2
Enter the elements::4
The array you entered::1 2 2 4
The array after deleting duplicates::1 2 4
C:\Users\harsh\Desktop\Practicales>
```

Practical-3

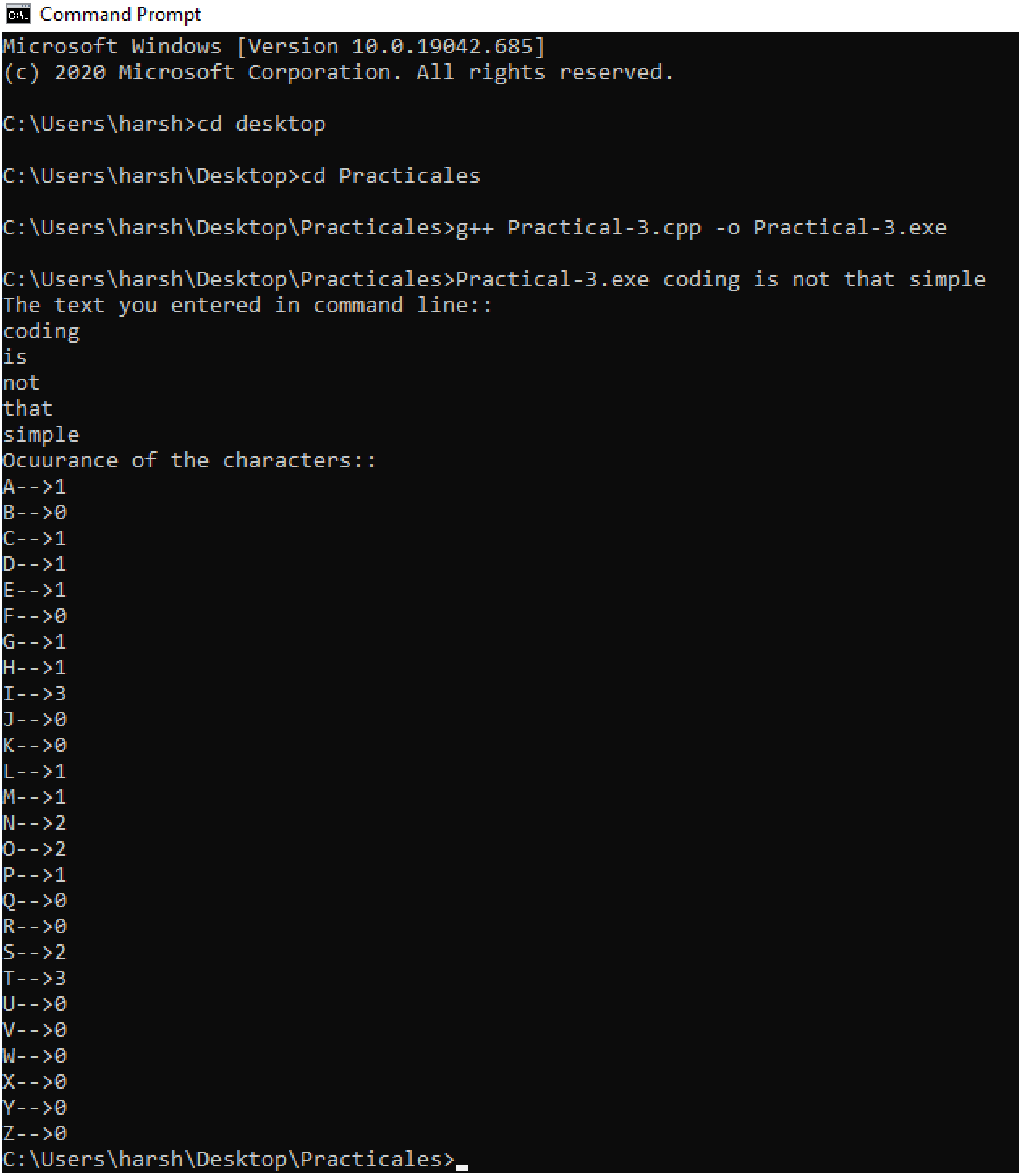
Q3. Program to print a table that shows the number of occurrence of alphabets in the text entered in the command line argument.

Code:-

```
//program to count the occurrence  of each character


#include <iostream>

#include <string> using

namespace std;



int main(int argc, char *argv[])
   {

        string str="";                    //defining variables
        int count[26];
        int x;


        for(int i=0 ; i<26 ; i++)
                {

                        count[i]=0;             //initialising count to 0
                }



        cout << "The text you entered in command line::" << endl;

        for(int i=1 ; i<argc ; i++)

                {

                        cout << argv[i] << endl;
                        str+=argv[i];                          //adding the values of argv in str
                }
```

```
    for(int i=0 ; i<str.length() ; i++)
        {

            if(str[i]>='A' && str[i]<='Z')
                {

                    x=int(str[i])-65;          //checking for alphabets

                    count[x]++;               //counting the occurance

                }

            else if(str[i]>='a' && str[i]<='z')
                {

                    x=int(str[i])-97;          //checking for alphabets

                    count[x]++;               //counting the occurrence

                }
        }




    cout<<"Occurrence of the characters::";

    for(int i=0 ; i<26 ; i++)

        {                                              //printing the final result
            cout << endl << char(65+i) << "-->" << count[i];

        }
    return 0;
}
```

Output:-



```
Microsoft Windows [Version 10.0.19042.685]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd Practicales

C:\Users\harsh\Desktop\Practicales>g++ Practical-3.cpp -o Practical-3.exe

C:\Users\harsh\Desktop\Practicales>Practical-3.exe coding is not that simple
The text you entered in command line::
coding
is
not
that
simple
Ocuurance of the characters::
A-->1
B-->0
C-->1
D-->1
E-->1
F-->0
G-->1
H-->1
I-->3
J-->0
K-->0
L-->1
M-->1
N-->2
O-->2
P-->1
Q-->0
R-->0
S-->2
T-->3
U-->0
V-->0
W-->0
X-->0
Y-->0
Z-->0
C:\Users\harsh\Desktop\Practicales>_
```

Practicle-4

Q4. Menu driven program to perform different operation on strings without using inbuilt string function.

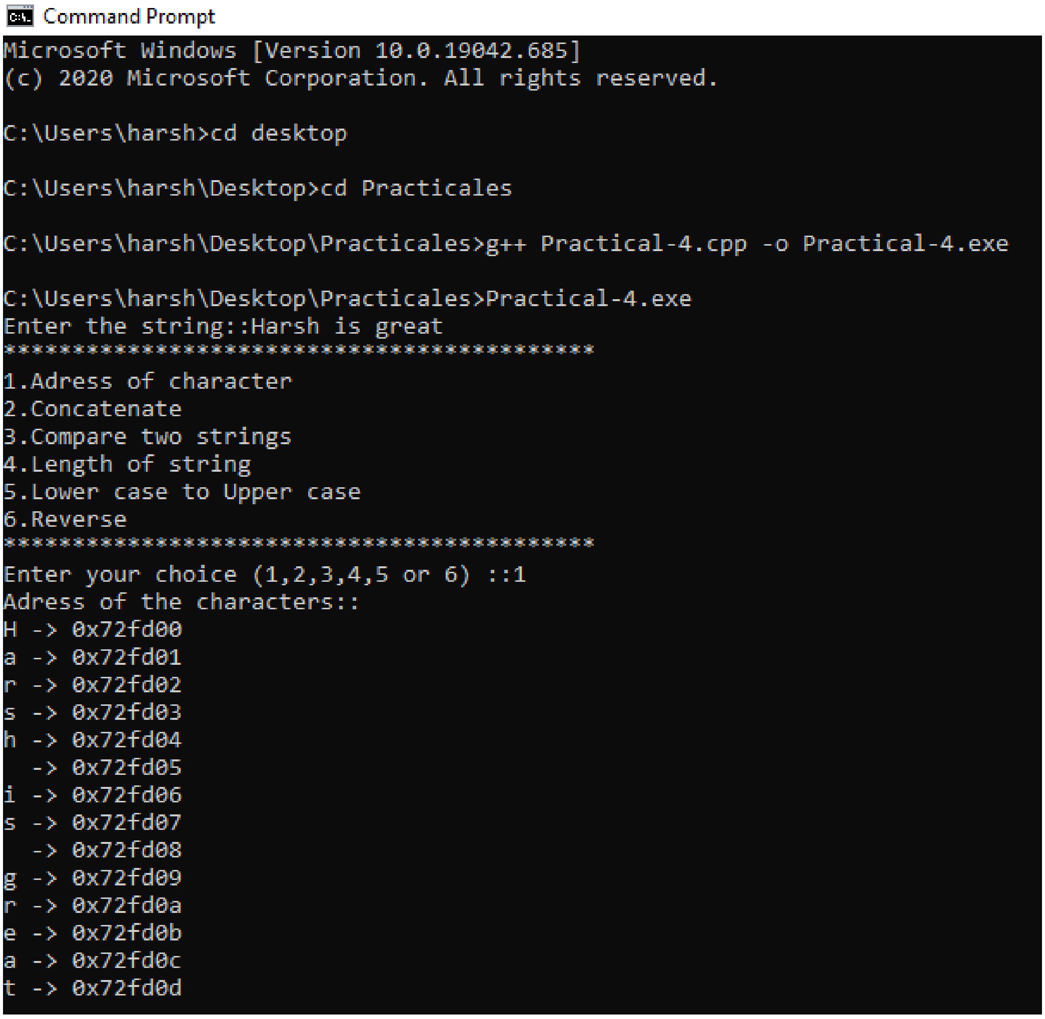
Code:-

```
#include <iostream>
using namespace std;

int len(string s)
   {                                    //defining function to find the length of the string
      int lent=0;
      while(true)
         {
            if(s[lent]>char(31) && s[lent]<char(123))
                  {
                           lent+=1;
                  }
           else
                  {
                           break;
                  }
         }
      return lent;

   }


void adress(string s)
   {                                                              //defining function to find the address of string
      cout << "Adress of the characters::" << endl;
      for(int i=0 ; i<len(s) ; i++)
         {
            cout << s[i] << " -> " << (void*)&s[i] << endl;
         }
   }


string con(string s)
   {                                       //defining function to concatenate two strings
      string second , f;
      cout << "Enter the second string to Concatenate::";
      cin >> second;
      f=s+second;
      return f;
   }
```

```
void com(string s)
   {                                    //defining function to compare two strings
      string second;
      bool equal=true;
      cout << "Enter the second string to compare::";
      cin >> second;
      for(int i=0 ; i<len(s) && i<len(second) ; i++)
         {
            if(s[i]!=second[i])
               {
                  equal=false;
               }

         }
      if(equal==true)
          {
                    cout << "The strings are equal!!";
          }
       else
          {
                    cout << "The strings are not equal!!";
          }

   }

string rev(string s)
   {                          //defining function to find the reverse of the string
      char f[100];
      int l=len(s);
      for(int i=0 ; i<l ; i++)
         {
                    f[i]=s[l-1-i];
         }
      return f;
   }

string upper(string s)
   {                          //defining function to convert the lower case to upper
      int v;
      for(int i=0 ; i<len(s) ; i++)
         {
            if(s[i]>=char(97) && s[i]<=char(122))
                    {
                              v=int(s[i]);
                              s[i]=char(v-32);
                    }
            else
                    {
                              continue;
                    }
         }
      return s
}

int main()

{

    string x;       //defining variables
    int y;
    cout << "Enter the string::";
    getline(cin , x);                                          //showing the menu to user
    cout << "***********************************************" << endl;
    cout << "1.Adress of character" << endl << "2.Concatenate" << endl << "3.Compare two strings" << endl;cout <<
    "4.Length of string" << endl << "5.Lower case to Upper case" << endl << "6.Reverse" << endl; cout <<
    "**************************************************" << endl;
    cout << "Enter your choice (1,2,3,4,5 or 6) ::";
    cin >>y;
    switch(y)
          {                                          //creating switch case and printing the final result
                  case 1:
                          adress(x);
                          break;
                   case 2:
                          cout << "The string after concatenate::" << con(x);
                          break;
                   case 3:
                          com(x);
                          break;
                   case 4:
                          cout << "The lenght of the string is::" << len(x);
                          break;
                   case 5:
                          cout << "The string in upper case::" << upper(x);
                          break;
                   case 6:
                          cout << "The string after reverse::" << rev(x);
                          break;
                  default:
                          cout << "Wrong Input !!";
                          break;
          }
    return 0;

}
```

Output:-

Function-1



```
Command Prompt
Microsoft Windows [Version 10.0.19042.685]
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C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd Practicales

C:\Users\harsh\Desktop\Practicales>g++ Practical-4.cpp -o Practical-4.exe

C:\Users\harsh\Desktop\Practicales>Practical-4.exe
Enter the string::Harsh is great
*******************************************
1.Adress of character
2.Concatenate
3.Compare two strings
4.Length of string
5.Lower case to Upper case
6.Reverse
*******************************************
Enter your choice (1,2,3,4,5 or 6) ::1
Adress of the characters::
H -> 0x72fd00
a -> 0x72fd01
r -> 0x72fd02
s -> 0x72fd03
h -> 0x72fd04
  -> 0x72fd05
i -> 0x72fd06
s -> 0x72fd07
  -> 0x72fd08
g -> 0x72fd09
r -> 0x72fd0a
e -> 0x72fd0b
a -> 0x72fd0c
t -> 0x72fd0d
```
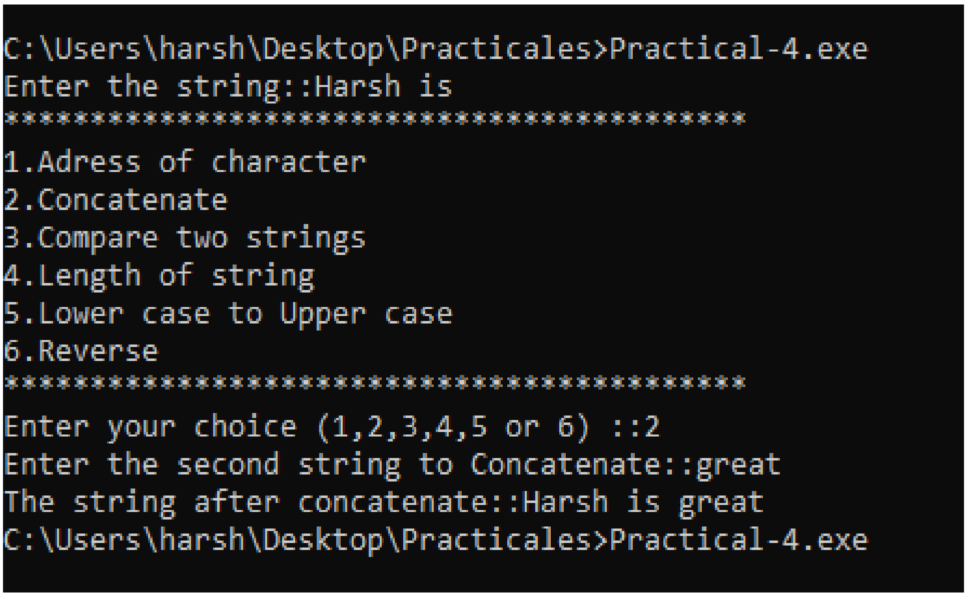
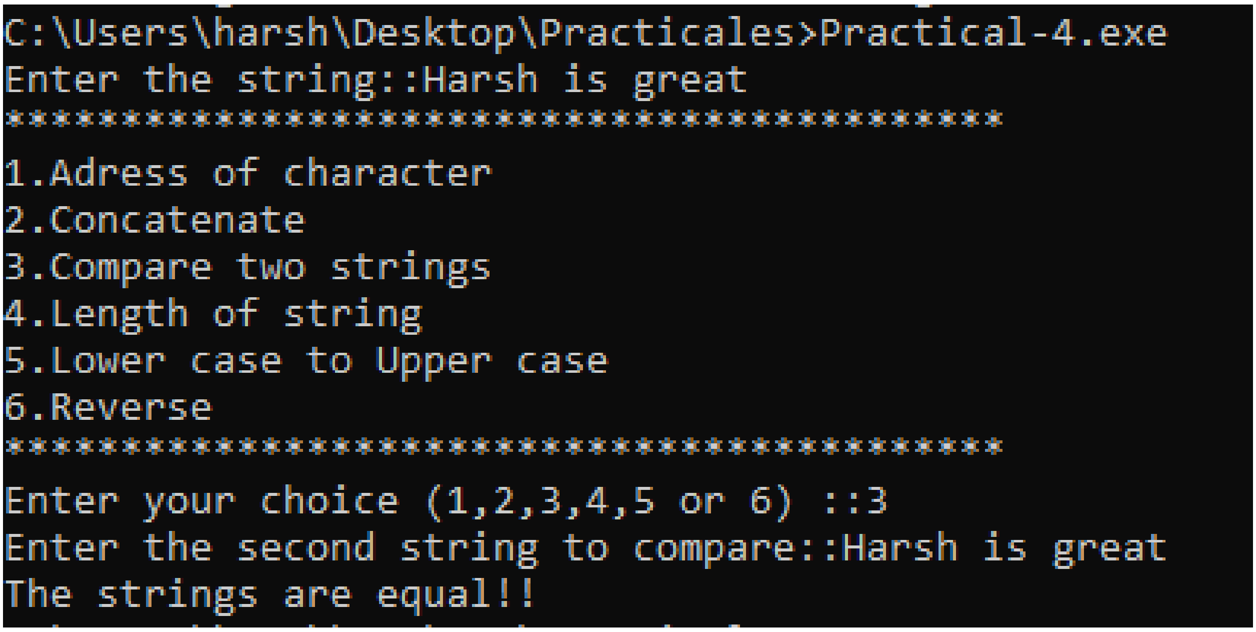

Function-2



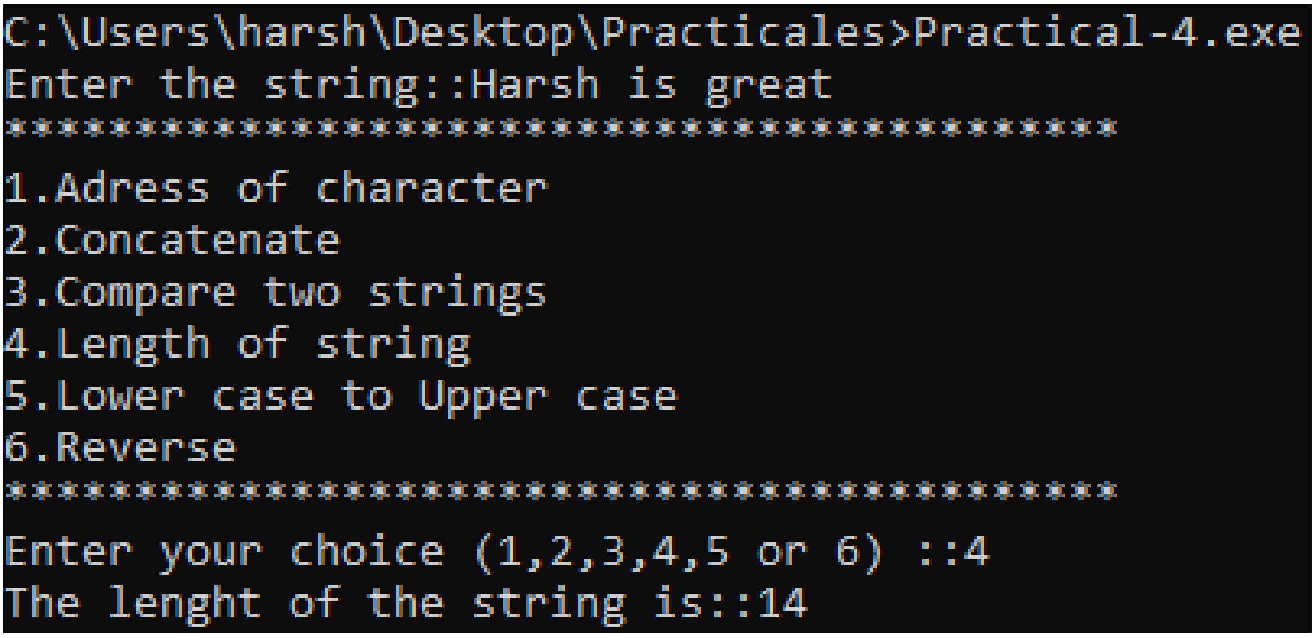
```
C:\Users\harsh\Desktop\Practicales>Practical-4.exe
Enter the string::Harsh is
*******************************************
1.Adress of character
2.Concatenate
3.Compare two strings
4.Length of string
5.Lower case to Upper case
6.Reverse
*******************************************
Enter your choice (1,2,3,4,5 or 6) ::2
Enter the second string to Concatenate::great
The string after concatenate::Harsh is great
C:\Users\harsh\Desktop\Practicales>Practical-4.exe
```

Function-3



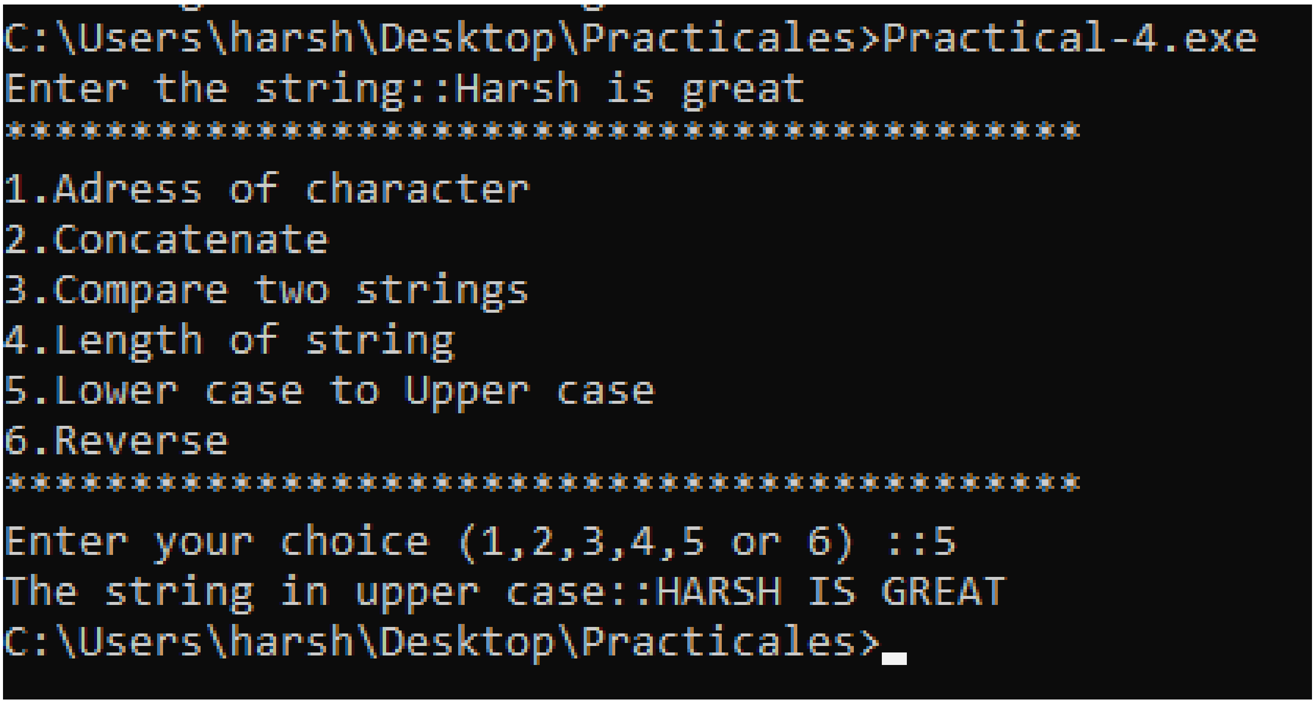
```
C:\Users\harsh\Desktop\Practicales>Practical-4.exe
Enter the string::Harsh is great
*******************************************
1.Adress of character
2.Concatenate
3.Compare two strings
4.Length of string
5.Lower case to Upper case
6.Reverse
*******************************************
Enter your choice (1,2,3,4,5 or 6) ::3
Enter the second string to compare::Harsh is great
The strings are equal!!
```

Function-4



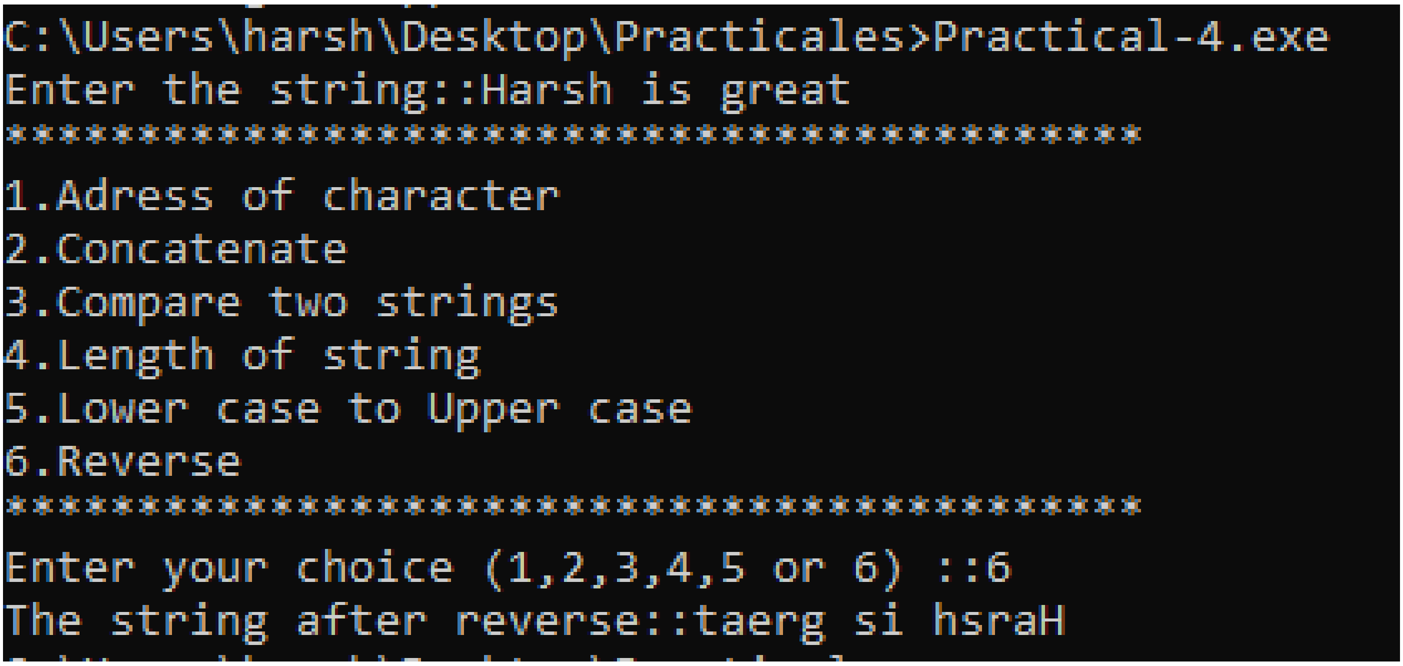
```
C:\Users\harsh\Desktop\Practicales>Practical-4.exe
Enter the string::Harsh is great
*******************************************
1.Adress of character
2.Concatenate
3.Compare two strings
4.Length of string
5.Lower case to Upper case
6.Reverse
*******************************************
Enter your choice (1,2,3,4,5 or 6) ::4
The lenght of the string is::14
```

Function-5



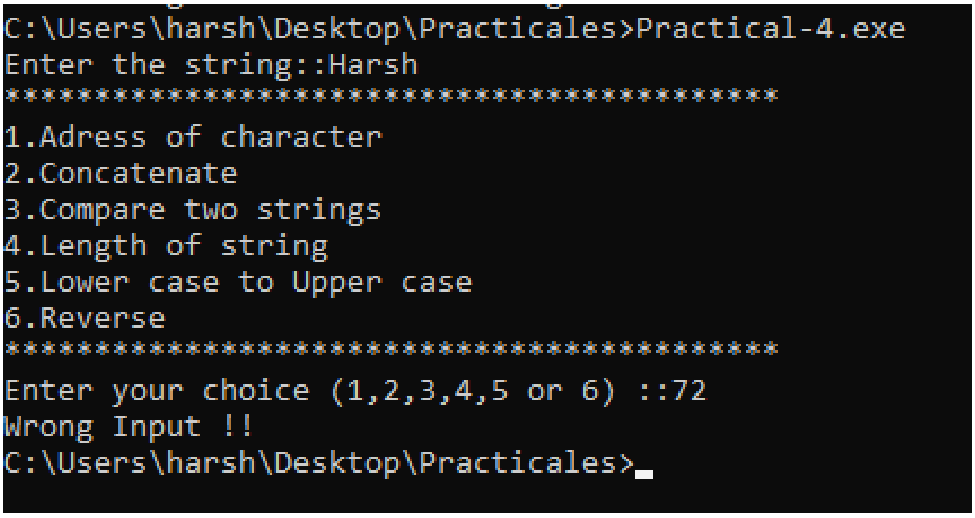
```
C:\Users\harsh\Desktop\Practicales>Practical-4.exe
Enter the string::Harsh is great
*******************************************
1.Adress of character
2.Concatenate
3.Compare two strings
4.Length of string
5.Lower case to Upper case
6.Reverse
*******************************************
Enter your choice (1,2,3,4,5 or 6) ::5
The string in upper case::HARSH IS GREAT
C:\Users\harsh\Desktop\Practicales>
```

Function-6



```
C:\Users\harsh\Desktop\Practicales>Practical-4.exe
Enter the string::Harsh is great
*******************************************
1.Adress of character
2.Concatenate
3.Compare two strings
4.Length of string
5.Lower case to Upper case
6.Reverse
*******************************************
Enter your choice (1,2,3,4,5 or 6) ::6
The string after reverse::taerg si hsraH
```

Checking Exception



```
C:\Users\harsh\Desktop\Practicales>Practical-4.exe
Enter the string::Harsh
*******************************************
1.Adress of character
2.Concatenate
3.Compare two strings
4.Length of string
5.Lower case to Upper case
6.Reverse
*******************************************
Enter your choice (1,2,3,4,5 or 6) ::72
Wrong Input !!
C:\Users\harsh\Desktop\Practicales>
```

Practicle-5

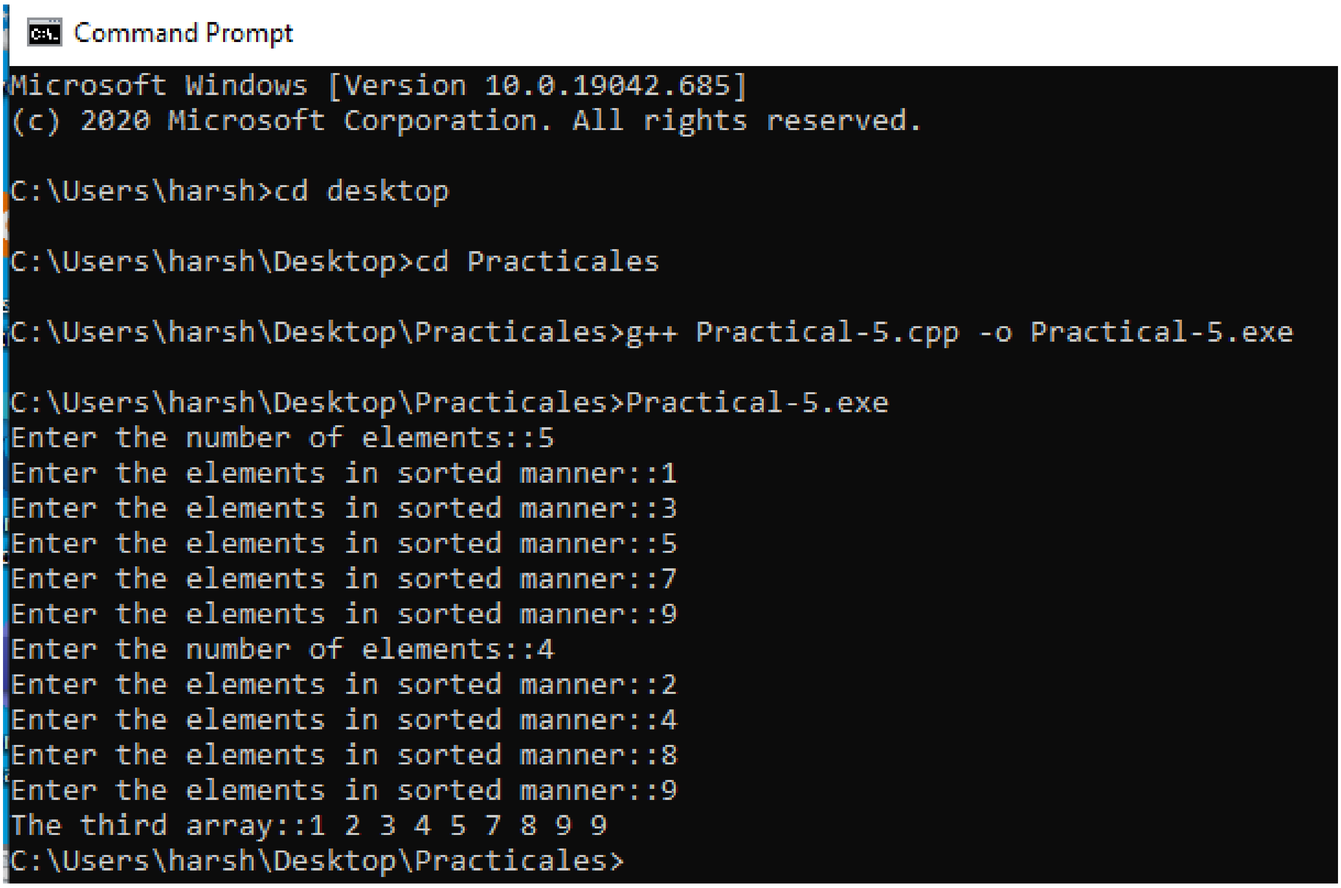
Q5. Program to merge two sorted array into one sorted array.

Code:-

```
//program to merge two sorted array
#include <iostream>
using namespace std;

int main()

{

    int n1 , n2 , n3;                                        //Declaring variables
    cout << "Enter the number of elements::";
    cin >> n1;
    int arr1[n1];
    for(int i=0 ; i<n1 ; i++)
          {
                    cout << "Enter the elements in sorted manner::";
                    cin >> arr1[i];                          //inputting first array
          }

    cout << "Enter the number of elements::";
    cin >> n2;
    int arr2[n2];
    for(int j=0 ; j<n2 ; j++)
          {
                    cout << "Enter the elements in sorted manner::";              //inputing second array
                    cin >> arr2[j];
          }

    n3=n1+n2;
    int arr3[n3], x=0 , y=0 ,k=0;
    while(x<n1 && y<n2)
          {
                    if(arr1[x]<=arr2[y])
                              {
                                        arr3[k++]=arr1[x++];
                              }
                    else                                            //comparing the elements and
                              {                                    //copying them in the third array
                                        arr3[k++]=arr2[y++];
                              }
          }
     while(x<n1)
          {
                    arr3[k++]=arr1[x++];
          }
```

```
   while(y<n2)                          //copying the remaining elements
         {
                  arr3[k++]=arr2[y++];
         }


   cout << "The third array::";
   for(int p=0; p<n3; p++)
         {
                  cout << arr3[p] << " ";       //printing the final merged array
         }

   return 0;
}
```

Output:-



```
Microsoft Windows [Version 10.0.19042.685]
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C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd Practicales

C:\Users\harsh\Desktop\Practicales>g++ Practical-5.cpp -o Practical-5.exe

C:\Users\harsh\Desktop\Practicales>Practical-5.exe
Enter the number of elements::5
Enter the elements in sorted manner::1
Enter the elements in sorted manner::3
Enter the elements in sorted manner::5
Enter the elements in sorted manner::7
Enter the elements in sorted manner::9
Enter the number of elements::4
Enter the elements in sorted manner::2
Enter the elements in sorted manner::4
Enter the elements in sorted manner::8
Enter the elements in sorted manner::9
The third array::1 2 3 4 5 7 8 9 9
C:\Users\harsh\Desktop\Practicales>
```

Practical-6(a)

Q. Program for binary search using recursion.

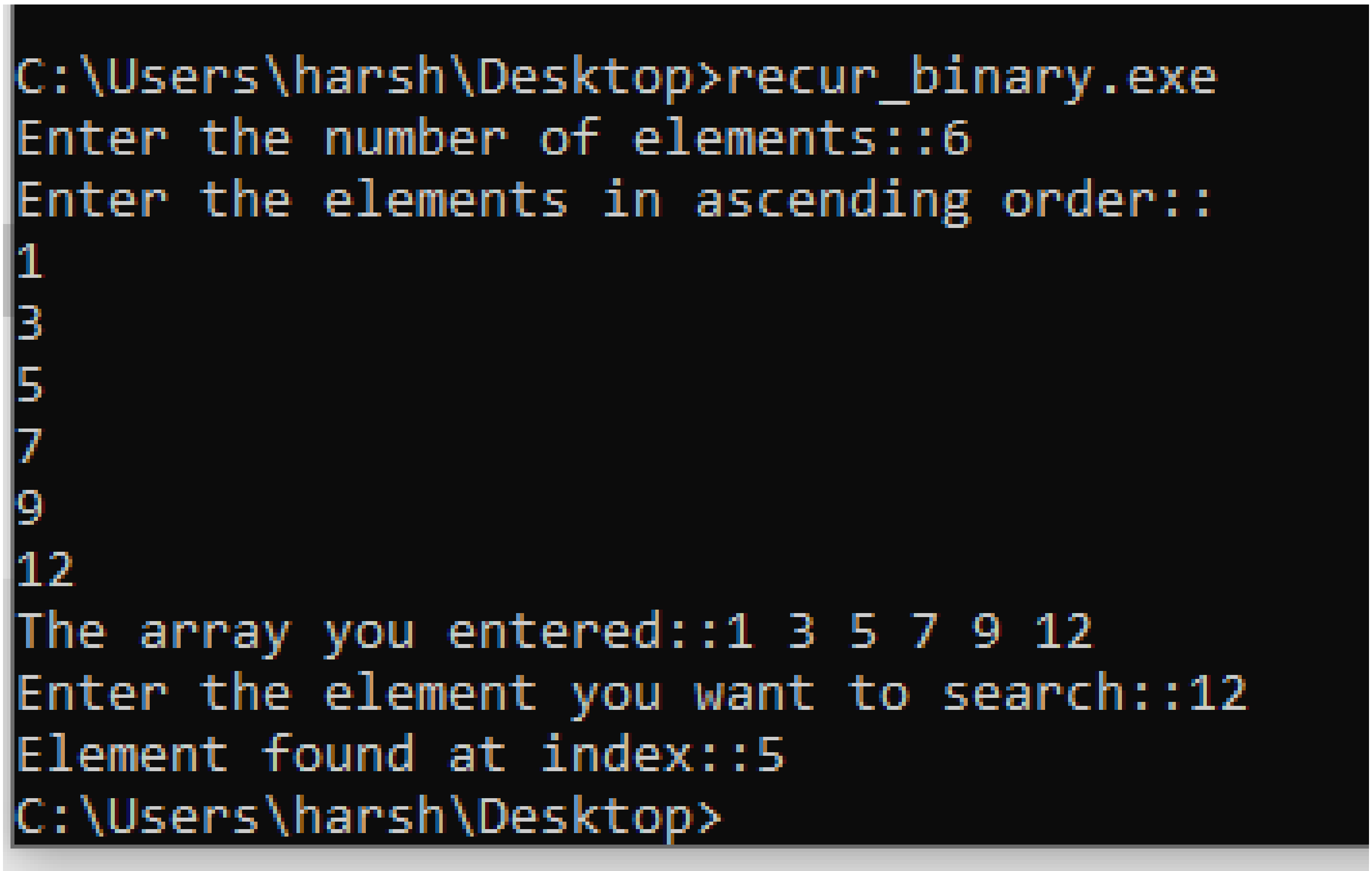
Code:-

```
//Harsh Bamotra AC-1216
//Program for binary search using recursion


#include <iostream>

using namespace std;


//defining function for binary search
int binary(int s , int high , int low , int arr[])
   {
        if(high>=1)                                          //checking for empty array
                {


                        int mid=low+(high-1)/2;
                        if(arr[mid]==s)                                 //searching in the mid index
                                {                                    //and if found then returning the index

                                        return mid;

                                }
                        else if(arr[mid]>s)                         //checking in the lower part
                                {                                 //of the array


                                        return binary(s , mid-1 , low , arr );
                                }


                        else                                       //checking in the upper part
                                {                               //of the array


                                        return binary(s , high , mid+1 , arr);
                                }
                }

        return -1;                                     //returning -1 to check for exception
   }
```

```
int main()

        {
                int n , s;                                                          //defining variables
                cout << "Enter the number of elements::";
                cin >> n;                                                         //taking number of elements
                int arr[n];
                cout << "Enter the elements in ascending order::" << endl;

                for(int i=0 ; i<n ; i++)

                        {

                                cin >> arr[i];                                  //initializing the elements in the array
                        }

                cout << "The array you entered::";

                for(int i=0 ; i<n ; i++)

                        {

                                cout << arr[i] << " ";                          //printing the array
                        }

                cout << endl << "Enter the element you want to search::";
                cin >> s;                                                         //taking the search element
                int r=binary(s , n-1 , 0 , arr);

                if(r==-1)

                        {

                                cout << "Element not found !!";
                        }

                else                                                              //printing the final result
                        {

                                cout << "Element found at index::" << r;
                        }
                return 0;
  }
```

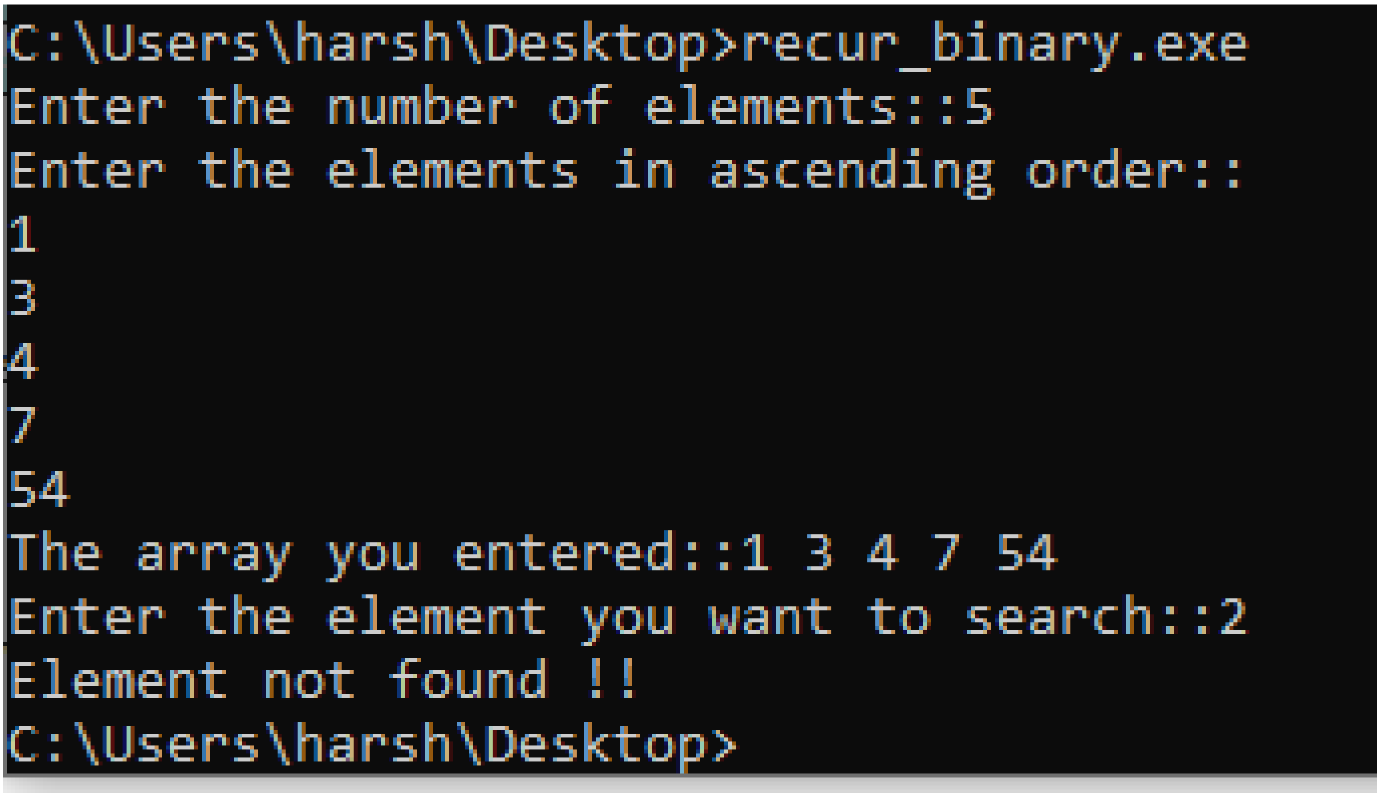
Output:-

Normal case



```
C:\Users\harsh\Desktop>recur_binary.exe
Enter the number of elements::6
Enter the elements in ascending order::
1
3
5
7
9
12
The array you entered::1 3 5 7 9 12
Enter the element you want to search::12
Element found at index::5
C:\Users\harsh\Desktop>
```

Exception case



```
C:\Users\harsh\Desktop>recur_binary.exe
Enter the number of elements::5
Enter the elements in ascending order::
1
3
4
7
54
The array you entered::1 3 4 7 54
Enter the element you want to search::2
Element not found !!
C:\Users\harsh\Desktop>
```

Practical-6(b)

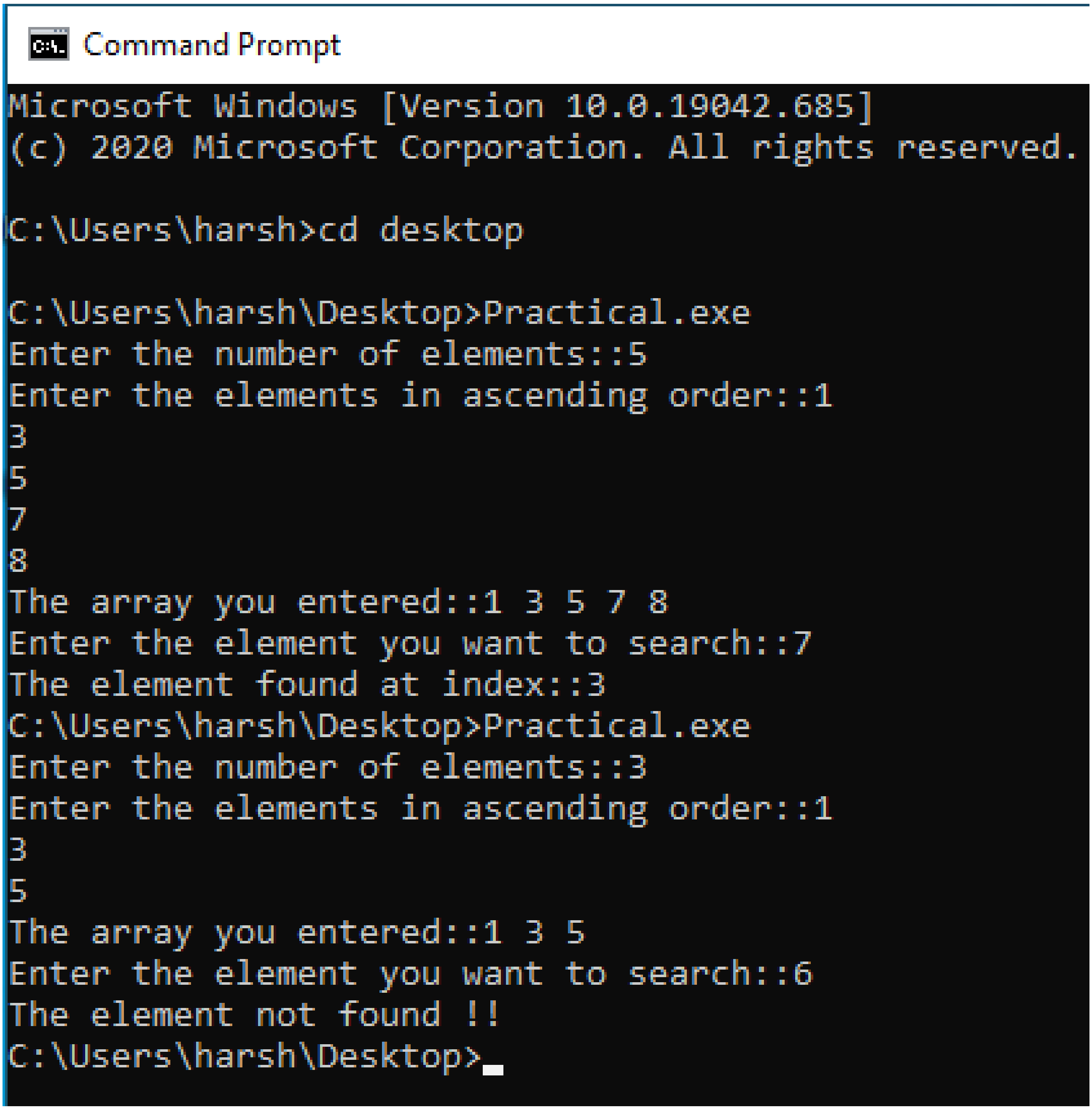
Q6. Program to binary search without using recursion.

Code:-

```
//program for binary search using function
#include <iostream>
using namespace std;


void binary_search(int n , int s , int arr[])                //defining function
   {

          int high=n , low=0 , i=0 , mid;                   //defining variables
          bool flag=false;                                   //defining bool to check exception
          while(high>low)

                 {

                        mid=(high+low)/2;
                        if(arr[mid]==s)                          //searching in the mid position
                               {

                                      flag=true;

                                      break;

                               }

                        else if(s<arr[mid])
                               {

                                      high=mid;
                               }                                //searching in the lower part of the array

                         else
                               {
                                      low=mid+1;
                               }                                  //searching in the upper part of the array


                 }
```

```
    if(flag==false)                                              //checking for exeption
        {

            cout << "The element not found !!";
        }

    else                                                             //printing the final result
        {

            cout << "The element found at index::" << mid;
        }
  }


int main()
  {

    int n , s;
    cout << "Enter the number of elements::";

    cin >> n;

    int arr[n];
    cout << "Enter the elements in ascending order::";

    for(int i=0 ; i<n ; i++)

        {

            cin >> arr[i];              //taking array from the user
        }

    cout << "The array you entered::";

    for(int i=0 ; i<n ; i++)

        {
            cout << arr[i] << " ";              //printing the array
        }

    cout << endl << "Enter the element you want to search::";
    cin >> s;                                //taking the element to search

    binary_search(n , s , arr);             //using the function defined earlier

    return 0;

  }
```

Output:-



```
Microsoft Windows [Version 10.0.19042.685]
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C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>Practical.exe
Enter the number of elements::5
Enter the elements in ascending order::1
3
5
7
8
The array you entered::1 3 5 7 8
Enter the element you want to search::7
The element found at index::3
C:\Users\harsh\Desktop>Practical.exe
Enter the number of elements::3
Enter the elements in ascending order::1
3
5
The array you entered::1 3 5
Enter the element you want to search::6
The element not found !!
C:\Users\harsh\Desktop>_
```
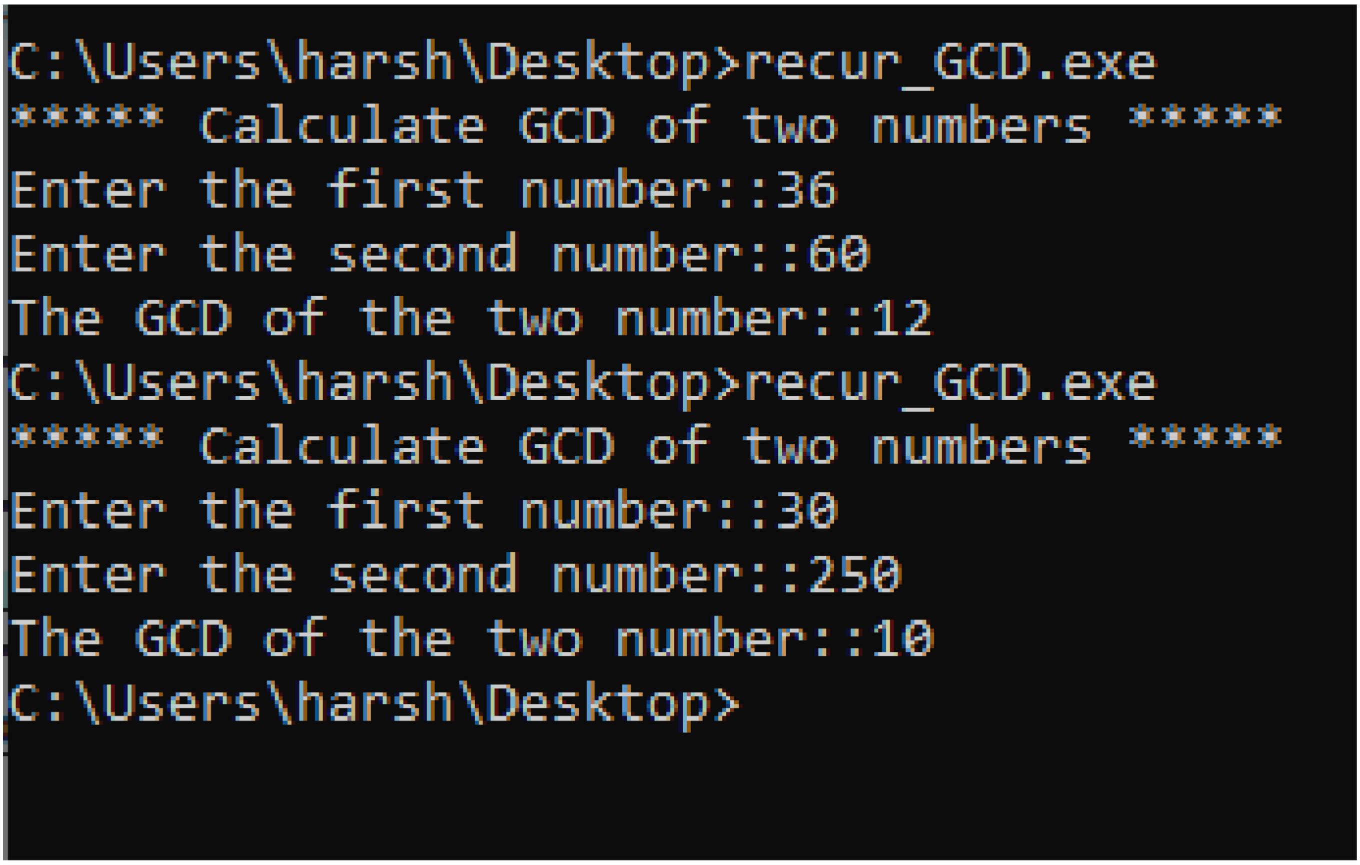

Practical-7(a)

Q. Program to calculate the GCD of two numbers using recursion.

Code:-

```
//Harsh Bamotra AC-1216
//Program to calculate GCD of two numbers using recursion

#include <iostream>
using namespace std;

//defining function to calculate GCD
int recur_GCD(int n1 , int n2)
  {
        if(n1==0 || n2==0)                          //checking if one of the number is 0
              {
                    return 0;                   //exception case
              }
        else if(n1==n2)                              //if n1 is equal to n2
              {
                    return n1;                  // exit case
              }
        else if(n1>n2)                                             //checking if n1 is greater than n2
              {
                    return recur_GCD(n1-n2 , n2);
              }
        else                                                    //if n2 is greater than n1
              {
                    return recur_GCD(n1 , n2-n1);
              }
  }

int main()
  {
        cout << "***** Calculate GCD of two numbers *****" << endl;
        int n1 , n2;                                                    //defining variables
        cout << "Enter the first number::";
        cin >> n1;                                                    //taking first number
        cout << "Enter the second number::";
        cin >> n2;                                                  //taking second number

        cout << "The GCD of the two number::" << recur_GCD(n1 , n2);        //printing the final result
        return 0;
  }
```

Output:-



```
C:\Users\harsh\Desktop>recur_GCD.exe
***** Calculate GCD of two numbers *****
Enter the first number::36
Enter the second number::60
The GCD of the two number::12
C:\Users\harsh\Desktop>recur_GCD.exe
***** Calculate GCD of two numbers *****
Enter the first number::30
Enter the second number::250
The GCD of the two number::10
C:\Users\harsh\Desktop>
```

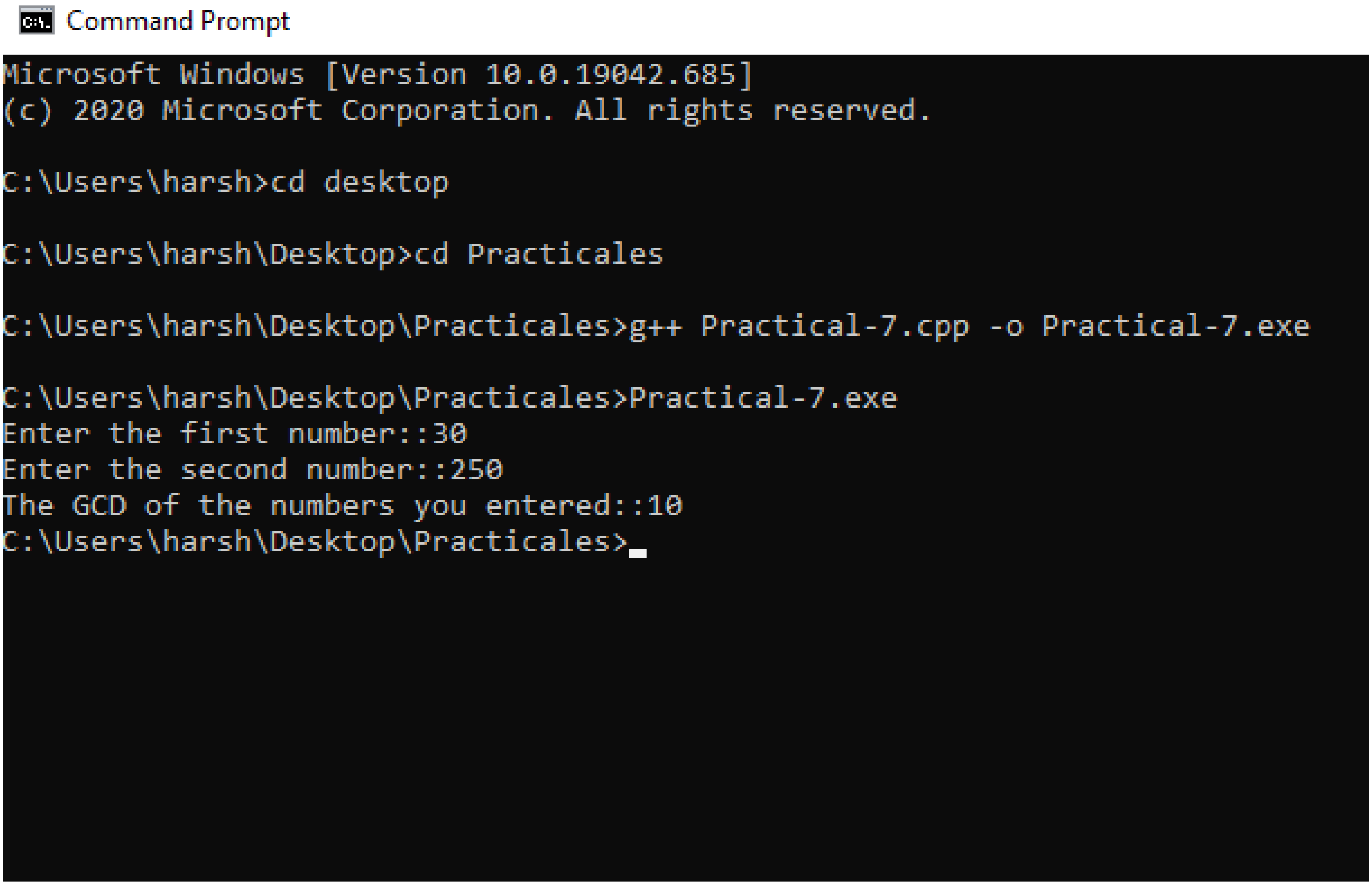
Practical-7(b)

Q7. Program to calculate the GCD of two numbers without using recursion.

Code:-

```
//program to calculate GCD of two numbers
#include <iostream>

using namespace std;


int gcd(int n1 , int n2)        //defining function
  {

        int gc;
        for(int i=1 ; i<=n1 && i<=n2 ; i++)
              {

                    if(n1%i==0 && n2%i==0)              //checking for the common factors
                          {

                                gc=i;     //storing the common factors in gc
                          }
              }

        return gc;                                   //returning gcd of the numbers
  }


int main()


  {
        int n1 , n2 ;                                          //defining variables
        cout << "Enter the first number::";

        cin >> n1;

        cout << "Enter the second number::";                          //taking the numbers from the user

        cin >> n2;

        cout << "The GCD of the numbers you entered::" << gcd(n1 , n2);      //printing the final result

        return 0;

  }
```

Output:-



```
Microsoft Windows [Version 10.0.19042.685]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd Practicales

C:\Users\harsh\Desktop\Practicales>g++ Practical-7.cpp -o Practical-7.exe

C:\Users\harsh\Desktop\Practicales>Practical-7.exe
Enter the first number::30
Enter the second number::250
The GCD of the numbers you entered::10
C:\Users\harsh\Desktop\Practicales>
```

Practical-8

Q. Program to create a matrix class and perform basic matrix functions .

Code:-

```
//Harsh Bamotra AC-1216
//Program to perform matrix function using matrix class

#include <iostream>
using namespace std;

//************************* Defining matrix class ************************//

class matrix
  {
    private:
    int row , col;                  //defining private members

    public:
    int arr[10][10];                  //defining public members
    void setData(int n1 , int n2)         //defining function to take input in the private members
        {
            row=n1;           //initializing private members
            col=n2;
        }

    void create_arr()                         //defining function to create a matrix by taking matrix elements
        {
            for(int i=0 ; i<row ; i++)
                {
                    for(int j=0 ; j<col ; j++)
                        {
                            cout << "Enter the elements at index [" << i << "][" << j << "]::";
                            cin >> arr[i][j];
                        }
                }
        }

    void display_arr()                      //defining function to print the elements of the matrix
        {
            for(int i=0 ; i<row ; i++)
                {
                    cout << endl;
                    for(int j=0 ; j<col ; j++)
                        {
                            cout << arr[i][j] << " ";
                        }
                }
        }
        void trans();                                   //defining function trans() for transpose of the matrix

//********************overloading operators to perform basic matrix functions ********************//

        matrix operator +(matrix m)                                  //overloading + operator to perform sum of matrix
                {
                        matrix temp;                    //defining a matrix class object for storing the result
                        temp.row=m.row;                 //initializing the private members of temp
                        temp.col=m.col;
                        if(row==m.row && col==m.col)                          //checking the order of the two matrix
                                {                                            //if they are equal or not
                                for(int i=0 ; i<row ; i++)
                                        {
                                                for(int j=0 ; j<col ; j++)           //adding the elements
                                                        {                    // and initializing them in arr of temp
                                                                temp.arr[i][j]=arr[i][j]+m.arr[i][j];
                                                        }
                                        }
                                }
                        else
                                {
                                        cout << "Error !! The order of the matrix are not same. ";
                                }                                                   //handling exception

                        return temp;                    //returning the temp
                }



        matrix operator -(matrix m)                            //overloading – operator for subtracting two matrix
                {
                        matrix temp;                          //defining a matrix class object for storing the result
                        temp.row=m.row;                       //initializing the private members of temp
                        temp.col=m.col;
                        if(row==m.row && col==m.col)               //checking if the order of the matrix is same or not
                                {
                                for(int i=0 ; i<row ; i++)
                                        {
                                                for(int j=0 ; j<col ; j++)         //subtracting the elements and
                                                        {                  //initializing them in the arr of temp
                                                                temp.arr[i][j]=arr[i][j]-m.arr[i][j];
                                                        }
                                        }
                                }
                        else
                                {
                                        cout << "Error !! The order of the matrix are not same. ";
                                }                                                              //handling exeption

                        return temp;                     //returning temp
                }
```

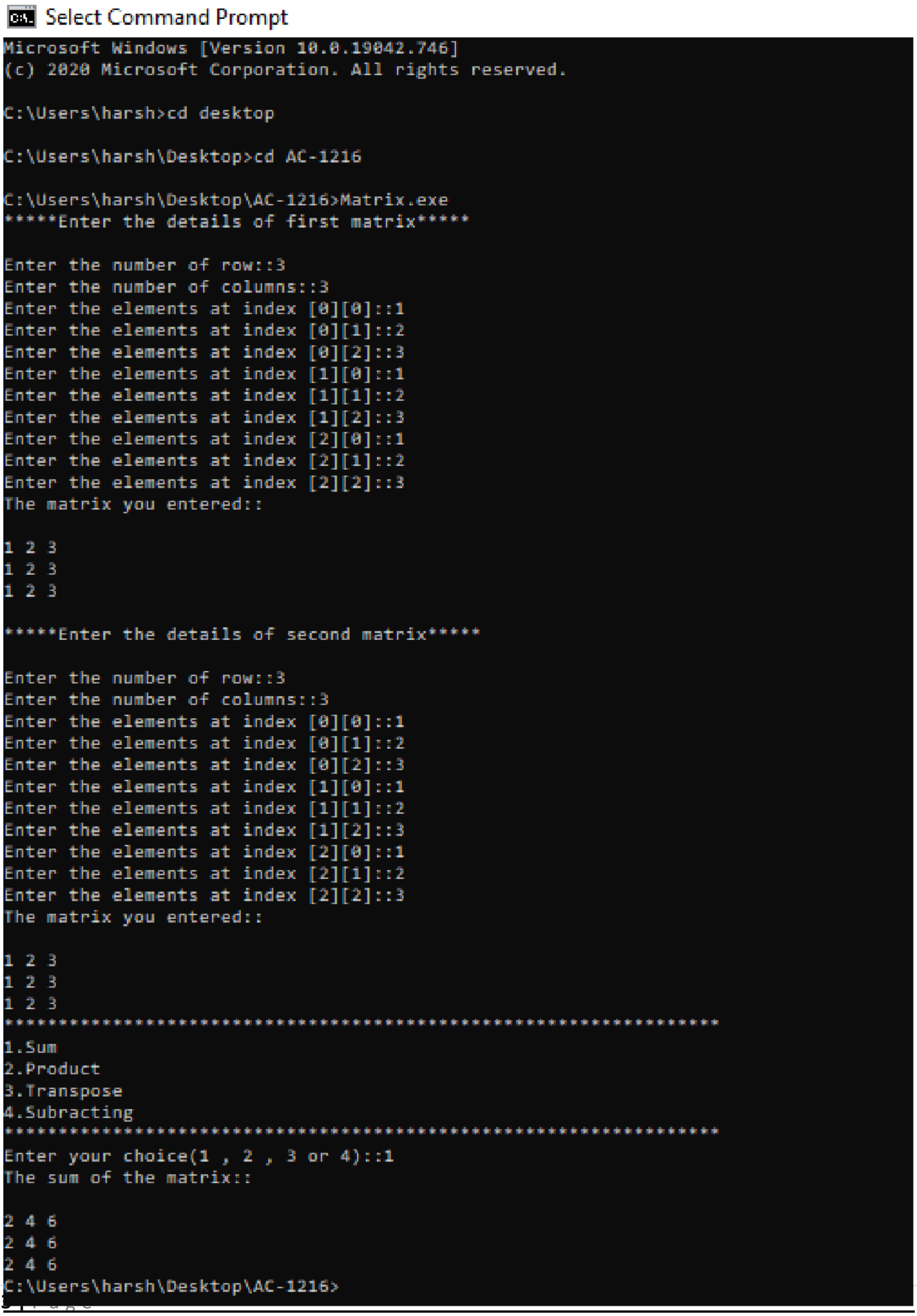
```
    matrix operator *(matrix m)                     //overloading * operator for multiplying two matrix
        {
            matrix temp;                    //defining a matrix class object for storing the result
            temp.row=row;                   //initializing the private members of temp
            temp.col=m.col;
            for(int i=0 ; i<row ; i++)
                {
                    for(int j=0 ; j<col ; j++)
                        {                           // initializing the whole matrix to 0
                            temp.arr[i][j]=0;
                        }
                }
            if(col==m.row)          //checking is the col of first matrix is equal to the row of the second matrix
                {
                    for(int i=0 ; i<row ; i++)                      //multiplying the elements and
                        {                                           //initializing them in arr of temp
                            for(int j=0 ; j<m.col ; j++)
                                {
                                    for(int k=0 ; k<col ; k++)
                                        {
                                          temp.arr[i][j]+=arr[i][k]*m.arr[k][j];
                                        }
                                }
                        }

                }
            else
                {
                    cout << "Error !! the column of the fisrt matrix not equal to the row of second.";
                }                               //handling exception
            return temp;
        }                           //returning temp

 };

void matrix :: trans()                          //defining the logic for transpose function
    {
        int arr1[10][10];               //defining a matrix
        for(int i=0 ; i<row ; i++)
            {
                for(int j=0 ; j<col ; j++)
                    {
                        arr1[i][j]=arr[j][i];       //transposing the elements and initializing
                    }                               // in the arr1
            }

        cout << "The matrix after transpose::";
        for(int i=0 ; i<row ; i++)
            {
                cout << endl;
                for(int j=0 ; j<col ; j++)
                    {
                        cout << arr1[i][j] << " ";          //printing the transposed matrix
```

```
                                        }
                        }
        }


int main()
  {
        int r1 , r2 , c1 , c2 , x , y;                              //defining variables
        matrix m1 , m2 , m3 ;                                      //defining matrix class objects
        cout << "*****Enter the details of first matrix*****" << endl << endl;
        cout << "Enter the number of row::";
        cin >> r1;                                                 //taking number of rows from the user
        cout << "Enter the number of columns::";
        cin >> c1;                                              //taking number of columns from the user
        m1.setData(r1 , c1);
        m1.create_arr();                                          //taking elements of the matrix from the user
        cout << "The matrix you entered::" << endl;
        m1.display_arr();                                        //printing the matrix

        cout << endl << endl << "*****Enter the details of second matrix*****" << endl << endl;
        cout << "Enter the number of row::";
        cin >> r2;                                                         //taking number of rows from the user
        cout << "Enter the number of columns::";
        cin >> c2;                                                        //taking number of columns from the user
        m2.setData(r2 , c2);
        m2.create_arr();                                                //taking elements of the matrix from the user
        cout << "The matrix you entered::" << endl;
        m2.display_arr();                                                  //printing the matrix

        //**********************Printing the menu to the user***********************************//

        cout << endl << "*******************************************************************" << endl;
        cout << "1.Sum" << endl << "2.Product" << endl << "3.Transpose" << endl << "4.Subracting" << endl ;
        cout << "*******************************************************************" << endl;
        cout << "Enter your choice(1 , 2 , 3 or 4)::";
        cin >> x;                                                                  //taking users choice
        if(x==1)
                {
                        m3=m1+m2;                                          //adding the matrix
                        if(r1==r2 && c1==c2)
                                {
                                        cout << "The sum of the matrix::" << endl;
                                        m3.display_arr();                                    //printing the result
                                }
                }
        else if(x==2)
                {
                        m3=m1*m2;                                          //multiplying the matrix
                        if(c1==r2)
                                {
                                        cout << "The product of the matrix::" << endl;
                                        m3.display_arr();                                    //printing the result
                                }
                }
```

```
    else if(x==3)
        {
            cout << "******************************************************************" << endl;
            cout << "Which matrix you want to transpose (1 or 2)::";
            cin >> y;                               //taking users choice
            if(y==1)
                 {
                    m1.trans();                 //transposing the first matrix
                 }
            else if(y==2)
                {
                    m2.trans();                 //transposing the second  matrix
                }
            else
                {
                    cout << "Wrong Input!!" << endl ;       //handling exception
                }

        }
    else if(x==4)
        {
            m3=m1-m2;                           //subtracting the matrix
            if(r1==r2 && c1==c2)
                {
                    cout << "The subtraction of the matrix::";
                    m3.display_arr();                       //printing the result
                }
        }
    else
        {
            cout << "Wrong input !!!";              //handling exception
        }


    return 0 ;
}
```

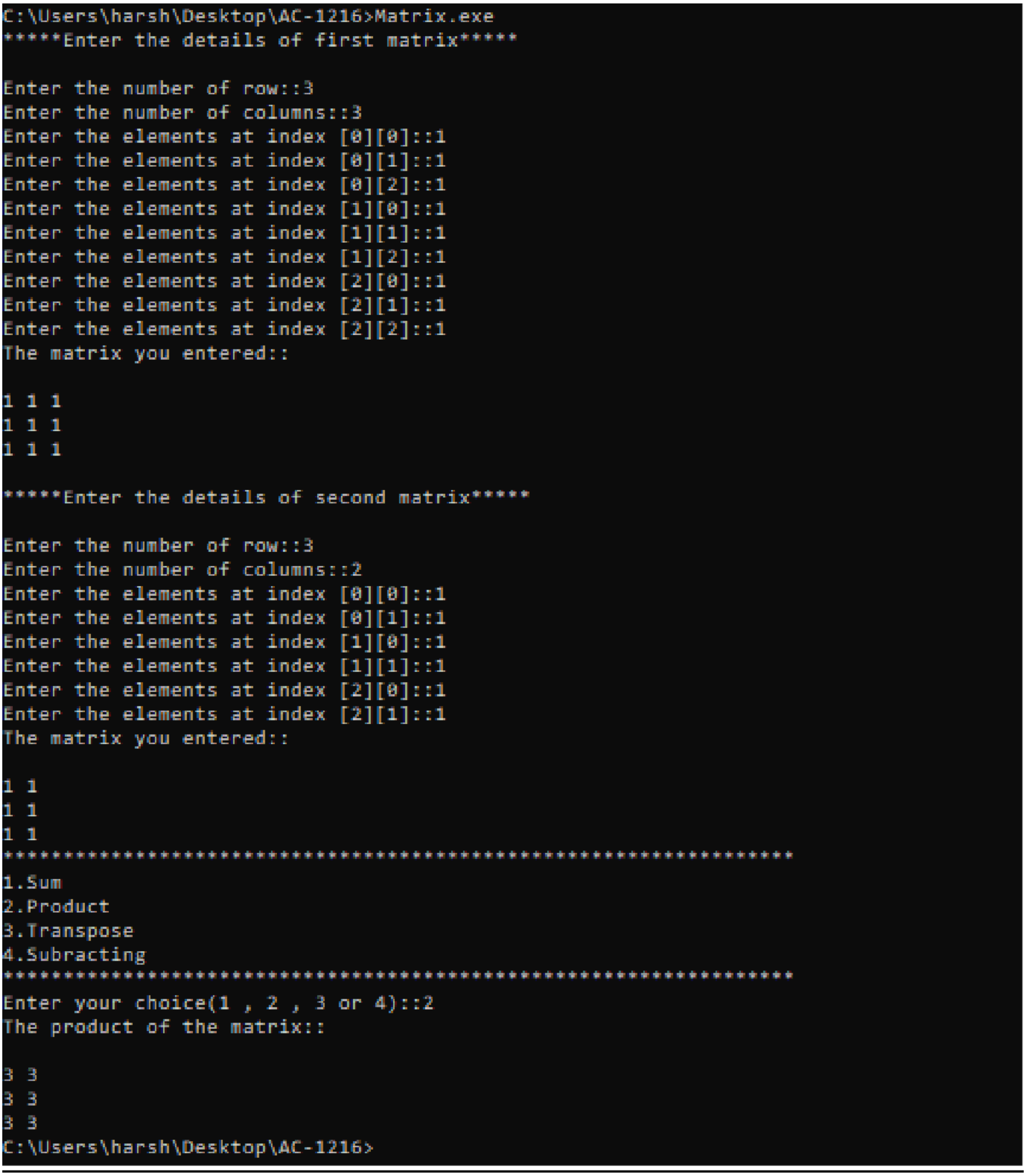
Output:-

1. Sum of two matrix



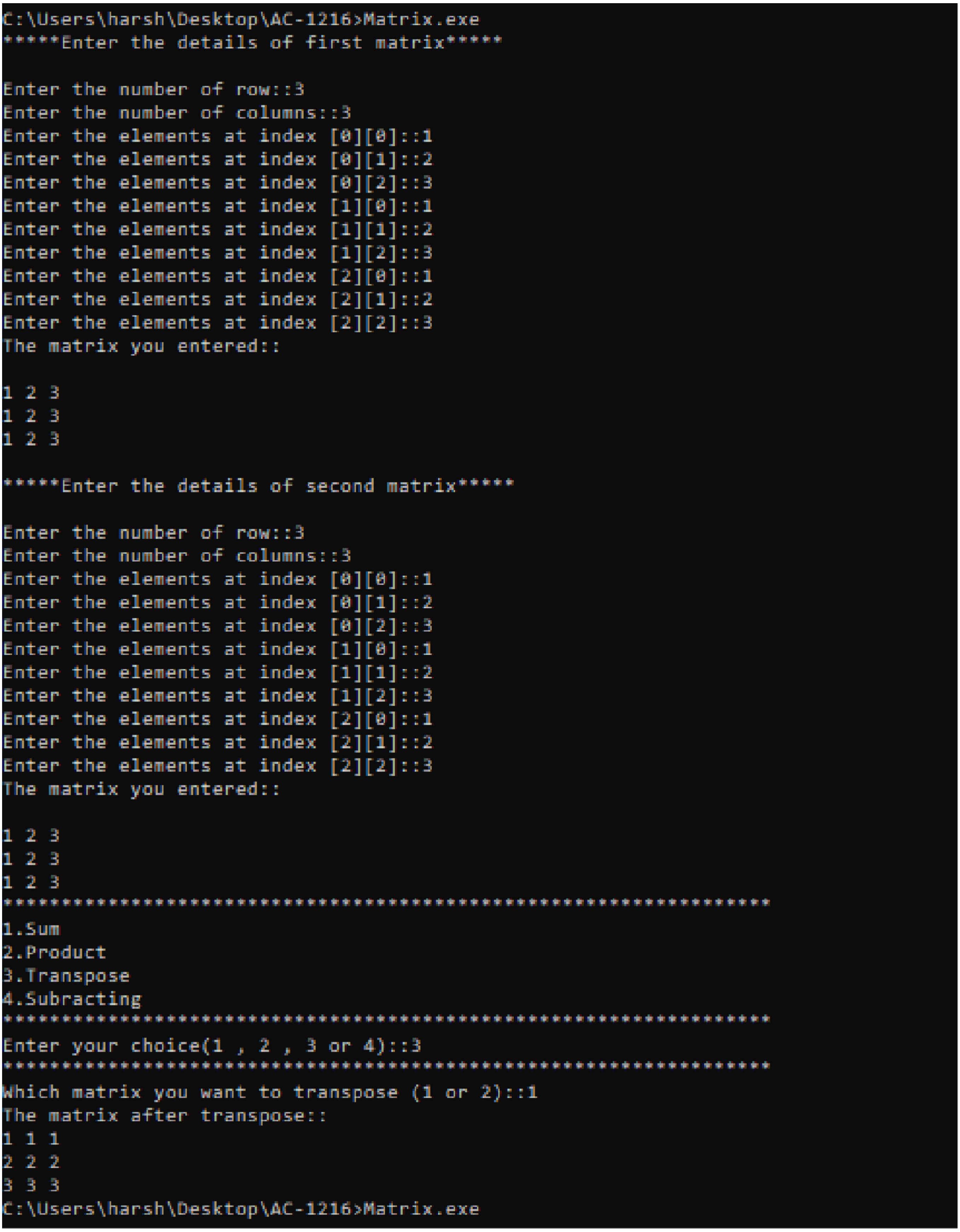
```
Microsoft Windows [Version 10.0.19042.746]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd AC-1216

C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::1
The sum of the matrix::

2 4 6
2 4 6
2 4 6
C:\Users\harsh\Desktop\AC-1216>
```

2. Multiplying the matrix



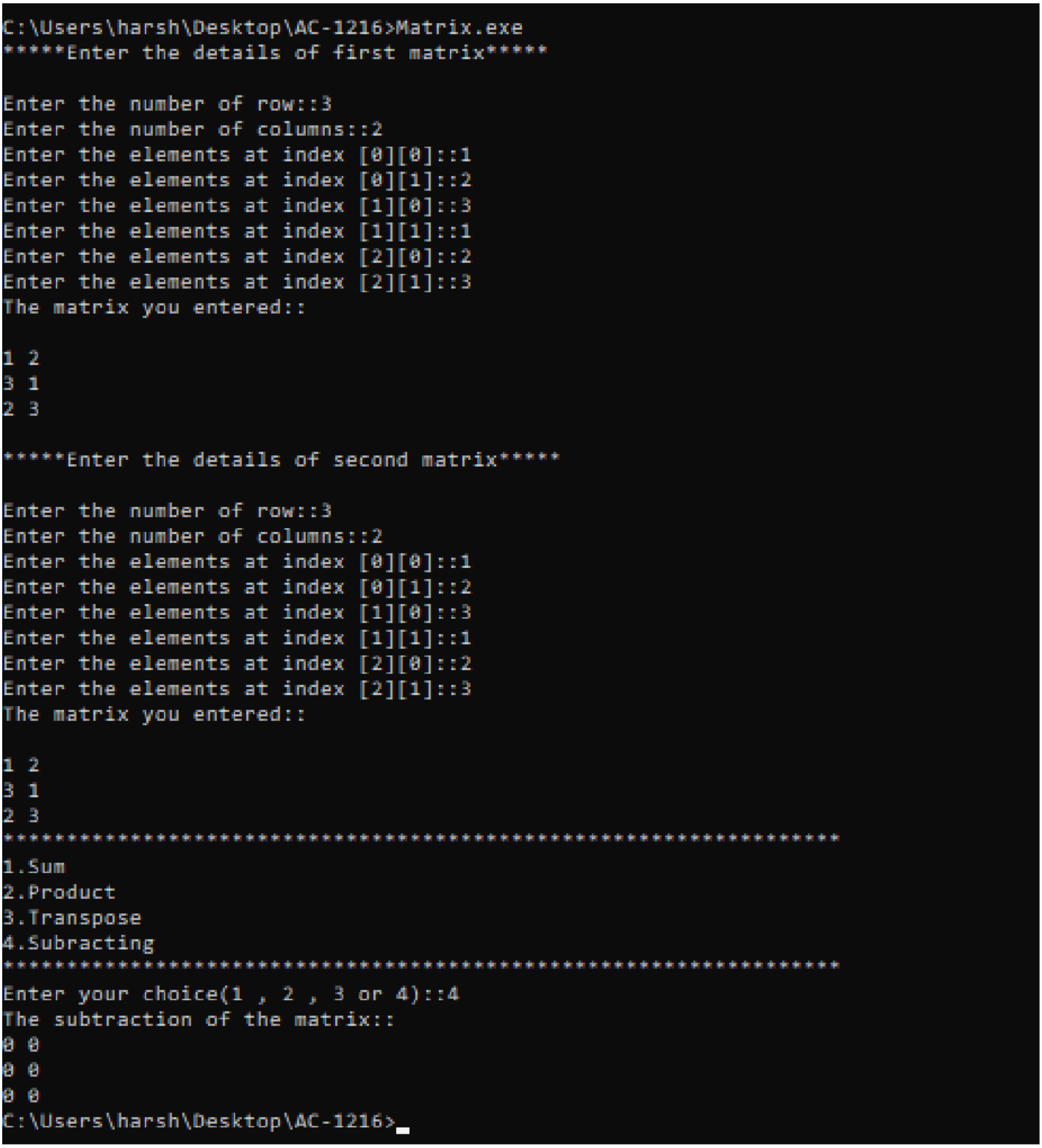
```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [0][2]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
Enter the elements at index [1][2]::1
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::1
Enter the elements at index [2][2]::1
The matrix you entered::

1 1 1
1 1 1
1 1 1

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::1
The matrix you entered::

1 1
1 1
1 1
********************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
********************************************************************
Enter your choice(1 , 2 , 3 or 4)::2
The product of the matrix::

3 3
3 3
3 3
C:\Users\harsh\Desktop\AC-1216>
```

3. Transpose of the matrix



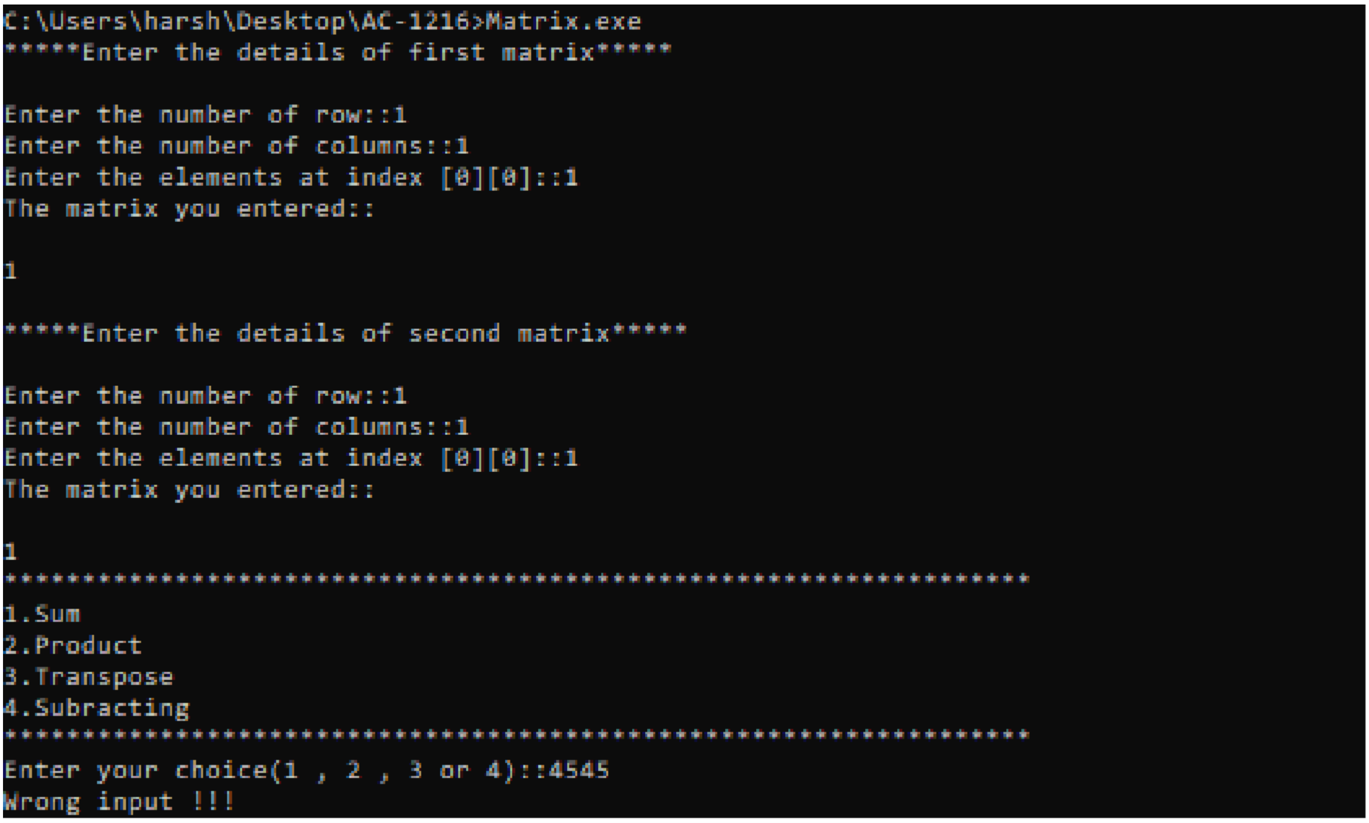
```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::3
******************************************************************
Which matrix you want to transpose (1 or 2)::1
The matrix after transpose::
1 1 1
2 2 2
3 3 3
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
```

4. Subtraction of two matrix

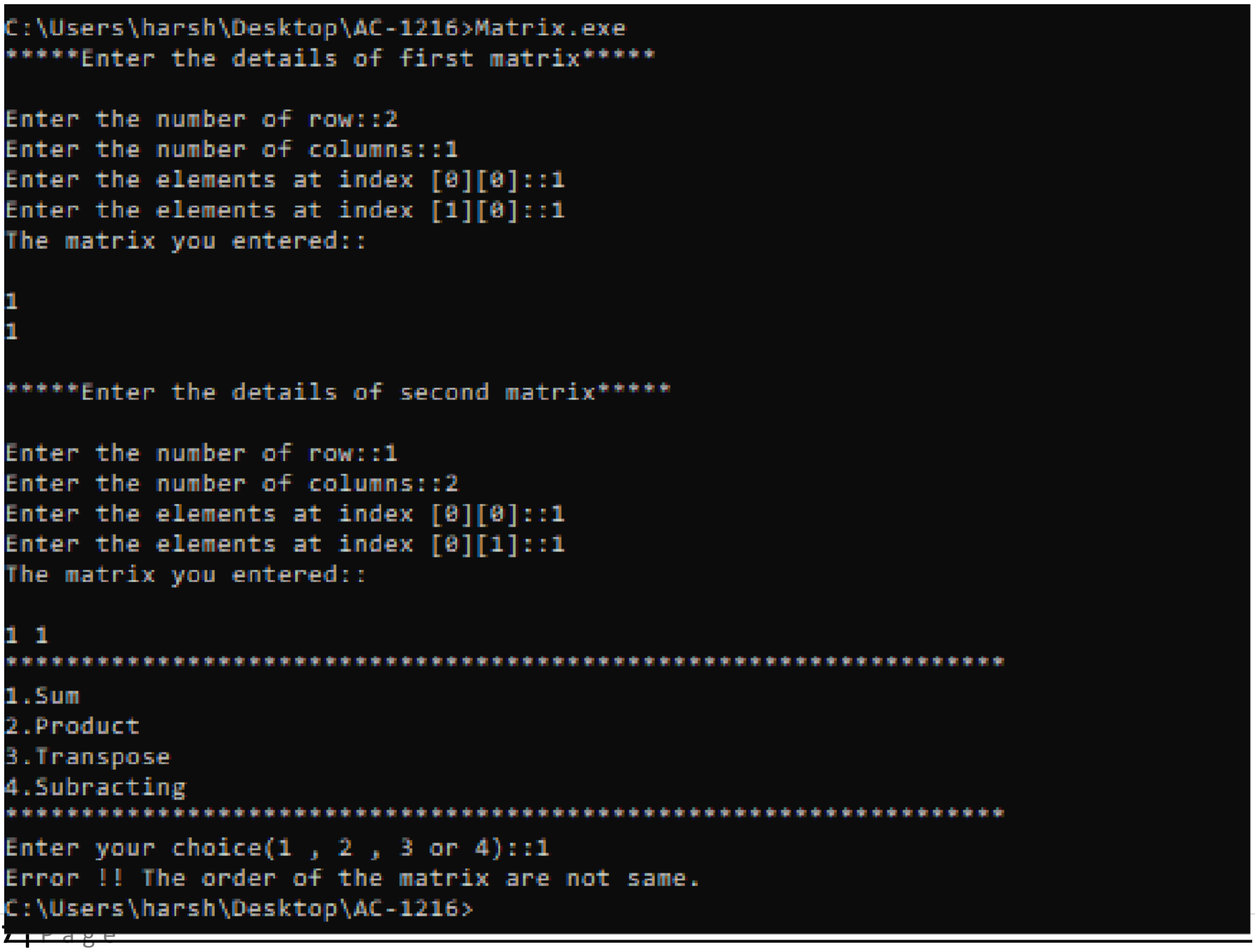


```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::3
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::3
Enter the elements at index [1][1]::1
Enter the elements at index [2][0]::2
Enter the elements at index [2][1]::3
The matrix you entered::

1 2
3 1
2 3

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::3
Enter the elements at index [1][1]::1
Enter the elements at index [2][0]::2
Enter the elements at index [2][1]::3
The matrix you entered::

1 2
3 1
2 3
*******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*******************************************************************
Enter your choice(1 , 2 , 3 or 4)::4
The subtraction of the matrix::
0 0
0 0
0 0
C:\Users\harsh\Desktop\AC-1216>
```

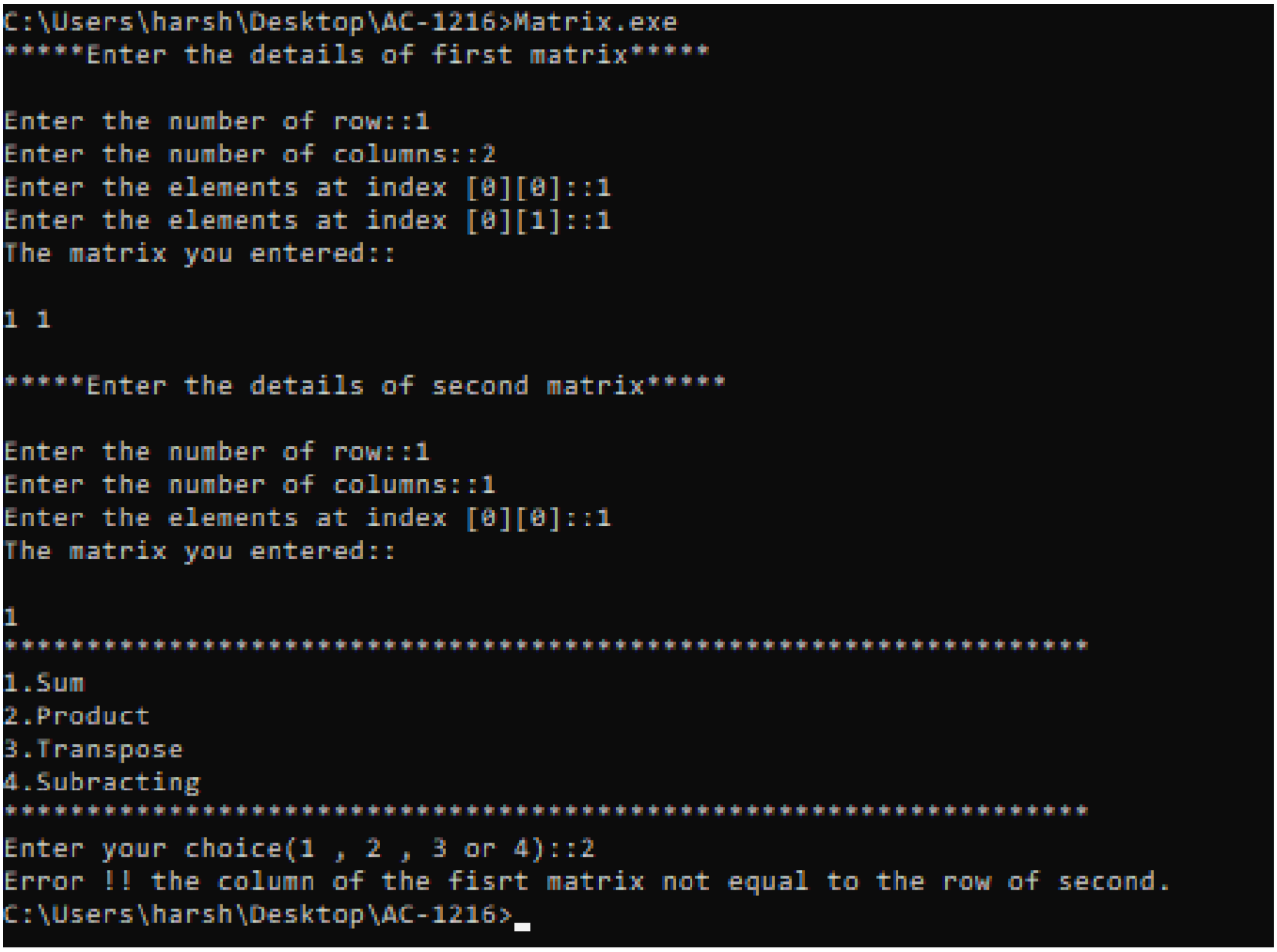
5. Handling different exceptions



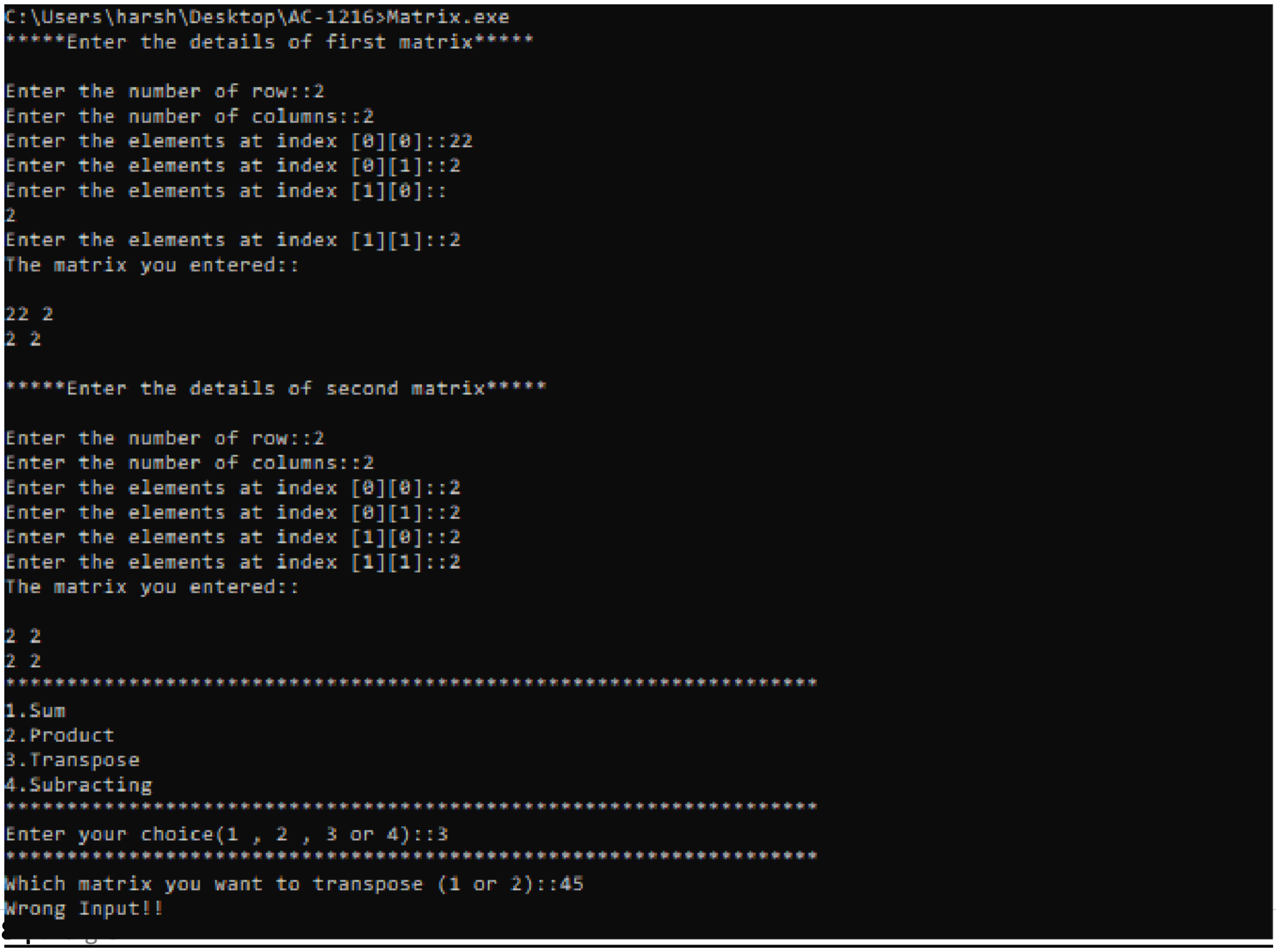
```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1
*******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*******************************************************************
Enter your choice(1 , 2 , 3 or 4)::4545
Wrong input !!!
```



```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::1
Enter the elements at index [0][0]::1
Enter the elements at index [1][0]::1
The matrix you entered::

1
1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
The matrix you entered::

1 1
*******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*******************************************************************
Enter your choice(1 , 2 , 3 or 4)::1
Error !! The order of the matrix are not same.
C:\Users\harsh\Desktop\AC-1216>
```



```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::1
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
The matrix you entered::

1 1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1
*******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*******************************************************************
Enter your choice(1 , 2 , 3 or 4)::2
Error !! the column of the fisrt matrix not equal to the row of second.
C:\Users\harsh\Desktop\AC-1216>_
```



```
C:\Users\harsh\Desktop\AC-1216>Matrix.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::22
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::
2
Enter the elements at index [1][1]::2
The matrix you entered::

22 2
2 2

*****Enter the details of second matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::2
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::2
Enter the elements at index [1][1]::2
The matrix you entered::

2 2
2 2
*******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*******************************************************************
Enter your choice(1 , 2 , 3 or 4)::3
*******************************************************************
Which matrix you want to transpose (1 or 2)::45
Wrong Input!!
```

Practical-9

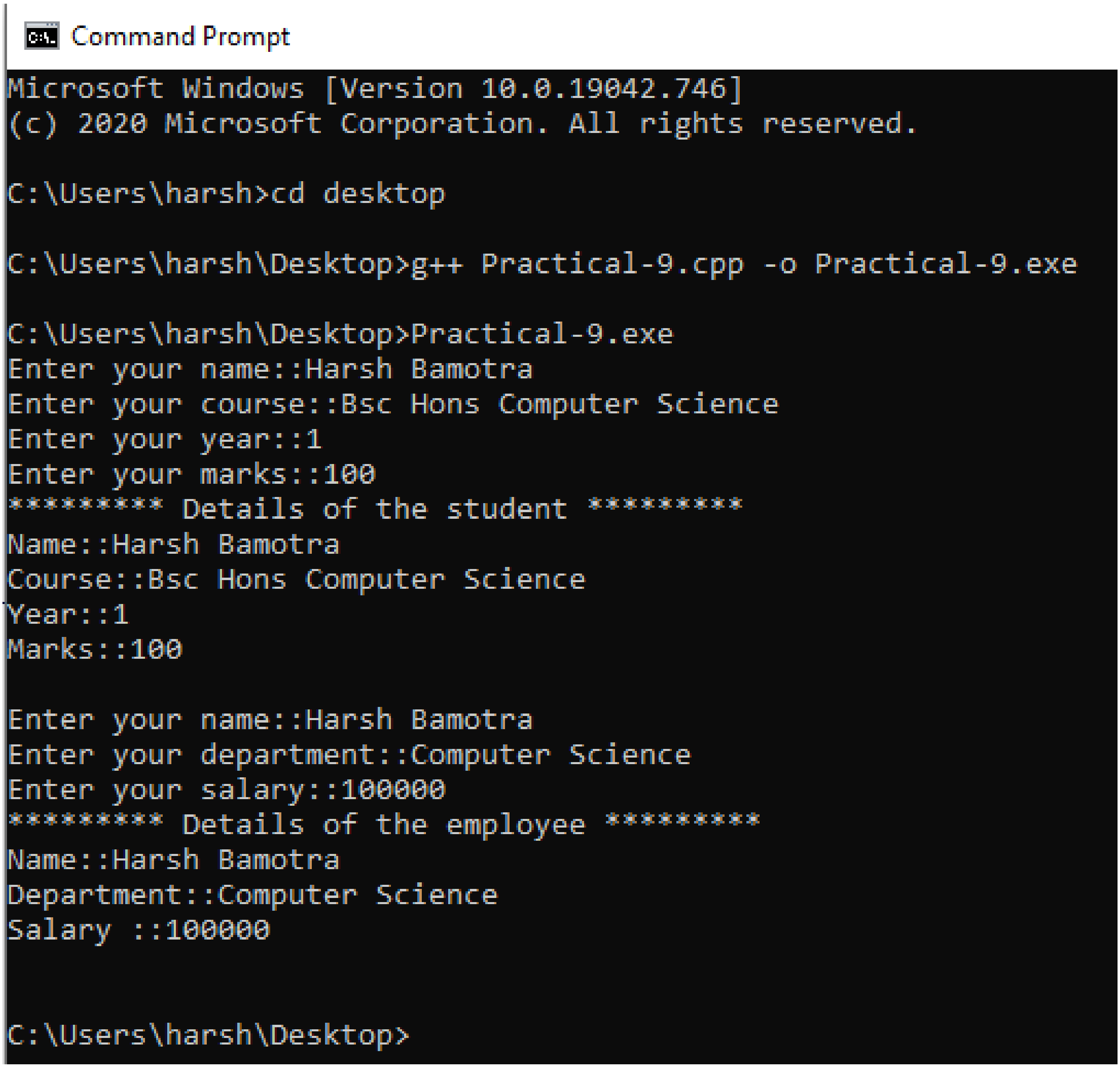
Q. Program to create a person class having names as data member in it and define two inherited classes Student and Employee .

Code:-

```
//Harsh Bamotra AC-1216
//Program to create a person class and show polymorphism

#include <iostream>
#include <string>
using namespace std;

//defining class person
class person
  {
          public:                                                     //defining public members
          string name;
          person()                                                //defining constructor
                    {
                              cout << "Enter your name::";
                              getline(cin, name);
                              fflush;
                    }
          virtual void display()                                        //defining virtual function display to print the details
                    {
                              cout << "Name::" << name;
                    }
  };
//inheriting student class from person class
class student : public person
  {
          private:                                                     //defining private members
          string course;
          int year , marks;

          public:                                                     //defining public members
          student()                                                 //defining constructor
                    {
                              cout << "Enter your course::";
                              getline(cin , course);
                              fflush;
                              cout << "Enter your year::";
                              cin >> year;
                              cout << "Enter your marks::";
                              cin >> marks;
                  }
```

```
        void display()                                             //overriding function display
                {
                        cout << "Name::" << name << endl;
                        cout << "Course::" << course << endl;
                        cout << "Year::" << year << endl;
                        cout << "Marks::" << marks << endl << endl;
                }
        };
//inheriting class employee from person
class employee : public person
  {
        private:                                         //defining private members
        string department;
        int salary;

        public:                                            //defining pubic members
        employee()                                        //defining constructor
                {
                        cout << "Enter your department::";
                        getline(cin , department);
                        fflush;
                        cout << "Enter your salary::";
                        cin >> salary;
                }

        void display()                                             //overriding function display
                {
                        cout << "Name::" << name << endl;
                        cout << "Department::" << department << endl;
                        cout << "Salary ::" << salary << endl << endl;
                }
  };
int main()
  {
        person *p;                                                        //defining class pointer

        student obj1;                                                 //defining class object
        p=&obj1;                                                     //pointing the p pointer to object of student
        cout << "********* Details of the student *********" << endl;
        p -> display();                                            //displaying the data
        cin.ignore();

        employee obj2;                                                   //defining class object
        p=&obj2;                                                       //pointing the p pointer to object of employee
        cout << "********* Details of the employee *********" << endl;
        p -> display();                                               //displaying the data
        cin.ignore();

        return 0;
  }
```

Output:-



```
Microsoft Windows [Version 10.0.19042.746]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>g++ Practical-9.cpp -o Practical-9.exe

C:\Users\harsh\Desktop>Practical-9.exe
Enter your name::Harsh Bamotra
Enter your course::Bsc Hons Computer Science
Enter your year::1
Enter your marks::100
********* Details of the student *********
Name::Harsh Bamotra
Course::Bsc Hons Computer Science
Year::1
Marks::100

Enter your name::Harsh Bamotra
Enter your department::Computer Science
Enter your salary::100000
********* Details of the employee *********
Name::Harsh Bamotra
Department::Computer Science
Salary ::100000


C:\Users\harsh\Desktop>
```

Practical-10

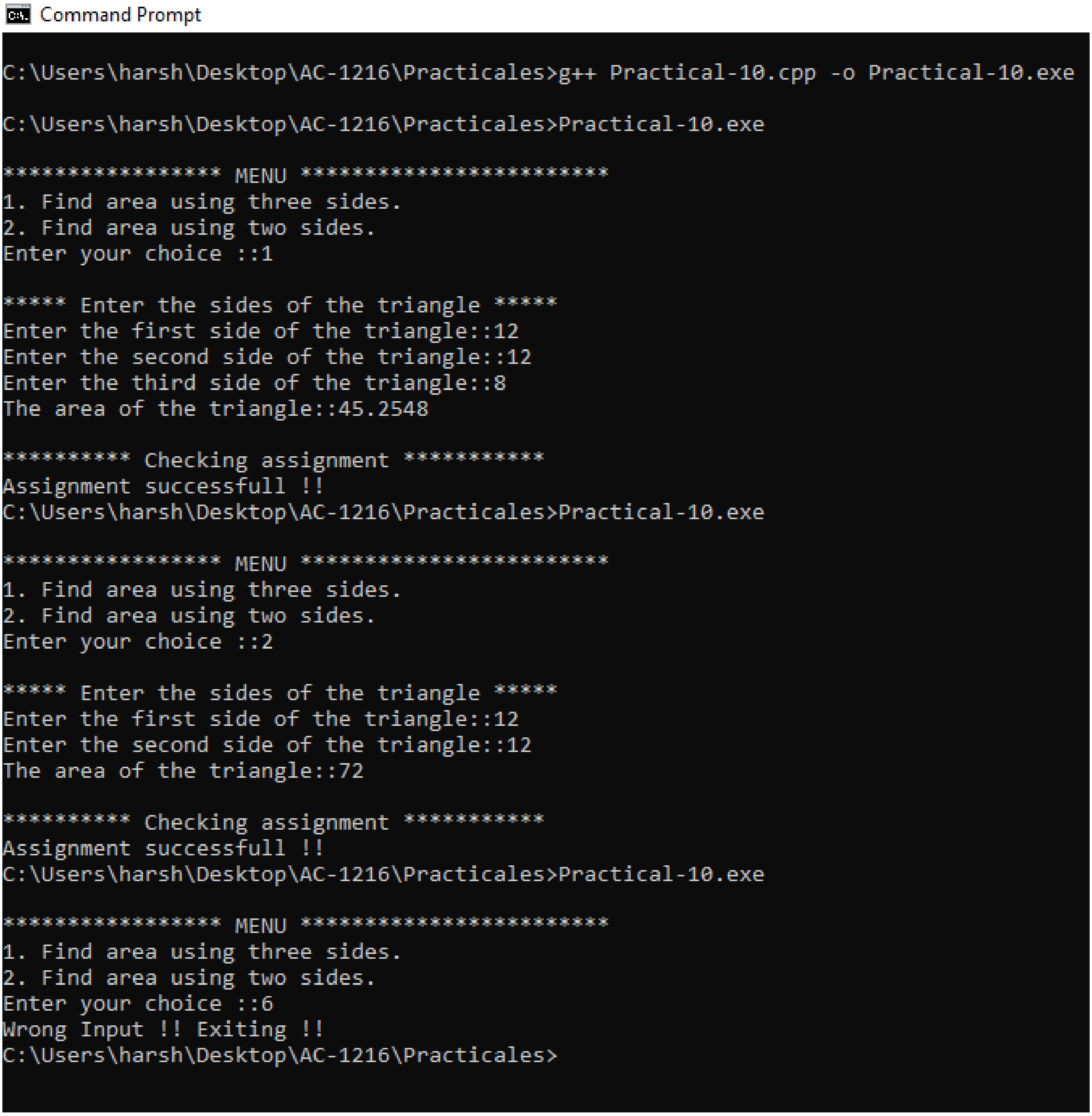
Q. Program to create a triangle class and overloading area function and assignment and equality operators .

Code:-

```
//Harsh Bamotra AC-1216
//Program to create a triangle class

#include <iostream>
#include <cmath>
using namespace std;

class triangle
  {                                   //defining class triangle
        private:                             //defining private members
        double base , height , side;

        public:
        void setData(double x , double y , double z)      //function to initialize the private members
                {
                        base=x;
                        height=y;
                        side=z;
                }

        void setData(double x , double y)         //overloading setData
                {
                        base=x;
                        height=y;
                        side=0;
                }

        double area(double base , double height)      //function to calculate the area
                {
                        double area;
                        area=0.5*base*height;
                        return area;
                }

        double area(double base , double height , double side)  //overloading area
                {
                        double area , sp;
                        sp=(base+height+side)/2;
                        area=sqrt(sp*(sp-base)*(sp-height)*(sp-side));
                        return area;
                }
        void operator =(triangle &m)              //overloading assignment operator
                {
                        m.base=base;
                        m.height=height;
                        m.side=side;
                }



        bool operator ==(triangle &m)           //overloading equality operator
                {
                        if(m.base==base && m.height==height && m.side==side)
                                {
                                        return true;
                                }
                        else
                                {
                                        return false;
                                }
                }
   };





int main()
   {
        double s1 , s2 , s3;                //defining variables
        int ch;
        triangle t1 , t2;                  //defining objects

        cout << endl << "***************** MENU ************************" << endl;
        cout << "1. Find area using three sides." << endl;
        cout << "2. Find area using two sides." << endl;
        cout << "Enter your choice ::";
        cin >> ch;

        switch (ch)
                {
                        case 1:
                                cout << endl << "***** Enter the sides of the triangle *****" << endl;
                                cout << "Enter the first side of the triangle::";
                                cin >> s1;
                                cout << "Enter the second side of the triangle::";          //taking the length of sides
                                cin >> s2;
                                cout << "Enter the third side of the triangle::";
                                cin >> s3;
                                t1.setData(s1 , s2 , s3);                      //initializing data members
                                cout << "The area of the triangle::" << t1.area(s1 , s2 , s3) << endl;
                                break;                                                      //printing the result
```

```
            case 2:
                cout << endl << "***** Enter the sides of the triangle *****" << endl;
                cout << "Enter the first side of the triangle::";
                cin >> s1;
                cout << "Enter the second side of the triangle::";      //taking the length of sides
                cin >> s2;
                t1.setData(s1 , s2);              //initializing data members
                cout << "The area of the triangle::" << t1.area(s1 , s2) << endl;
                break;                                        //printing the result

            default:
                cout << "Wrong Input !! Exiting !!";
                break;
        }

    if(ch==1 || ch==2)
        {
            t1=t2;                                                  //demonstrating assignment
            cout << endl << "********** Checking assignment ***********" << endl;
            if(t1==t2)                                          //demonstrating equality operator
                {
                    cout << "Assignment successfull !!";
                }
            else                                                //printing if the assignment is successfull
                {
                    cout << "Not successfull !!";
                }
        }
    return 0;
}
```

Output:-



```
C:\Users\harsh\Desktop\AC-1216\Practicales>g++ Practical-10.cpp -o Practical-10.exe

C:\Users\harsh\Desktop\AC-1216\Practicales>Practical-10.exe

***************** MENU ************************
1. Find area using three sides.
2. Find area using two sides.
Enter your choice ::1

***** Enter the sides of the triangle *****
Enter the first side of the triangle::12
Enter the second side of the triangle::12
Enter the third side of the triangle::8
The area of the triangle::45.2548

********** Checking assignment ***********
Assignment successfull !!
C:\Users\harsh\Desktop\AC-1216\Practicales>Practical-10.exe

***************** MENU ************************
1. Find area using three sides.
2. Find area using two sides.
Enter your choice ::2

***** Enter the sides of the triangle *****
Enter the first side of the triangle::12
Enter the second side of the triangle::12
The area of the triangle::72

********** Checking assignment ***********
Assignment successfull !!
C:\Users\harsh\Desktop\AC-1216\Practicales>Practical-10.exe

***************** MENU ************************
1. Find area using three sides.
2. Find area using two sides.
Enter your choice ::6
Wrong Input !! Exiting !!
C:\Users\harsh\Desktop\AC-1216\Practicales>
```

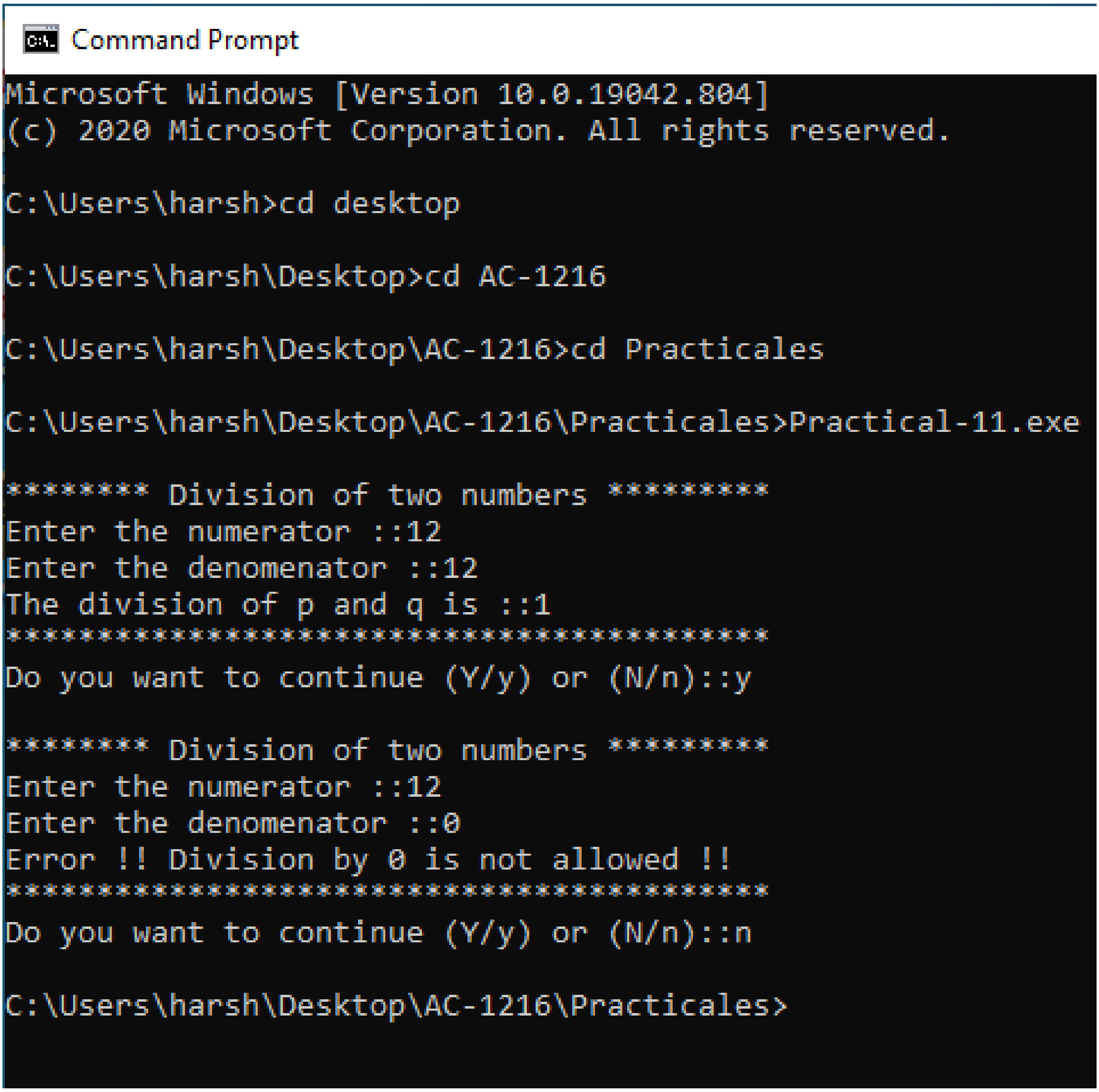
Practical-11

Q. Program to calculate the division of two numbers and perform exception handling .

Code:-

```
 //Harsh Bamotra
//Program to divide to numbers and perform exception handing

#include <iostream>
using namespace std;

int main()
  {
     double p , q;                    //Defining variables
     string ch="Y";
     while(ch=="Y" || ch=="y")
       {
         cout << endl << "******** Division of two numbers *********" << endl;
         cout << "Enter the numerator ::";
         cin >> p;                                    //taking input from the user
         cout << "Enter the denomenator ::";
         cin >> q;                                    //taking input from the user
         try
           {
             if(q==0)                  //checking exception
               {
                 throw q;              //throwing the value of q
               }
             else                    //printing division of p and q
               {
                 cout << "The division of p and q is ::" << p/q << endl;
               }
           }

         catch(double err)           //catching the thrown value
           {
             cout << "Error !! Division by " << err << " is not allowed !!" << endl;
           }                                                         //printing the error message

         cout << "******************************************" << endl;
         cout << "Do you want to continue (Y/y) or (N/n)::";
         cin >> ch;                                             //asking the user if he wants continue
       }
     return 0;
}
```

Output:-



```
Microsoft Windows [Version 10.0.19042.804]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd AC-1216

C:\Users\harsh\Desktop\AC-1216>cd Practicales

C:\Users\harsh\Desktop\AC-1216\Practicales>Practical-11.exe

******** Division of two numbers *********
Enter the numerator ::12
Enter the denomenator ::12
The division of p and q is ::1
******************************************
Do you want to continue (Y/y) or (N/n)::y

******** Division of two numbers *********
Enter the numerator ::12
Enter the denomenator ::0
Error !! Division by 0 is not allowed !!
******************************************
Do you want to continue (Y/y) or (N/n)::n

C:\Users\harsh\Desktop\AC-1216\Practicales>
```

Practical-12

Q. Program to create a matrix class with matrix functions , overloaded operators and performing exception handling.

Code:-

```
//Harsh Bamotra AC-1216
//Program to perform matrix class with overloading operators and exception handling.

#include <iostream>
using namespace std;

/****************************************** Creating Matrix class ******************************************/
class matrix
  {
        private:                                        //defining  private members
        int row , col;

        public:                                         //defining public members
        int arr[10][10];
        void setData(int n1 , int n2)                   //defining function to initialize the private members
                {
                        row=n1;
                        col=n2;
                }

        void create_arr()                               //defining function to create an array
                {
                        for(int i=0 ; i<row ; i++)
                                {
                                        for(int j=0 ; j<col ; j++)
                                                {
                                                        cout << "Enter the elements at index [" << i << "][" << j << "]::";
                                                        cin >> arr[i][j];
                                                }
                                }
                }

        void display_arr()                              //defining function to print the array
                {
                        for(int i=0 ; i<row ; i++)
                                {
                                        cout << endl;
                                        for(int j=0 ; j<col ; j++)
                                                {
                                                        cout << arr[i][j] << " ";
                                                }
                                }
                }
```

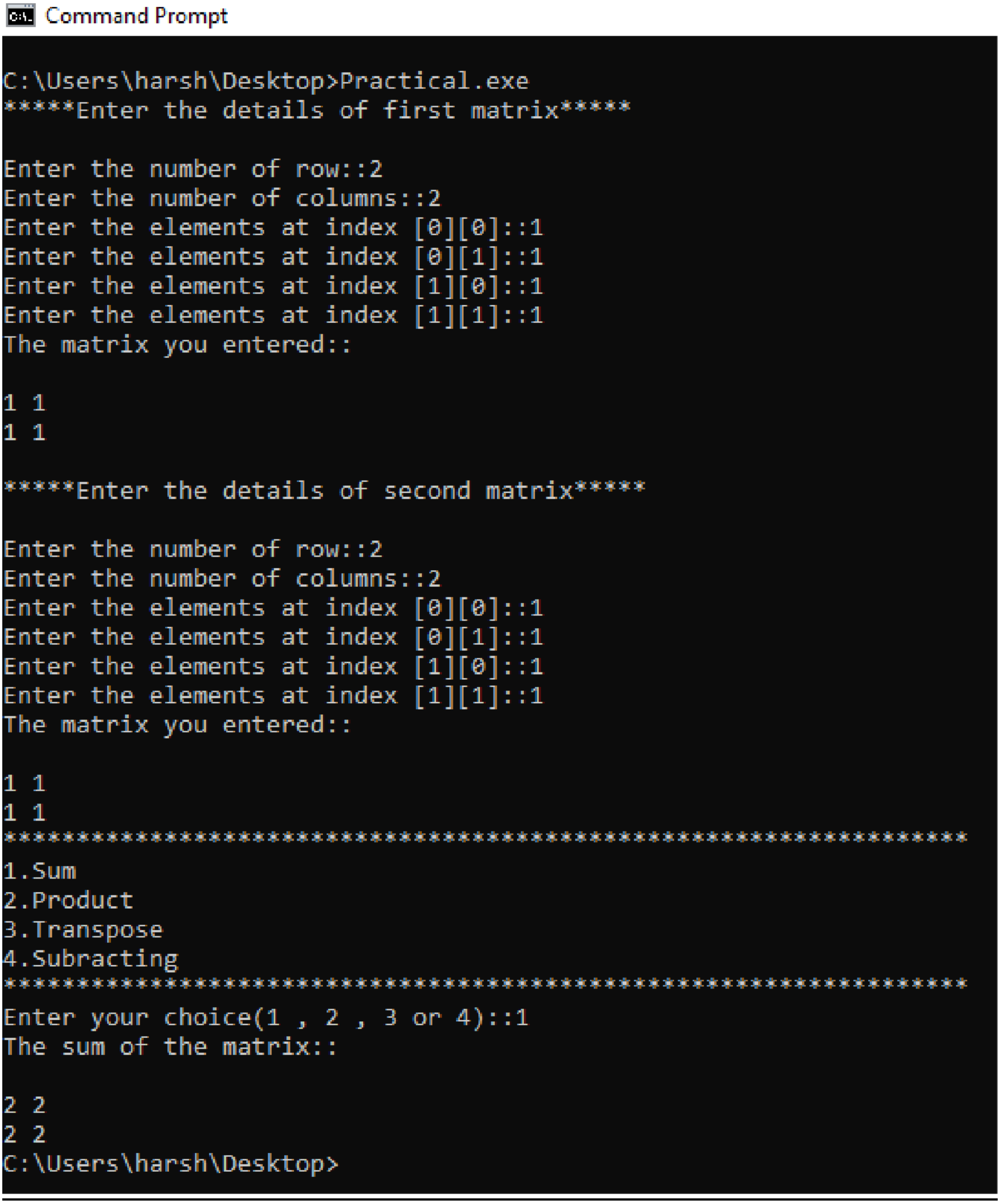
```
    void trans();                                           //defining function for transpose of the matrix

/**************************************** Overloading operators ****************************************/


    matrix operator +(matrix m)
        {                                           //overloading + operator for adding two matrix
            matrix temp;                        //defining temp matrix class
            temp.row=m.row;
            temp.col=m.col;
            if(row==m.row && col==m.col)
                {
                for(int i=0 ; i<row ; i++)
                    {
                        for(int j=0 ; j<col ; j++)
                            {
                                temp.arr[i][j]=arr[i][j]+m.arr[i][j];
                            }                                   //adding the elements
                    }                                       //and initializing them in the temp
                }
            else
                {
                    cout << "Error !! The order of the matrix are not same. ";
                }

            return temp;                              //returning the result
        }



    matrix operator -(matrix m)
        {                                             //overloading – operator for subtracting two matrix
            matrix temp;                          //defining temp matrix class to store the sum
            temp.row=m.row;
            temp.col=m.col;
            if(row==m.row && col==m.col)
                {
                for(int i=0 ; i<row ; i++)
                    {
                        for(int j=0 ; j<col ; j++)
                            {
                                temp.arr[i][j]=arr[i][j]-m.arr[i][j];
                            }                               //subtracting the elements
                    }                                       //and initializing them in temp
                }
            else
                {
                    cout << "Error !! The order of the matrix are not same. ";
                }

            return temp;                                  //returning the result
        }
    matrix operator *(matrix m)                                         //overloading * operator to multiply two matrix
        {
            matrix temp;                            //defining temp matric class
            temp.row=row;
            temp.col=m.col;
            for(int i=0 ; i<row ; i++)
                {
                    for(int j=0 ; j<col ; j++)
                        {
                            temp.arr[i][j]=0;     //initializing the elements of temp to 0
                        }
                }
            if(col==m.row)
                {
                    for(int i=0 ; i<row ; i++)
                        {
                            for(int j=0 ; j<m.col ; j++)
                                {
                                    for(int k=0 ; k<col ; k++)
                                        {
                                        temp.arr[i][j]+=arr[i][k]*m.arr[k][j];
                                        }
                                }       //multiplying the matrix
                        }
                }
            else
                {
                    cout << "Error !! the column of the fisrt matrix not equal to the row of second.";
                }
            return temp;                            //returning the result matrix
        }

 };

void matrix :: trans()                          // defining function trans for transposing matrix
    {
        int arr1[10][10];
        for(int i=0 ; i<row ; i++)
            {
                for(int j=0 ; j<col ; j++)
                    {
                        arr1[i][j]=arr[j][i];         //transposing the matrix
                    }
            }

        cout << "The matrix after transpose::";
        for(int i=0 ; i<row ; i++)
            {
                cout << endl;
                for(int j=0 ; j<col ; j++)
                    {
                        cout << arr1[i][j] << " ";
                    }                                       //printing the transposed matrix
            }
    }
```

```
int main(){
    int r1 , r2 , c1 , c2 , x , y;                                    //defining variables
    matrix m1 , m2 , m3 ;                                            //defining matrix class object
    cout << "*****Enter the details of first matrix*****" << endl << endl;
    cout << "Enter the number of row::";
    cin >> r1;                                                        //taking number of rows from the user
    cout << "Enter the number of columns::";
    cin >> c1;                                                        //taking number of columns from the user
    m1.setData(r1 , c1);
    m1.create_arr();                                                //initializing members and creating matrix
    cout << "The matrix you entered::" << endl;
    m1.display_arr();                                             //printing the matrix

    cout << endl << endl << "*****Enter the details of second matrix*****" << endl << endl;
    cout << "Enter the number of row::";
    cin >> r2;                                                        //taking number of rows from the user
    cout << "Enter the number of columns::";
    cin >> c2;                                                        //taking number of columns from the user
    m2.setData(r2 , c2);
    m2.create_arr();                                                  //initializing members and creating matrix
    cout << "The matrix you entered::" << endl;
    m2.display_arr();                                                 //printing the matrix

    cout << endl << "**********************************************************************" << endl;
    cout << "1.Sum" << endl << "2.Product" << endl << "3.Transpose" << endl << "4.Subracting" << endl ;
    cout << "**********************************************************************" << endl;
    cout << "Enter your choice(1 , 2 , 3 or 4)::";
    cin >> x;                                                 //printing the menu and taking user's choice
    switch (x)                                               //defining switch case
    {
    case 1:
        try                                                   //handling exception
        {
            if(r1==r2 && c1==c2)
                {
                    m3=m1+m2;        //adding and printing the matrix
                    cout << "The sum of the matrix::" << endl;
                    m3.display_arr();
                }
            else
                {
                    throw r1
                }
        }
        catch(int err)                                        //printing error message
            {
                cout << "Error !! The order of the matrix must be same to perform sum."
            }
        break;

    case 2:
        try
        {                                             //handling exception
            if(c1==r2)
                {
                    m3=m1*m2;                         //multiplying matrix
```

```
                                        cout << "The product of the matrix::" << endl;
                                        m3.display_arr();                                       //printing the result
                                }
                        else
                                {
                                        throw r1;
                                }
                }
                catch(int err)                                                          //printing the error message
                        {
                                cout << "Error !! The column of the first matrix must be same to the row of the second.";
                        }
                break;

        case 3:
                cout << "**********************************************************************" << endl;
                cout << "Which matrix you want to transpose (1 or 2)::";
                cin >> y;
                if(y==1)
                        {
                                m1.trans();
                        }
                else if(y==2)                                                           //transposing and printing matrix
                        {
                                m2.trans();
                        }
                else
                        {
                                cout << "Wrong Input!!" << endl ;
                        }
                break;

        case 4:
                try                                                                             //handling exception
                {
                        if(r1==r2 && c1==c2)
                                {
                                        m3=m1-m2;                               subtracting and printing the matrix
                                        cout << "The subtraction of the matrix::";
                                        m3.display_arr();
                                }
                        else
                                {
                                        throw r1;
                                }
                }
                catch(int err)                                  //printing the error message
                        {
                                cout << "Error !! The order of the matrix must be same to perform subtraction.";
                        }
                break;

        default:                                                //exiting message
                cout << "Wrong input !!!";
    }

        return 0 ;
}
```

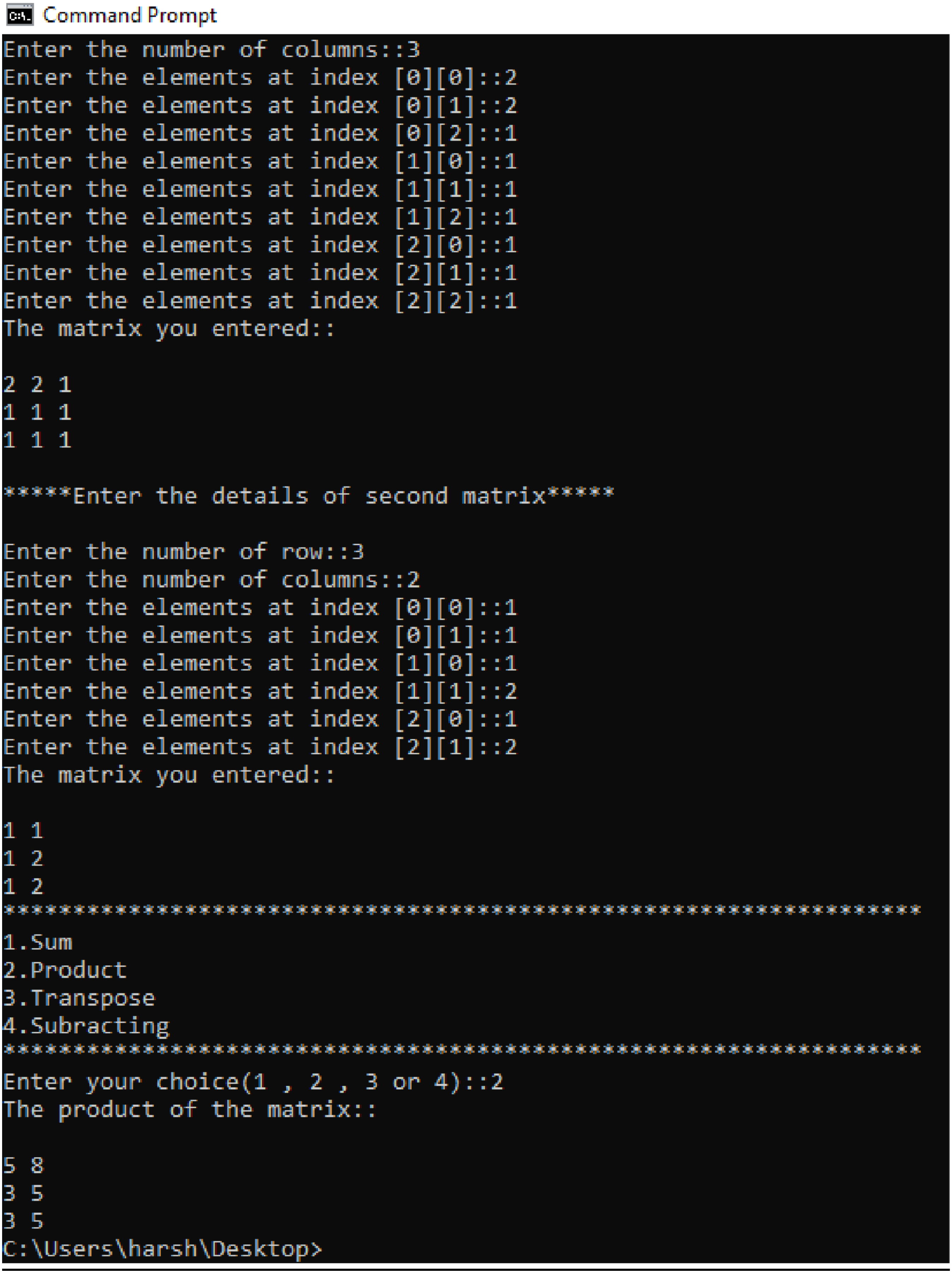
Output:-

1. Sum



```
C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1

*****Enter the details of second matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::1
The sum of the matrix::

2 2
2 2
C:\Users\harsh\Desktop>
```

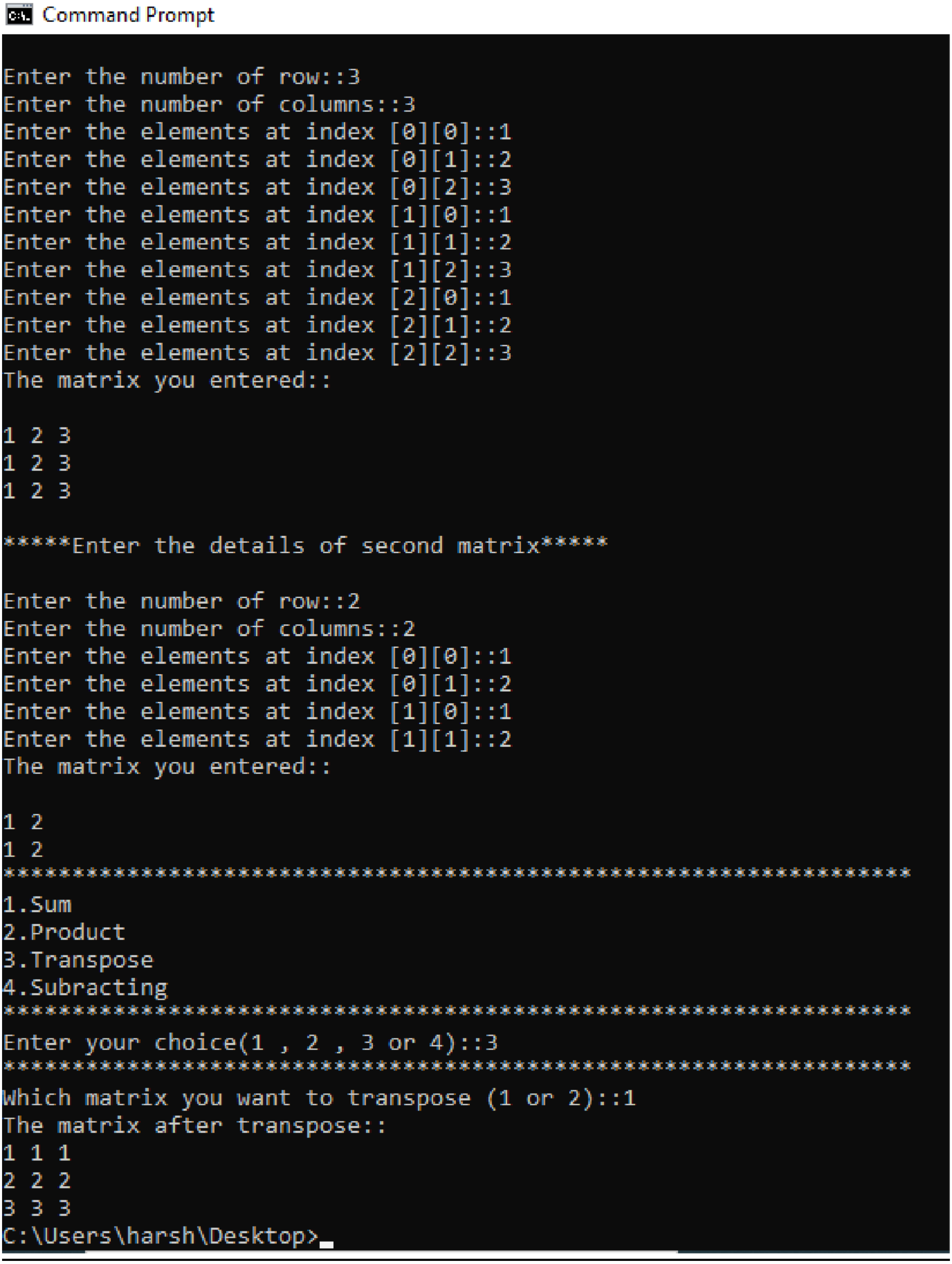
2. Product



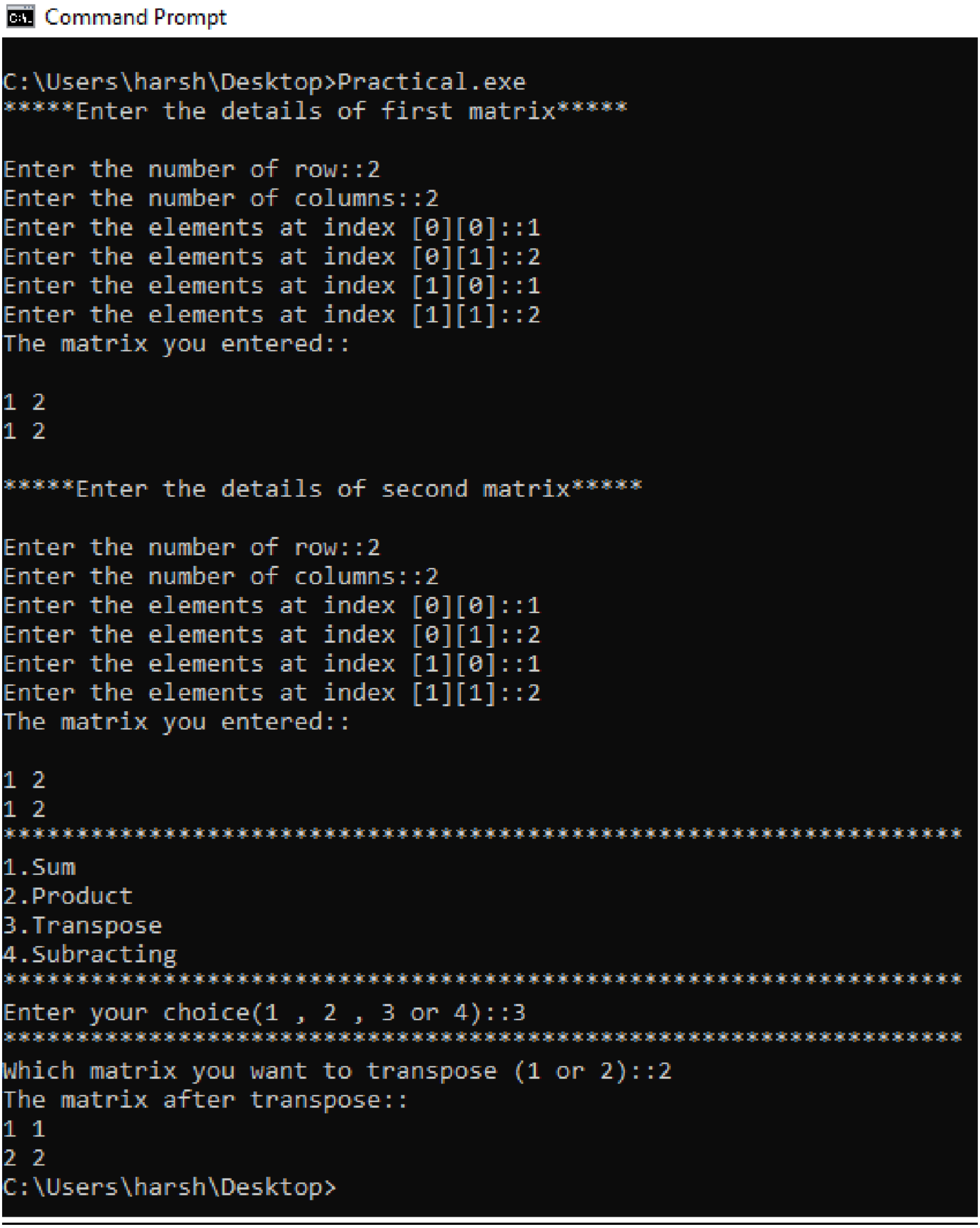
Command Prompt

```
Enter the number of columns::3
Enter the elements at index [0][0]::2
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
Enter the elements at index [1][2]::1
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::1
Enter the elements at index [2][2]::1
The matrix you entered::

2 2 1
1 1 1
1 1 1

*****Enter the details of second matrix*****

Enter the number of row::3
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
The matrix you entered::

1 1
1 2
1 2
*******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*******************************************************************
Enter your choice(1 , 2 , 3 or 4)::2
The product of the matrix::

5 8
3 5
3 5
C:\Users\harsh\Desktop>
```

3. Transpose

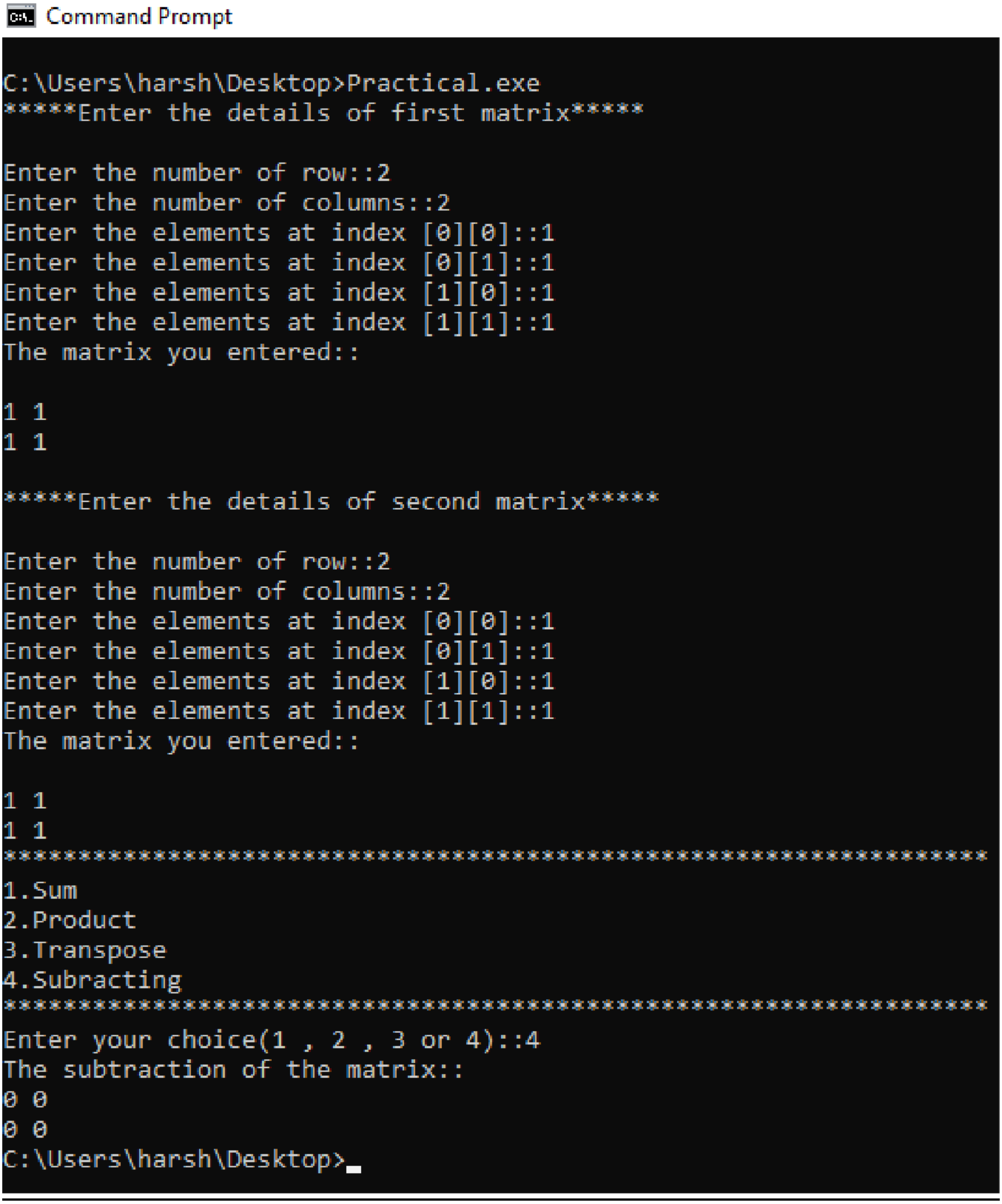


```
Enter the number of row::3
Enter the number of columns::3
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [0][2]::3
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
Enter the elements at index [1][2]::3
Enter the elements at index [2][0]::1
Enter the elements at index [2][1]::2
Enter the elements at index [2][2]::3
The matrix you entered::

1 2 3
1 2 3
1 2 3

*****Enter the details of second matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
The matrix you entered::

1 2
1 2
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::3
******************************************************************
Which matrix you want to transpose (1 or 2)::1
The matrix after transpose::
1 1 1
2 2 2
3 3 3
C:\Users\harsh\Desktop>
```



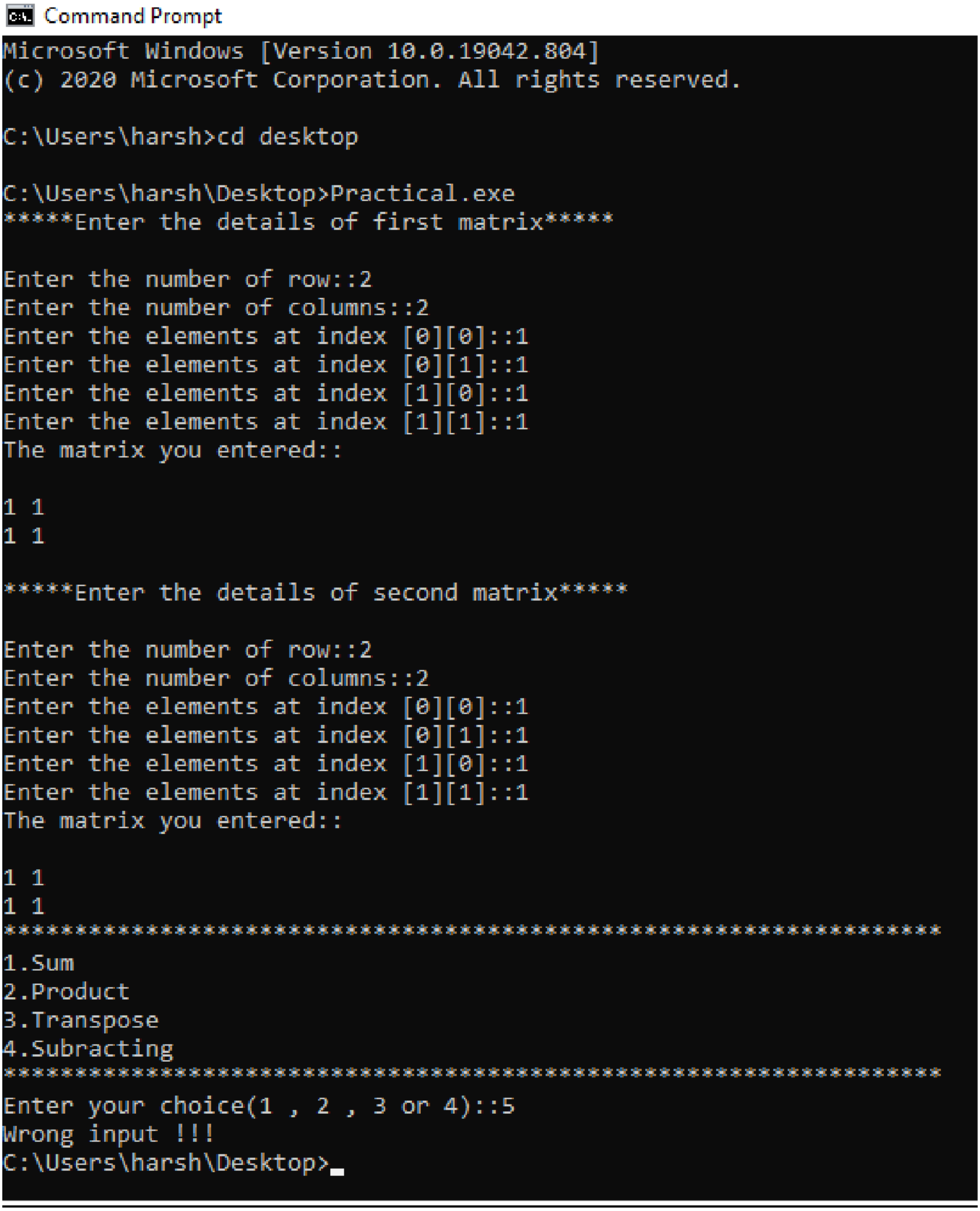
```
C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
The matrix you entered::

1 2
1 2

*****Enter the details of second matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::2
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::2
The matrix you entered::

1 2
1 2
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::3
******************************************************************
Which matrix you want to transpose (1 or 2)::2
The matrix after transpose::
1 1
2 2
C:\Users\harsh\Desktop>
```

4. Subtraction



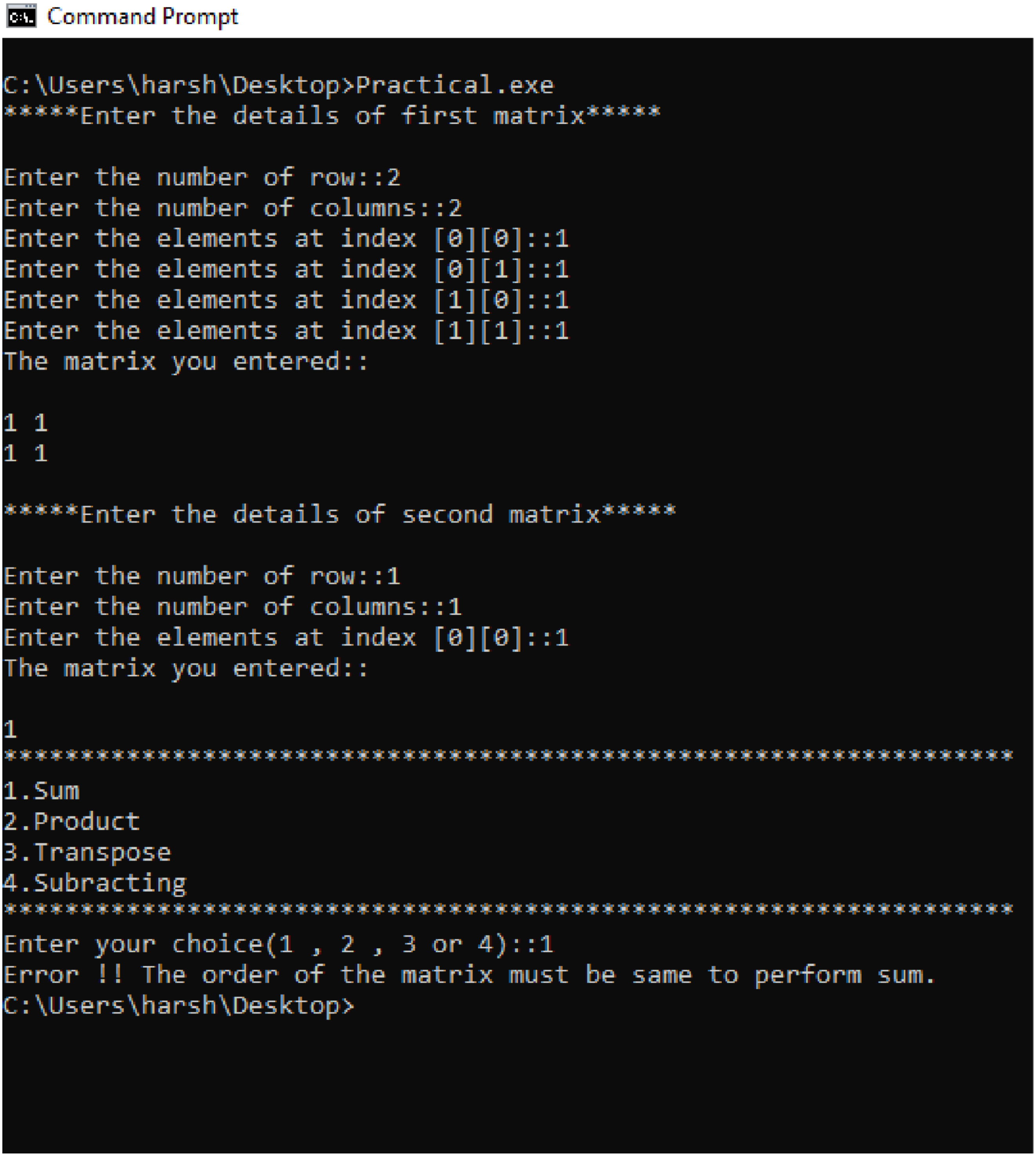
```
C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1

*****Enter the details of second matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::4
The subtraction of the matrix::
0 0
0 0
C:\Users\harsh\Desktop>_
```

5. Exception handling



```
Microsoft Windows [Version 10.0.19042.804]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1

*****Enter the details of second matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::5
Wrong input !!!
C:\Users\harsh\Desktop>
```

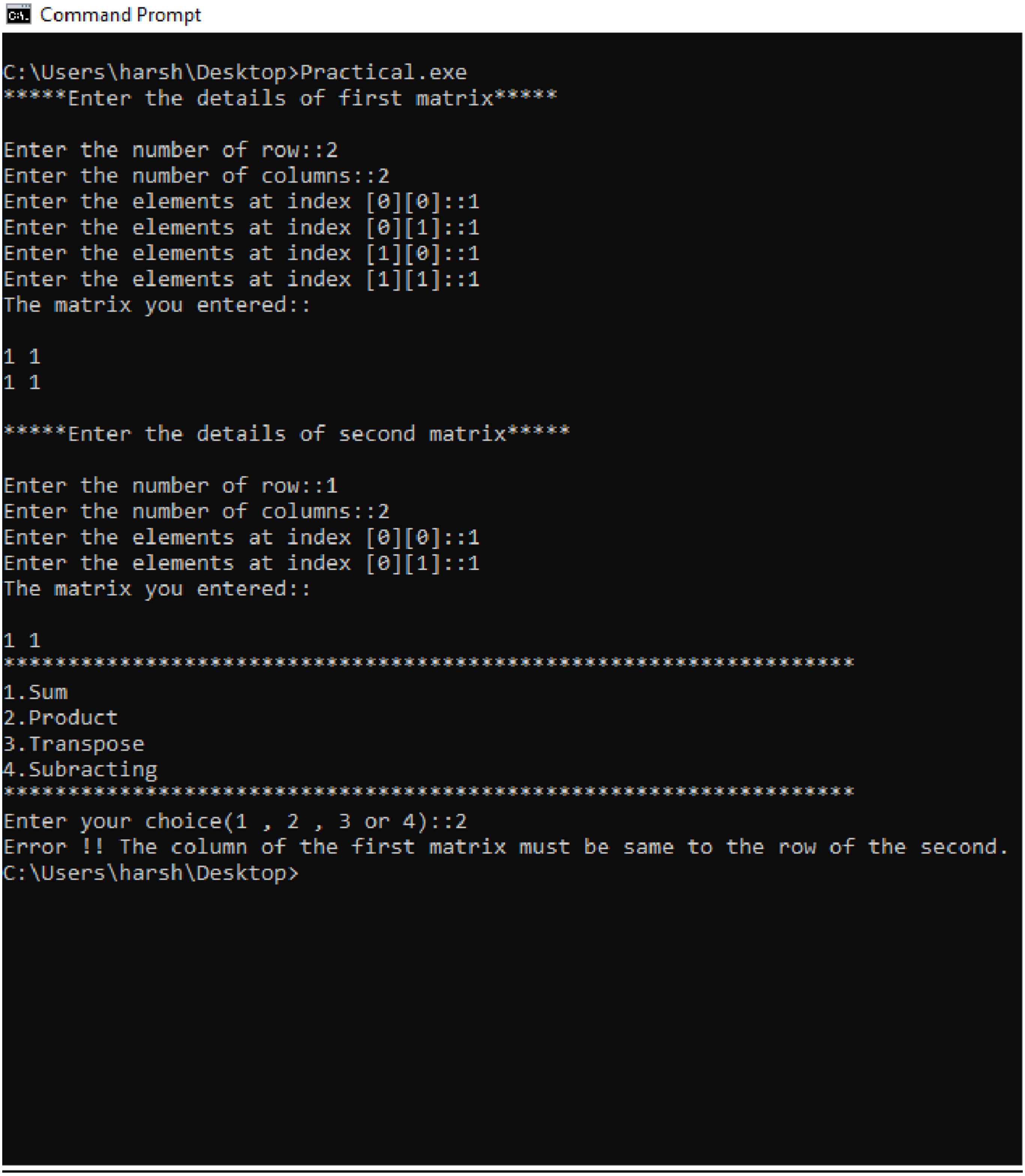
Exception in main menu



Command Prompt

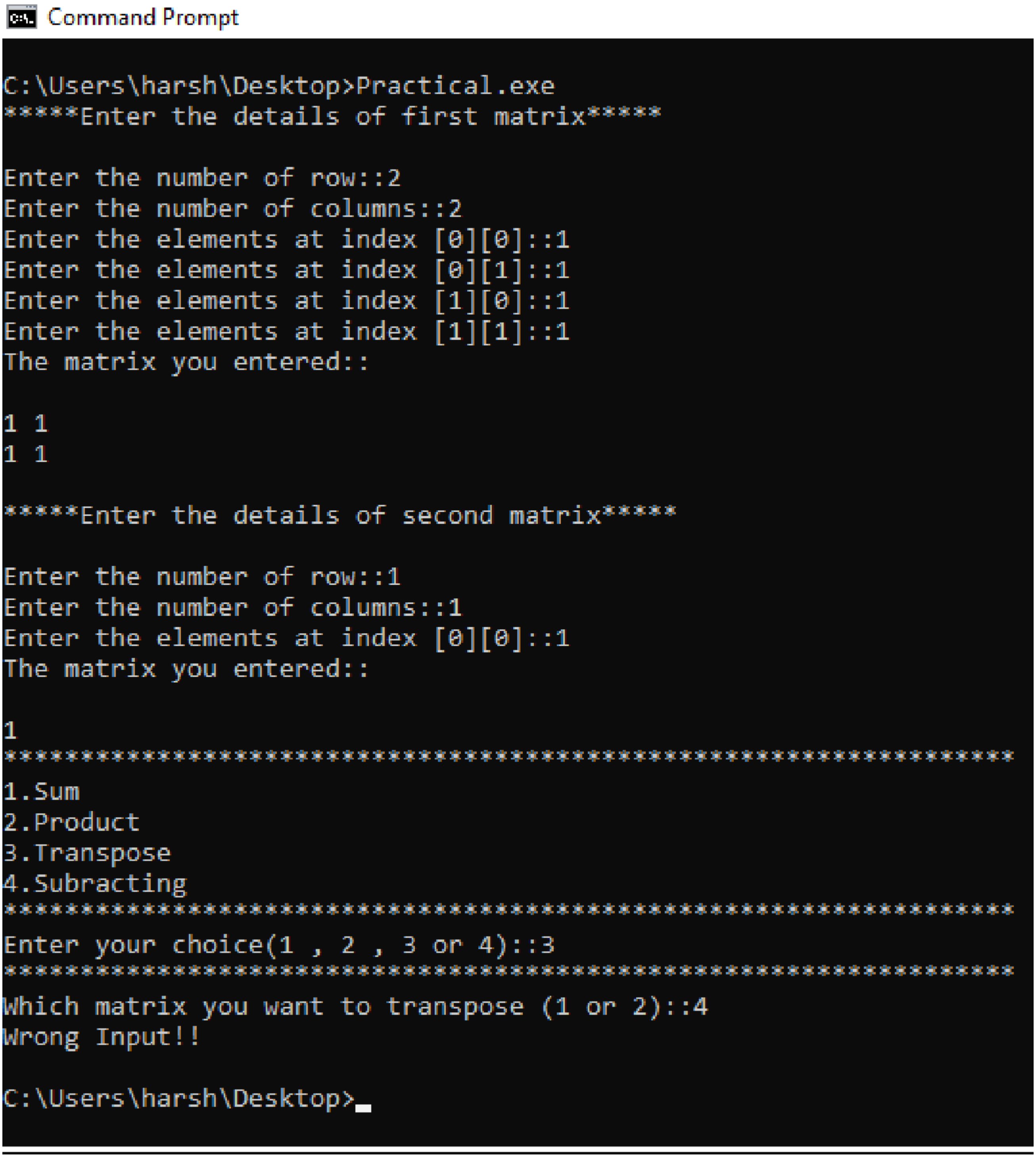
```
C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::1
Error !! The order of the matrix must be same to perform sum.
C:\Users\harsh\Desktop>
```

Exception in case of sum



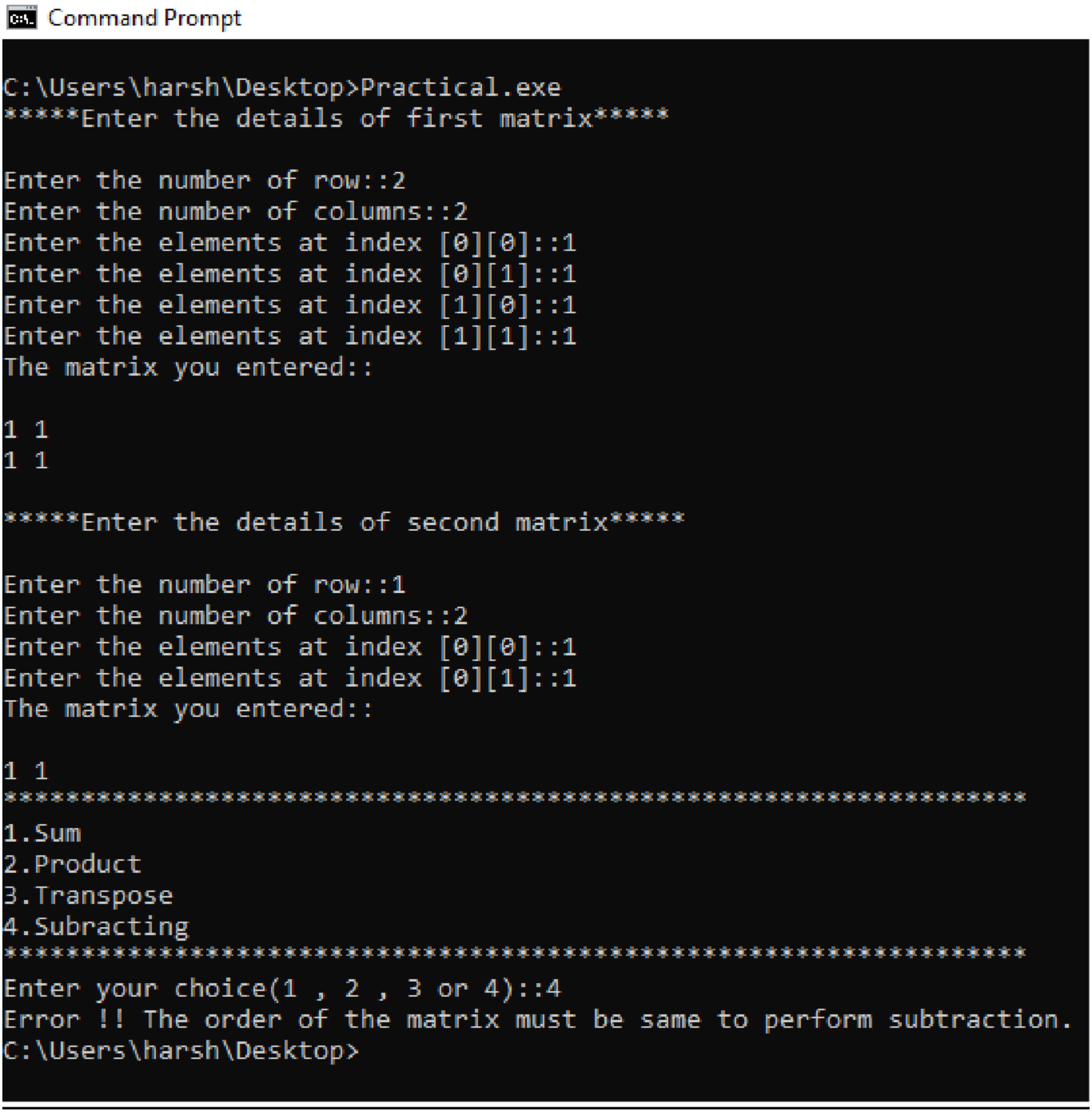
```
C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
The matrix you entered::

1 1
*******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
*******************************************************************
Enter your choice(1 , 2 , 3 or 4)::2
Error !! The column of the first matrix must be same to the row of the second.
C:\Users\harsh\Desktop>
```

Exception in case of product



```
C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::1
Enter the elements at index [0][0]::1
The matrix you entered::

1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::3
******************************************************************
Which matrix you want to transpose (1 or 2)::4
Wrong Input!!

C:\Users\harsh\Desktop>_
```

Exception in case of transpose



Command Prompt

```
C:\Users\harsh\Desktop>Practical.exe
*****Enter the details of first matrix*****

Enter the number of row::2
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
Enter the elements at index [1][0]::1
Enter the elements at index [1][1]::1
The matrix you entered::

1 1
1 1

*****Enter the details of second matrix*****

Enter the number of row::1
Enter the number of columns::2
Enter the elements at index [0][0]::1
Enter the elements at index [0][1]::1
The matrix you entered::

1 1
******************************************************************
1.Sum
2.Product
3.Transpose
4.Subracting
******************************************************************
Enter your choice(1 , 2 , 3 or 4)::4
Error !! The order of the matrix must be same to perform subtraction.
C:\Users\harsh\Desktop>
```

Exception in case of subtraction

Practical-13

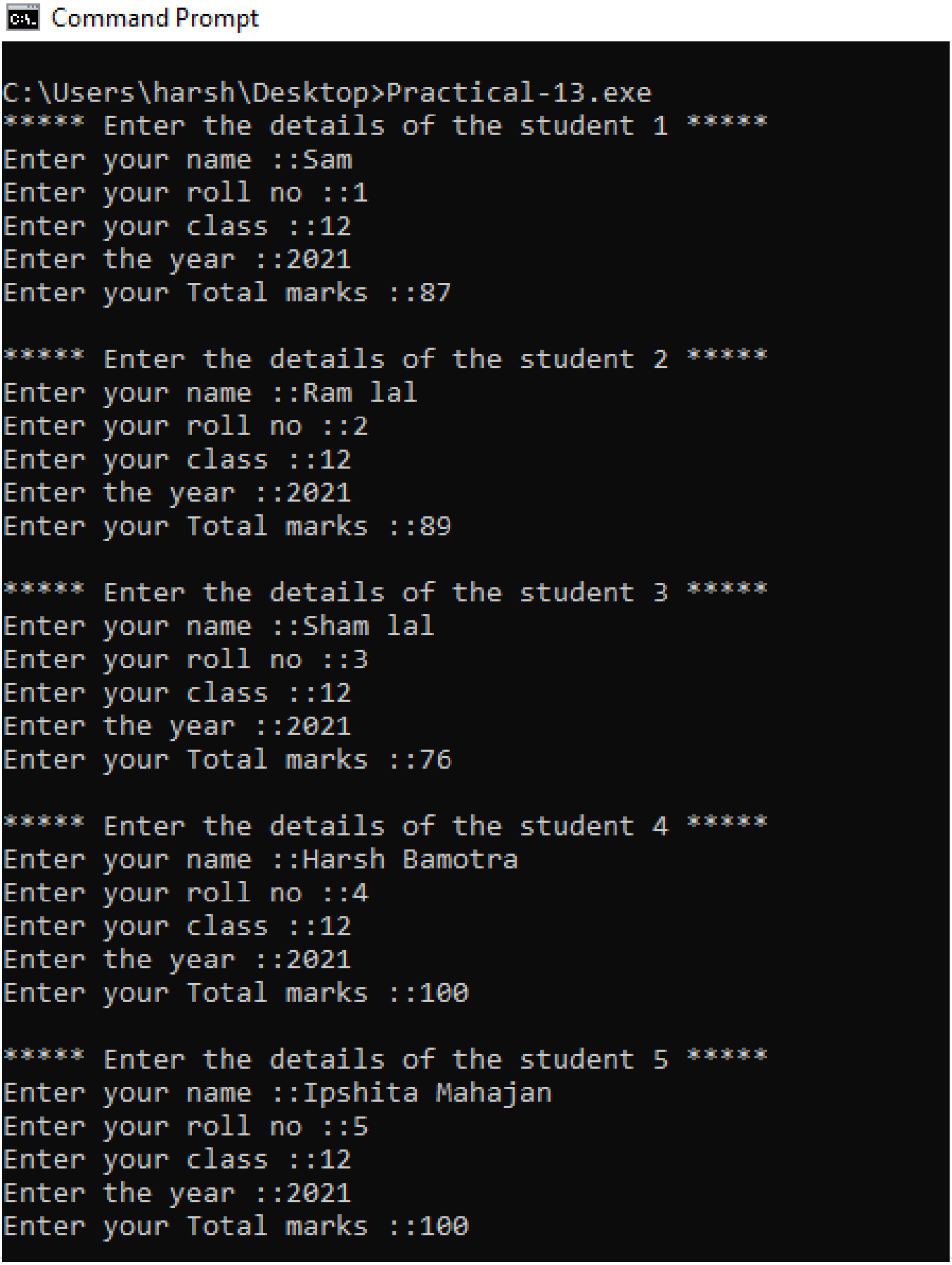
Q. Program to create a student class and take details of five students and save them in a text file .

Code:-

```
//Harsh Bamotra
//Program to write the details of student in a text file

#include <iostream>
#include <fstream>
using namespace std;
class student{                                    //Defining class student
    private:                                     //defining private members
    string roll_no , name , Class;
    int year , t_marks;

    public:                           //defining public members
    void getdata()                   //defining function to input data from user
      {
        cout << "Enter your name ::";
        getline(cin , name);
        fflush;
        cout << "Enter your roll no ::";
        cin >> roll_no;
        cout << "Enter your class ::";
        cin >> Class;
        cout << "Enter the year ::";
        cin >> year;
        cout << "Enter your Total marks ::";
        cin >> t_marks;
        cin.ignore();

      }

    void write()                                          //defining function to write in the text file
      {                                                  //defining output stream cursor to write in the text file
        ofstream out("sample.txt" , ios::app);
        out << "***** Details of the student *****\n";
        out << "Name ::" << name << "\n" ;
        out << "Roll No. ::" << roll_no << "\n" ;
        out << "Class ::" << Class << "\n" ;
        out << "Year ::" << year << "\n" ;
        out << "Total marks ::" << t_marks << "\n";
        out << "**********************************\n\n";
      }
    void display()                                          //defining function to display inputted data
      {
        cout << "Roll No. ::" << roll_no << endl;
        cout << "Name ::" << name << endl;
        cout << "Class ::" << Class << endl;
        cout << "Year ::" << year << endl;
        cout << "Total marks ::" << t_marks;
      }

  };

int main()
  {
       student arr[5];                                              //defining class student object

       for(int i=0 ; i<5 ; i++)                                     //loop to enter data of 5 students
               {
                        cout << "***** Enter the details of the student " << i+1 << " *****" << endl;
                        arr[i].getdata();
                        cout << endl;                                    //taking input from the user
               }

        for(int i=0 ; i<5 ; i++)                                  //loop to print and write data of 5 students
               {
                        cout << "***** Details of the student " << i+1 << " *****" << endl;
                        arr[i].display();                                  //printing the data to the user
                        arr[i].write();                                    //writing data in the text file
                        cout << endl;
                        cout << "**** Saved this data successfully ****" << endl << endl;
               }
       return 0;

  }
```

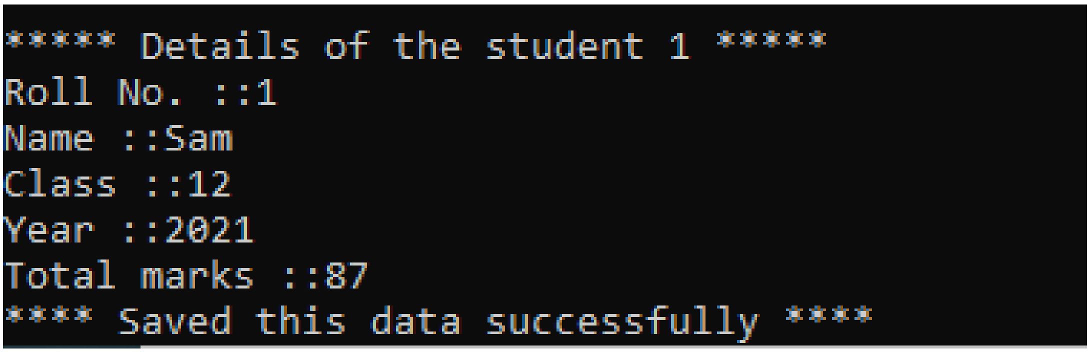
Output:-

1. Giving input to the program

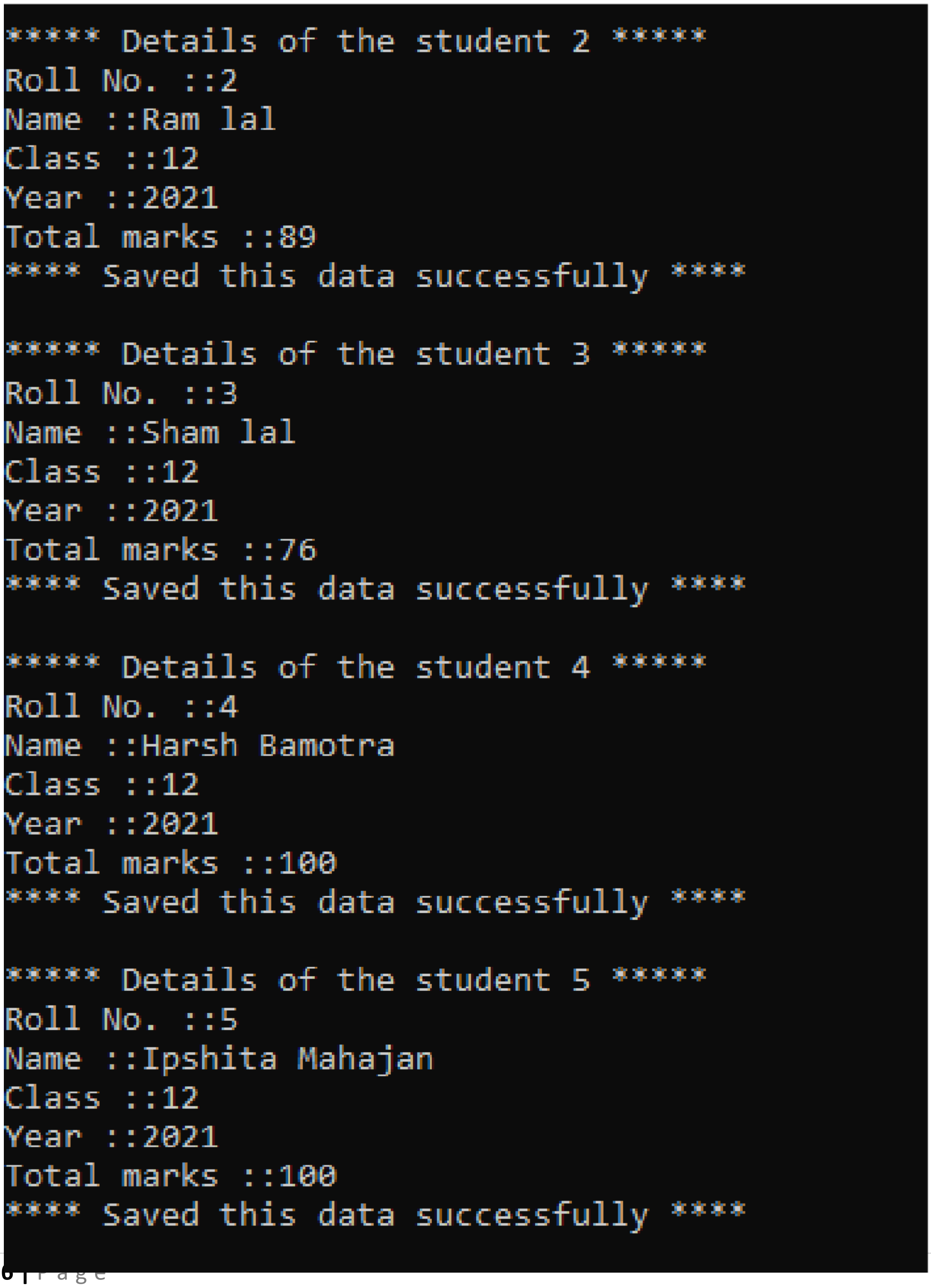


```
C:\Users\harsh\Desktop>Practical-13.exe
***** Enter the details of the student 1 *****
Enter your name ::Sam
Enter your roll no ::1
Enter your class ::12
Enter the year ::2021
Enter your Total marks ::87

***** Enter the details of the student 2 *****
Enter your name ::Ram lal
Enter your roll no ::2
Enter your class ::12
Enter the year ::2021
Enter your Total marks ::89

***** Enter the details of the student 3 *****
Enter your name ::Sham lal
Enter your roll no ::3
Enter your class ::12
Enter the year ::2021
Enter your Total marks ::76

***** Enter the details of the student 4 *****
Enter your name ::Harsh Bamotra
Enter your roll no ::4
Enter your class ::12
Enter the year ::2021
Enter your Total marks ::100

***** Enter the details of the student 5 *****
Enter your name ::Ipshita Mahajan
Enter your roll no ::5
Enter your class ::12
Enter the year ::2021
Enter your Total marks ::100
```

2. Showing the data to the user

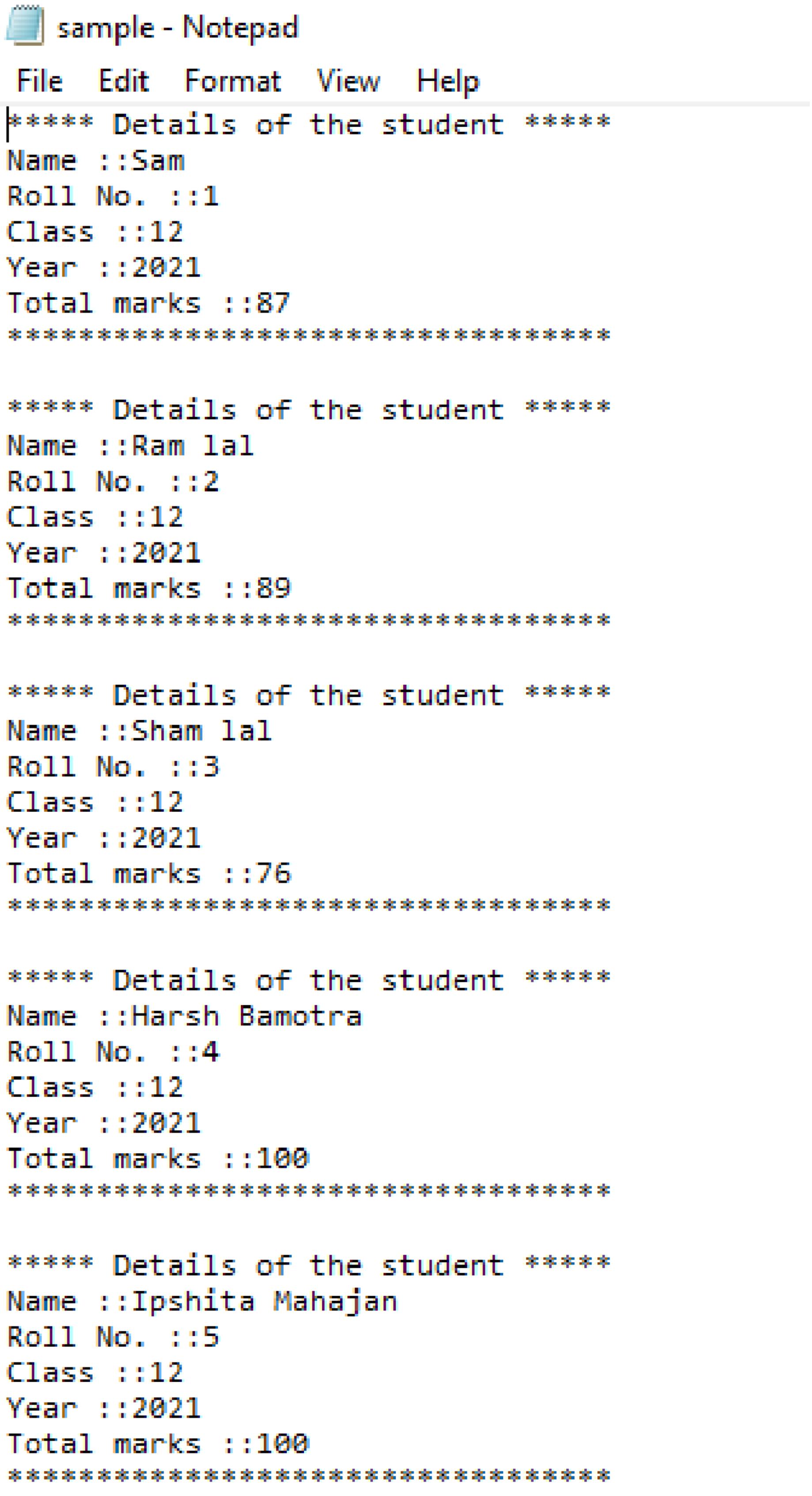


```
***** Details of the student 1 *****
Roll No. ::1
Name ::Sam
Class ::12
Year ::2021
Total marks ::87
**** Saved this data successfully ****
```



```
***** Details of the student 2 *****
Roll No. ::2
Name ::Ram lal
Class ::12
Year ::2021
Total marks ::89
**** Saved this data successfully ****

***** Details of the student 3 *****
Roll No. ::3
Name ::Sham lal
Class ::12
Year ::2021
Total marks ::76
**** Saved this data successfully ****

***** Details of the student 4 *****
Roll No. ::4
Name ::Harsh Bamotra
Class ::12
Year ::2021
Total marks ::100
**** Saved this data successfully ****

***** Details of the student 5 *****
Roll No. ::5
Name ::Ipshita Mahajan
Class ::12
Year ::2021
Total marks ::100
**** Saved this data successfully ****
```

3. Data saved in the text file



```
***** Details of the student *****
Name ::Sam
Roll No. ::1
Class ::12
Year ::2021
Total marks ::87
**********************************

***** Details of the student *****
Name ::Ram lal
Roll No. ::2
Class ::12
Year ::2021
Total marks ::89
**********************************

***** Details of the student *****
Name ::Sham lal
Roll No. ::3
Class ::12
Year ::2021
Total marks ::76
**********************************

***** Details of the student *****
Name ::Harsh Bamotra
Roll No. ::4
Class ::12
Year ::2021
Total marks ::100
**********************************

***** Details of the student *****
Name ::Ipshita Mahajan
Roll No. ::5
Class ::12
Year ::2021
Total marks ::100
**********************************
```

Practical-14

Q. Program to copy the contents of a file to another after removing all the whitespaces.

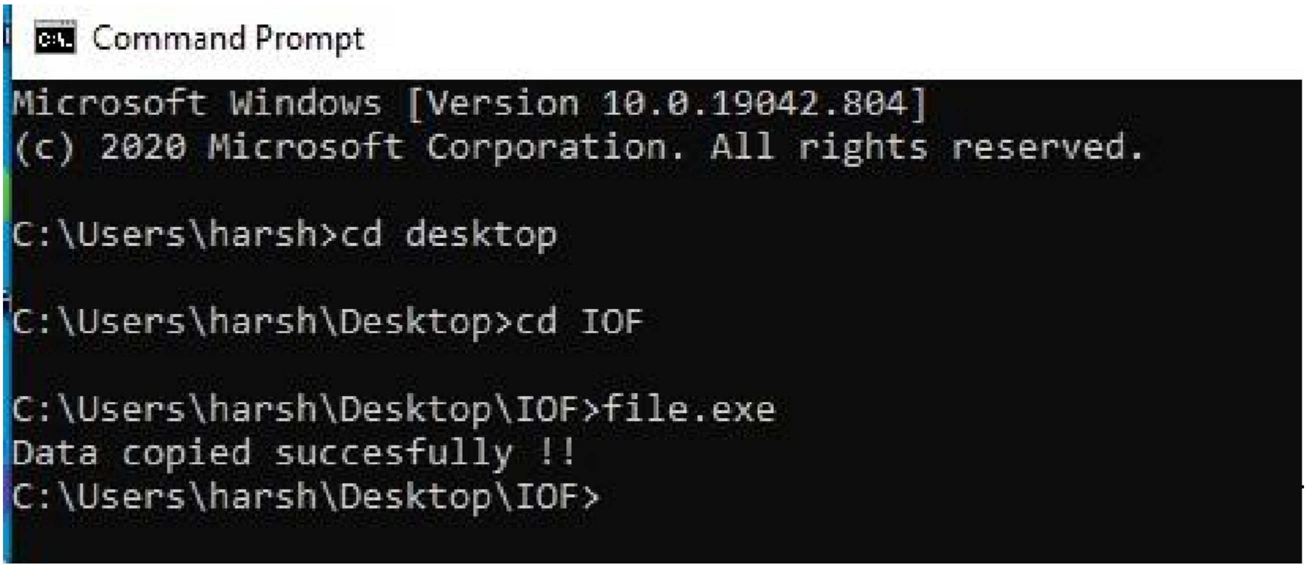
Code:-

```
 //Harsh Bamotra
//Program to copy the contents of a file to other after removing spaces.

#include <iostream>
#include <fstream>
using namespace std;

int main()
  {
        string str;                  //defining string str
        ifstream in("a.txt");                       //defining cursor for reading from the text file
        if(in)
                {
                        cout << "Data copied succesfully !!";
                }
        else
                {
                        cout << "File not found !!";
                }

        ofstream out("a1.txt");                     //defining cursor for writing in the text file
        while(in)
                {
                in >> str;                                  //reading from the file a
                if(str!=" ")                                //checking for whitespaces
                        {
                                        out << str;                 //writing in the file
                        }

                if(in.eof())                            //checking the end of the file
                        {
                                        break;          //breaking the loop at the end of the file
                        }
                }

        return 0;
  }
```

Output:-

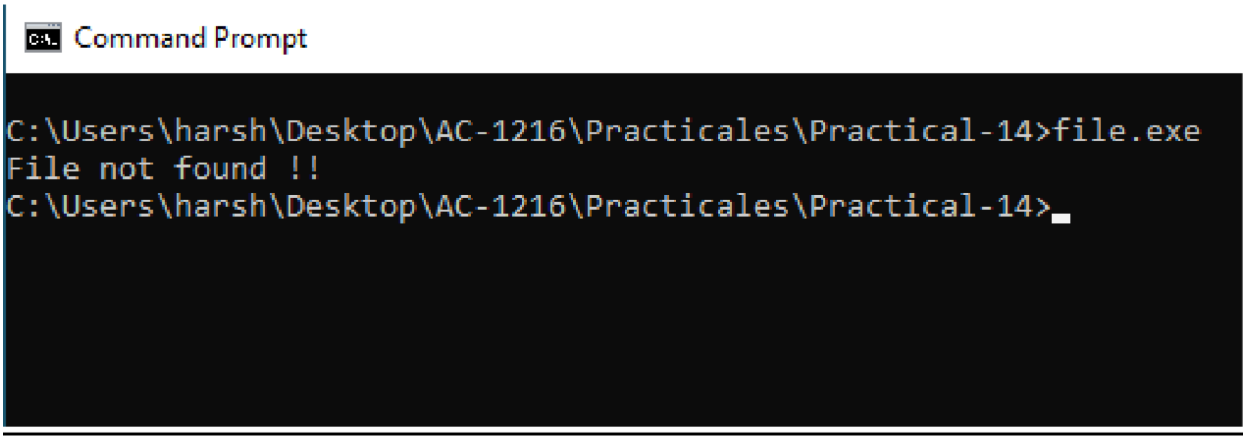
1. Message in the console .

When file is present in the directory



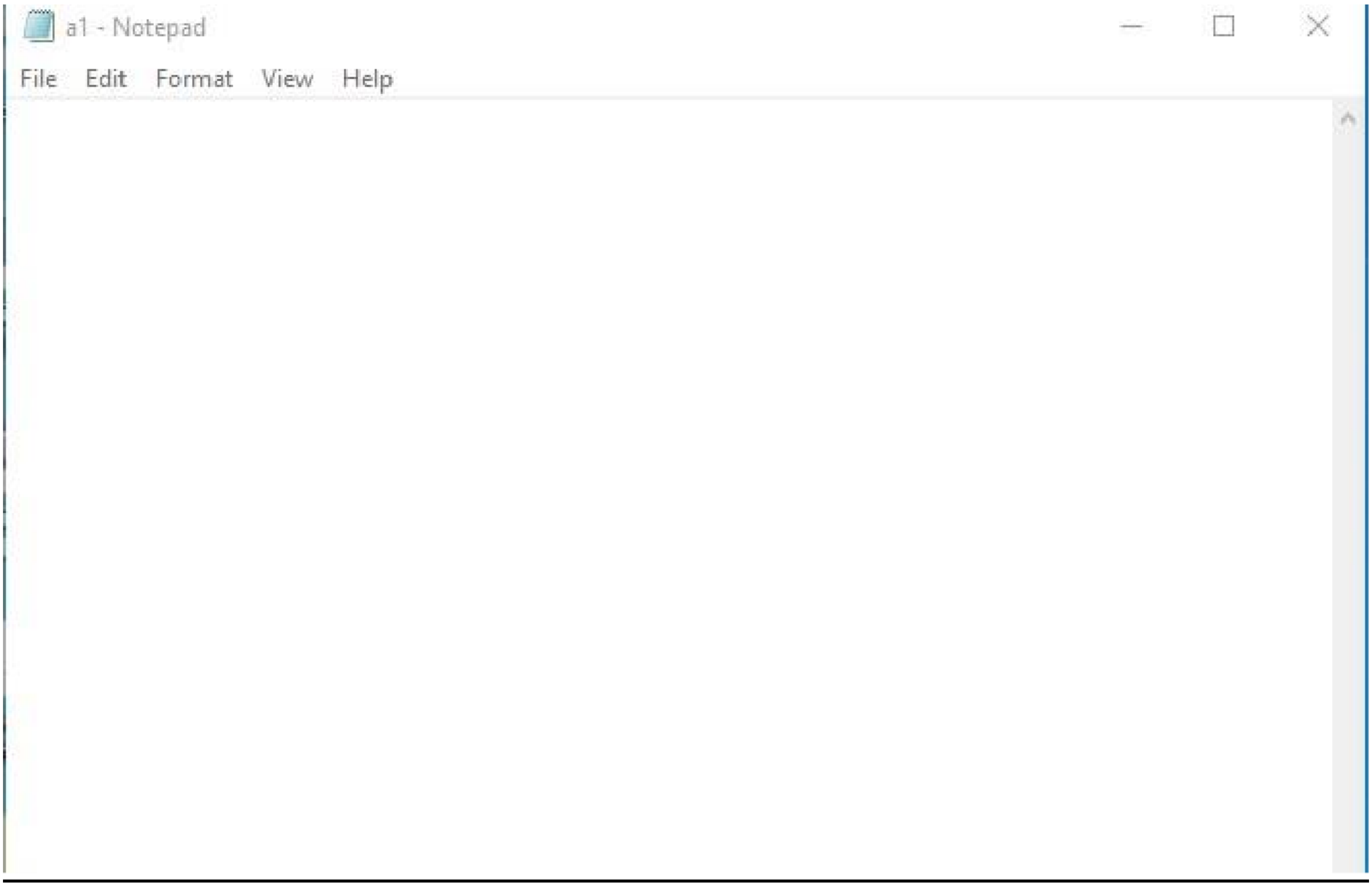
```
Microsoft Windows [Version 10.0.19042.804]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\harsh>cd desktop

C:\Users\harsh\Desktop>cd IOF

C:\Users\harsh\Desktop\IOF>file.exe
Data copied succesfully !!
C:\Users\harsh\Desktop\IOF>
```

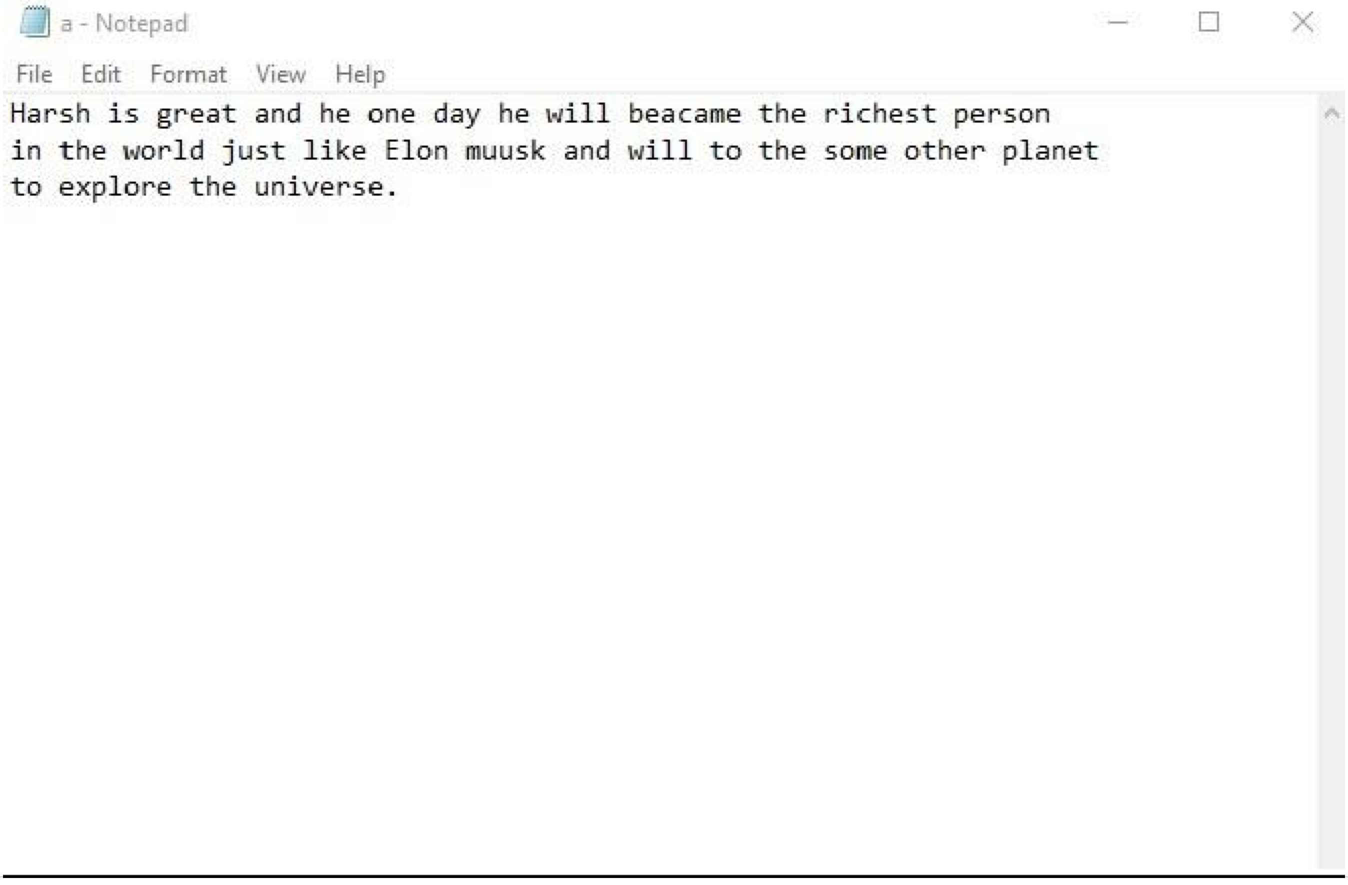
When file is present not in the directory



```
C:\Users\harsh\Desktop\AC-1216\Practicales\Practical-14>file.exe
File not found !!
C:\Users\harsh\Desktop\AC-1216\Practicales\Practical-14>
```

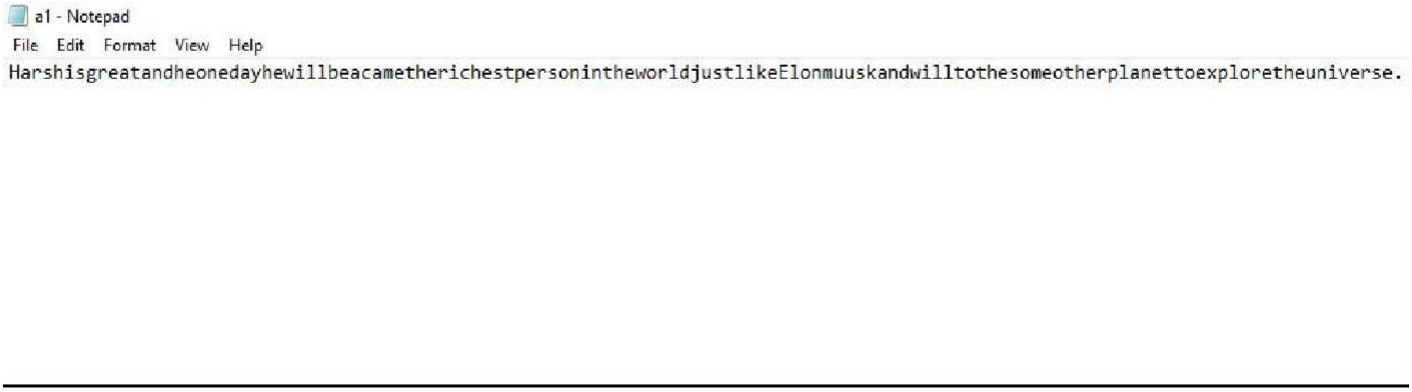
2. Both files before coping





```
Harsh is great and he one day he will beacame the richest person
in the world just like Elon muusk and will to the some other planet
to explore the universe.
```

3. File after copying the content



```
HarshisgreatandheonedayhewillbeacametherichestpersonintheworldjustlikeElonmuuskandwilltothesomeotherplanettoexploretheuniverse.
```