Lab manual Programs (week 7 - 9)

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Week 7

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

1i))

1)Problem statement:

Write a C program to perform the basic Matrix operations
i) Addition

2)Pseudo code:

Start

Define a[2][3],b[2][3],c[2][3],i,j

Input the matrix a and b

Then

For(i=0;i<2;i++)

For(i=0;i<3;j++)

c[i][j]=a[i][j]+b[i][j]

then output the c matrix

For(i=0;i<2;i++)

For(i=0;i<3;j++)

Output (c[i][j])

3)Executable C program :

```c
#include <stdio.h>
#include <conio.h>
void main()
{
    int a[2][3],b[2][3],c[2][3],i,j;

    printf("\nENTER VALUES FOR MATRIX A:\n");
    for(i=0;i<2;i++)
        for(j=0;j<3;j++)
            scanf("%d",&a[i][j]);
    printf("\nENTER VALUES FOR MATRIX B:\n");
    for(i=0;i<2;i++)
        for(j=0;j<3;j++)
            scanf("%d",&b[i][j]);
    for(i=0;i<2;i++)
        for(j=0;j<3;j++)
            c[i][j]=a[i][j]+b[i][j];
    printf("\nTHE VALUES OF MATRIX C ARE:\n");
    for(i=0;i<2;i++)
        {
        for(j=0;j<3;j++)
            printf("%5d",c[i][j]);
        printf("\n");
    }
    getch();
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> .\1i

ENTER VALUES FOR MATRIX A:
1
2
3
4
5
6

ENTER VALUES FOR MATRIX B:
1
2
3
4
5
6

THE VALUES OF MATRIX C ARE:
   2   4   6
   8  10  12
```

1ii))

1)Problem statement:

ii) Subtraction

2)Pseudo code:

Start

Define a[2][3],b[2][3],c[2][3],i,j

Input the matrix a and b

Then

For(i=0;i<2;i++)

For(i=0;i<3;j++)

c[i][j]=a[i][j]-b[i][j]

then output the c matrix

For(i=0;i<2;i++)

For(i=0;i<3;j++)

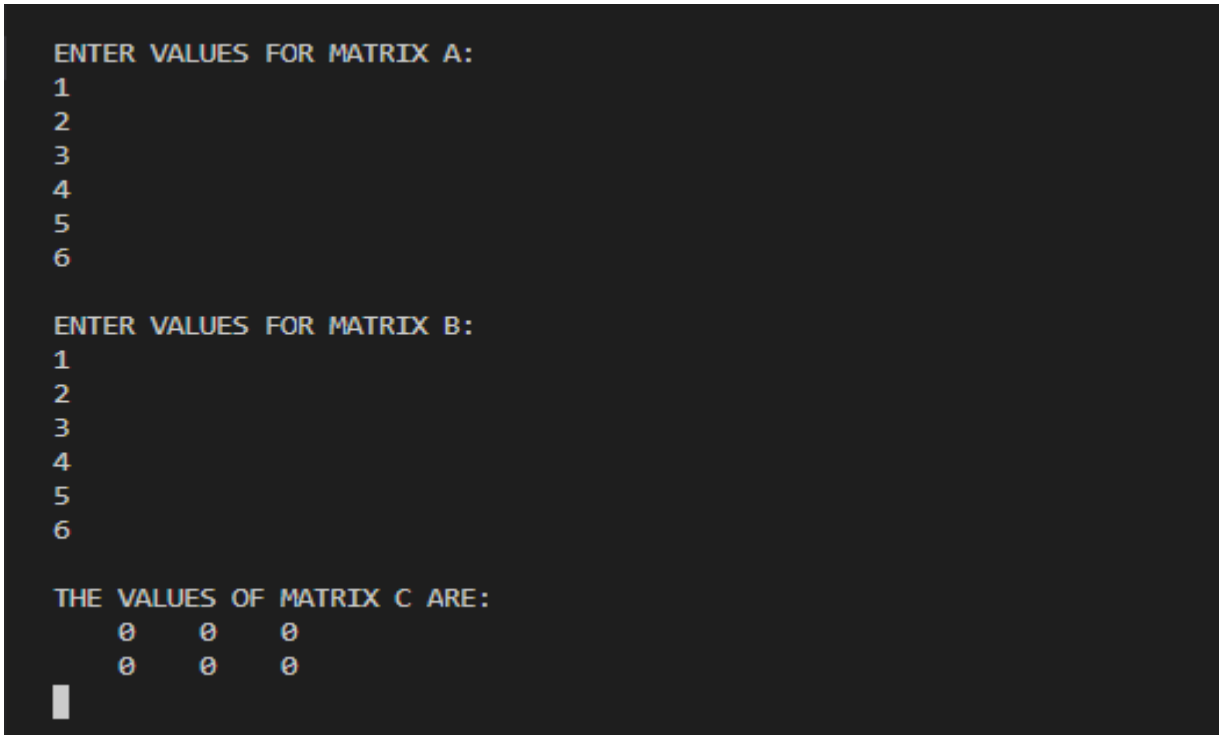
Output (c[i][j])

3)Executable C program :

```c
#include <stdio.h>
#include <conio.h>
void main()
{
    int a[2][3],b[2][3],c[2][3],i,j;

    printf("\nENTER VALUES FOR MATRIX A:\n");
    for(i=0;i<2;i++)
        for(j=0;j<3;j++)
            scanf("%d",&a[i][j]);
    printf("\nENTER VALUES FOR MATRIX B:\n");
    for(i=0;i<2;i++)
        for(j=0;j<3;j++)
            scanf("%d",&b[i][j]);
    for(i=0;i<2;i++)
        for(j=0;j<3;j++)
            c[i][j]=a[i][j]-b[i][j];
    printf("\nTHE VALUES OF MATRIX C ARE:\n");
    for(i=0;i<2;i++)
        {
        for(j=0;j<3;j++)
            printf("%5d",c[i][j]);
        printf("\n");
    }
    getch();
}
```

4)Output:



1iii))

1)Problem statement:

iii) Multiplication

2)Pseudo code:

Start

Define a[2][3],b[2][3],c[2][3],i,j

Input the matrix a and b

Then

For(i=0;i<2;i++)

For(i=0;i<3;j++)

Mul[i][j]+=a[i][k]*b[k][j]

then output the c matrix

For(i=0;i<2;i++)

For(i=0;i<3;j++)

Output (mul[i][j])

3)Executable C program :

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int a[10][10],b[10][10],mul[10][10],r,c,i,j,k;
    printf("Enter the number of rows:");
    scanf("%d",&r);
    printf("Enter the number of columns: ");
    scanf("%d",&c);
    printf("Enter the elements of tne first matrix");
    for(i=0;i<r;i++)
    {
        for(j=0;j<c;j++)
            scanf("%d",&a[i][j]);
    }
        printf("Enter the elements of tne second matrix");
    for(i=0;i<r;i++)
    {
        for(j=0;j<c;j++)
            scanf("%d",&b[i][j]);
    }
    printf("Multiplication matrix is :\n");
    for(i=0;i<r;i++)
     {
         for(j=0;j<c;j++)
          {
             mul[i][j]=0;
             for(k=0;k<c;k++)
              {
                 mul[i][j]=mul[i][j]+a[i][k]*b[k][j];
              }
          }
     }
    for(i=0;i<r;i++)
```

```
    {
        for(j=0;j<c;j++)
            printf("%d  ",mul[i][j]);
        printf("\n");
    }


}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> gcc 1iii.c -o 1iii
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> .\1iii
Enter the number of rows:3
Enter the number of columns: 3
Enter the elements of tne first matrix1
2
3
4
5
6
7
8
9
Enter the elements of tne second matrix1
2
3
4
5
6
7
8
9
Multiplication matrix is :
30  36  42
66  81  96
102  126  150
```

1iv))

1)Problem statement:

iv) Transpose.

2)Pseudo code:

Start

Define a[2][3],b[2][3],c[2][3],i,j

Input the matrix a and temp

Then

For(i=0;i<2;i++)

For(i=0;i<3;j++)

Temp[j][i]=a[i][j]

then output the c matrix

For(i=0;i<2;i++)

For(i=0;i<3;j++)

Output (temp [i][j])

3)Executable C program :

```
//iv)transpose
#include <stdio.h>
#include <conio.h>
void main()
{
    int a[10][10],tr[10][10],r,c,i,j;
    printf("Enter the number of rows:");
    scanf("%d",&r);
    printf("Enter the number of columns: ");
    scanf("%d",&c);
    printf("Enter the elements of the a matrix:\n");
```

```
    for(i=0;i<r;i++)
    {
        for(j=0;j<c;j++)
            scanf("%d",&a[i][j]);
    }
    printf("the matrix you have entered is:\n");
    for(i=0;i<r;i++)
    {
        for(j=0;j<c;j++)
        {
            printf("%d ",a[i][j]);
        }
        printf("\n");
    }
    for(i=0;i<r;i++)
    {
        for(j=0;j<c;j++)
        {
            tr[j][i]=a[i][j];
        }
    }
    printf("the Transpose of the matrix is:\n");
    for(i=0;i<c;i++)
    {
        for(j=0;j<r;j++)
        {
            printf("%d ",tr[i][j]);
        }
        printf("\n");
    }
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> gcc 1iv.c -o 1iv
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> .\1iv
Enter the number of rows:3
Enter the number of columns: 2
Enter the elements of the a matrix:
1
2
3
4
5
6
the matrix you have entered is:
1 2
3 4
5 6
the Transpose of the matrix is:
1 3 5
2 4 6
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7>
```

2))

1)Problem statement:

Write a C program to determine if the given string is a palindrome or not

2)Pseudo code:

Start

Declare s[1000]

Input the string

Find the length of the string

Start for loop

For(i=0;i<n;i++)

  If(s[i]==s[n-i-1]

    Increase c by 1

If c==i

Output string is palindrome

Else

Output string is not a palindrome

3)Executable C program :

```c
#include <stdio.h>
#include <string.h>

int main()
{
    char s[1000];
    int i,n,c=0;

    printf("Enter  the string : ");
    gets(s);
    n=strlen(s);

    for(i=0;i<n;i++)
    {
        if(s[i]==s[n-i-1])
        c++;

    }
    if(c==i)
        printf("string is palindrome");
    else
        printf("string is not palindrome");



  return 0;
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> .\2
Enter  the string : archana
string is not palindrome
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> .\2
Enter  the string : programming
string is not palindrome
```

3))

1)Problem statement:

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

2)Pseudo code:

Start

Declare str[100],words=0;newline=0;characters=0

Input the string

Start the for loop

For(i=0;str[i]!='\0';i++)

If(str[i]==' ')

Increments words by 1

Else if(str[i]!=' ' and str[i]!='\n'

Increment character++

If character>0

Increment words by 1

Increment newline by 1

Then

Output

Total words Total lines Total characters

3)Executable C program :

```
#include <stdio.h>
int main()
{
    char str[100];//input string with size 100

    int words=0,newline=0,characters=0; // counter var
iables

    printf("Enter the string that terminates with #\n"
);

    scanf("%[^#]",&str);//scanf formatting

    for(int i=0;str[i]!='\0';i++)
     {
         if(str[i] == ' ')
         {
              words++;
         }
         else if(str[i] == '\n')
         {
             newline++;
              words++;//since with every next line new
 words start. corner case 1
         }
         else if(str[i] != ' ' && str[i] != '\n'){
         characters++;
         }
     }
    if(characters > 0)//Corner case 2,3.
    {
        words++;
        newline++;
```

```
    }
     printf("Total number of words : %d\n",words);
     printf("Total number of lines : %d\n",newline);
     printf("Total number of characters : %d\n",charac
ters);
    return 0;
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7> .\3
Enter the string that terminates with #
The scanf() function reads the sequence of characters until it encounters whitespace
#
Total number of words : 13
Total number of lines : 2
Total number of characters : 73
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week7>
```

Week 8

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

1i))

1)Problem statement:

Write a C Function for the following task
i) Calculating Factorial

2)Pseudo code:

Start

Declare num,factorial

Input num

Call fact

Factorial=fact(num);

Output factorial

Define fact()

Define factorial=1

For(i=1;i<=num;i++)

Factorial=factorial*i

Return(factorial);

End

3)Executable C program :

```c
//i) Calculating Factorial
#include <stdio.h>
int fact(int);
int main()
{
    int num;
    int factorial;
    printf("Enter a number:");
    scanf("%d",&num);
    factorial=fact(num);
    printf("Factorial of %d = %ld\n",num,factorial);
    return 0;
}
int fact(int num)
{
    int i;
    int factorial=1;
    for(i=1;i<=num;i++)
        factorial=factorial*i;
    return(factorial);
```

```
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs> cd week8
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\1i
Enter a number:5
Factorial of 5 = 120
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\1i
Enter a number:8
```

1ii))

1)Problem statement:

ii) Find value of a given Fibonacci term

2)Pseudo code:

Start

Declare n,Fibonacci

Input n

Call fibo(n);

Define fibo(n)

Declare a=0,b=1,c,i

Start for loop

For(i=1;i<n;i++)

Output a

c=a+b

a=b

b=c

3)Executable C program :

```
//ii) Find value of a given Fibonacci term
```

```c
#include<stdio.h>
int fibo(int);
int main()
{
int n,fibonacci;
printf("Enter any number:");
scanf("%d",&n);
fibo(n);
return 0;
}

int fibo(int n)
{  int a=0,b=1,c,i;
printf("the %d fibonacci series are:",n);
  for(i=1;i<=n;i++)
  {
    printf("%d ",a);
    c=a+b;
    a=b;
    b=c;
   }
  ;
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\1ii
Enter any number:6
the 6 fibonacci series are:0 1 1 2 3 5
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\1ii
Enter any number:8
the 8 fibonacci series are:0 1 1 2 3 5 8 13
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8>
```

1iii))

1)Problem statement:

iii) Swapping the values of two variable

2)Pseudo code:

Start

Declare a,b

Call function swap(a,b)

Go to function definition

Swap(int a,int b)

Declare Int temp

temp=a

a=b

b=temp

output a,b

3)Executable C program :

```c
//iii) Swapping the values of two variable
#include <stdio.h>
void swap(int,int);
int main()
{
    int a,b;
    printf("Enter a:");
    scanf("%d",&a);
    printf("Enter b:");
    scanf("%d",&b);
    swap(a,b);
    return 0;
}
void swap(int a,int b)
```

```c
{
    int temp;
    temp=a;
    a=b;
    b=temp;
    printf("a=%d  b=%d\n",a,b);
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\1iii
Enter a:4
Enter b:7
a=7  b=4
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\1iii
Enter a:6
Enter b:9
a=9  b=6
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8>
```

2i))

1)Problem statement:

2. Write a C program that uses functions to perform the following operations:
i) To insert a sub-string in to a given main string from a given position.

2)Pseudo code:

Start

Declare i,pos,str[100],substr[30]

Input i,pos

Call substring(str,substr,i);

Defining substring(str,substr,int)

Declare temp[100],m,n,k,j

m=strlen(str)

n=strlen(substr)

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

temp[j]=str[j]

for(j=1,k=0;j<m,k<m;j++,k++)

temp[j]=subtr[k]

for(j=n+I,k=i;j<m,k<m;j++,k++)

temp[j]=str[k]

output temp

3)Executable C program :

```
#include <stdio.h>
#include <string.h>

//Declaration of function substring to insert substrin
g into main string
void substring(char str[100],char substr[30],int i);

//Main function to execute program
void main()
{
char str[100],substr[30];
int i,pos;
printf("\nEnter the main string:");
gets(str);
printf("\nEnter the sub string:");
gets(substr);
printf("\nEnter the position where you want to insert
sub string:");
scanf("%d",&pos);
i=pos-1;
```

```
//Call to substring() function to perform required tas
k
substring(str,substr,i);
}

//Definition of substring() function
void substring(char str[100],char substr[30],int i)
{
char temp[100];
int m,n,k,j;

//strlen(str) function to measure length of the string
m=strlen(str);
n=strlen(substr);

//str is copied into temp from 0 to i
for(j=0;j<i;j++)
{
temp[j]=str[j];
}

//substr is copied into temp from i to n
for(j=i,k=0;j<n+i,k<n;j++,k++)
temp[j]=substr[k];

//remaining str is copied into temp from n+i to m
for(j=n+i,k=i;j<m,k<m;j++,k++)
temp[j]=str[k];

//puts() function to print temp
puts(temp);
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> gcc 2.c -o 2
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\2

Enter the main string:programming for

Enter the sub string:problem solving

Enter the position where you want to insert sub string:16
programming forproblem solving
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8>
```

2ii))

1)Problem statement:

ii) To delete n Characters from a given position in a given string.

2)Pseudo code:

Start

Declare string[20],pos,n

Input string[20],pos,n

Call delchar(string,n,pos)

Define delchar(char *string,int n,int pos)

If n+pos-1<=strlen(string)

Strcpy(&string[pos-1],&string[n+pos-1])

Output string

End

3)Executable C program :

```c
#include <stdio.h>
#include <conio.h>
#include <string.h>
 void delchar(char *string,int n, int pos);
```

```c
int main()
{
     char string[20];
     int n,pos;

     puts("Enter a string :");
     gets(string);
     printf("Enter the position from where you want to
 delete:");
     scanf("%d",&pos);
     printf("Enter the number of characters to be dele
ted :");
     scanf("%d",&n);
     delchar(string, n,pos);
}

// Function to delete n characters
void delchar(char *string,int n, int pos)
{
  if ((n+pos-1) <= strlen(string))
  {
    strcpy(&string[pos-1],&string[n+pos-1]);
    puts(string);
    }
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8> .\3
Enter a string :
archana
Enter the position from where you want to delete:1
Enter the number of characters to be deleted :1
rchana
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week8>
```

Week 9

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

1))

1)Problem statement:

1) Write the following recursive C Function
i) Factorial of a given number

2)Pseudo code:

Start

Declare a,fact

Input a

Call rec(a);

Define rec(int a)

Declare int f

If x==1

Return 1

Else

F=x*rec(x-1)

Return f

End

3)Executable C program :

```c
//i) Factorial of a given number
#include <stdio.h>
int rec(int);
int main()
{
    int a,fact;
    printf("Enter any number:");
    scanf("%d",&a);
    fact=rec(a);
    printf("factorial value=%d\n",fact);
    return 0;
}
int rec(int x)
{
    int f;
    if(x==1)
      return 1;
    else
      f=x*rec(x-1);
    return(f);
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9> .\1
Enter any number:5
factorial value=120
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9> .\1
Enter any number:6
factorial value=720
```

1ii))

1)Problem statement:

ii) Nth Fibonacci number

2)Pseudo code:

Start

Declare num,result

Input num

If num<0

Output Fibonacci of negative number is not possible

Else

Result=fibo(num);

Output the Fibonacci series nth number is result

Define fibo(num)

If num==0

Return 0

Else if num==1

Return 1

Else

return(fibo(num-1)+fibo(num-2));

3)Executable C program :

```c
//Nth Fibonacci number

#include <stdio.h>
int fibo(int);

int main()
{
    int num;
```

```c
    int result;

    printf("Enter the nth number in fibonacci series:
");
    scanf("%d", &num);
    if (num < 0)
    {
        printf("Fibonacci of negative number is not po
ssible.\n");
    }
    else
    {
        result = fibo(num);
        printf("The %d number in fibonacci series is %
d\n", num, result);
    }
    return 0;
}
int fibo(int num)
{
    if (num == 0)
    {
        return 0;
    }
    else if (num == 1)
    {
        return 1;
    }
    else
    {
        return(fibo(num - 1) + fibo(num - 2));
    }
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9> .\1ii
Enter the nth number in fibonacci series: 9
The 9 number in fibonacci series is 34
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9> .\1ii
Enter the nth number in fibonacci series: 10
The 10 number in fibonacci series is 55
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9>
```

1iii))

1)Problem statement:

iii) Reverse of a given String

2)Pseudo code:

Start

Declare str[20],size

Input str

Size=strlen(str)

Call reverse(str,0,size-1);

Output

Reverse_string

Define reverse()

Declare temp

Temp=str[index]

str[index]=str[size-index]

if(index==size/2)

return

reversr(str,index+1,size)

end

3)Executable C program :

```c
/*
 * C Program to Reverse the String using Recursion
 */
#include <stdio.h>
#include <string.h>

void reverse(char [], int, int);
int main()
{
    char str1[20];
    int size;

    printf("Enter a string to reverse: ");
    scanf("%s", str1);
    size = strlen(str1);
    reverse(str1, 0, size - 1);
    printf("The string after reversing is: %s\n", str1
);
    return 0;
}

void reverse(char str1[], int index, int size)
{
    char temp;
    temp = str1[index];
    str1[index] = str1[size - index];
    str1[size - index] = temp;
    if (index == size / 2)
    {
        return;
    }
```

```
    reverse(str1, index + 1, size);
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9> .\1iii
The string after reversing is: anahcra
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9> .\1iii
Enter a string to reverse: programming
The string after reversing is: gnimmargorp
```

1iv))

1)Problem statement:

iv) Reverse of a give Number

2)Pseudo code:

Start

Declare num,reverse_number

Input num

Reverse_number=reverse_function(num);

Output reverse_number

Define reverse_function

Define num

Rem=num%10

Sum=sum*10+rem

Reverse_function(num/10)

Return sum;

End

3)Executable C program :

```c
#include<stdio.h>
int reverse_number(int);
int main(){
   int num,reverse_number;

   //User would input the number
   printf("\nEnter any number:");
   scanf("%d",&num);

   //Calling user defined function to perform reverse
   reverse_number=reverse_function(num);
   printf("\nAfter reverse the no is :%d",reverse_numb
er);
   return 0;
}
int sum=0,rem;
 int reverse_function(int num){
   if(num){
      rem=num%10;
      sum=sum*10+rem;
      reverse_function(num/10);
   }
   else
      return sum;
   return sum;
}
```

4)Output:

```
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9> .\1iv

Enter any number:7467

After reverse the no is :7647
PS C:\Users\user\Desktop\c programming\PPS_lab_programs\week9>
```