Institute of Distance and Open Learning

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CERTIFICATE

This is to certify that Mr/Ms. ____________________________________ of **Master in Computer Application** (MCA) Semester _______ has completed the specified term work in the subject of ____________________________________ satisfactorily within this institute as laid down by University of Mumbai during the academic year 20___ to 20___.

__________ __________ __________

Subject In-charge External Examiner Coordinator – M.C.A

University of Mumbai

Institute of Distance and Open Learning (IDOL)

PCP CENTER – DTSS Malad(E)

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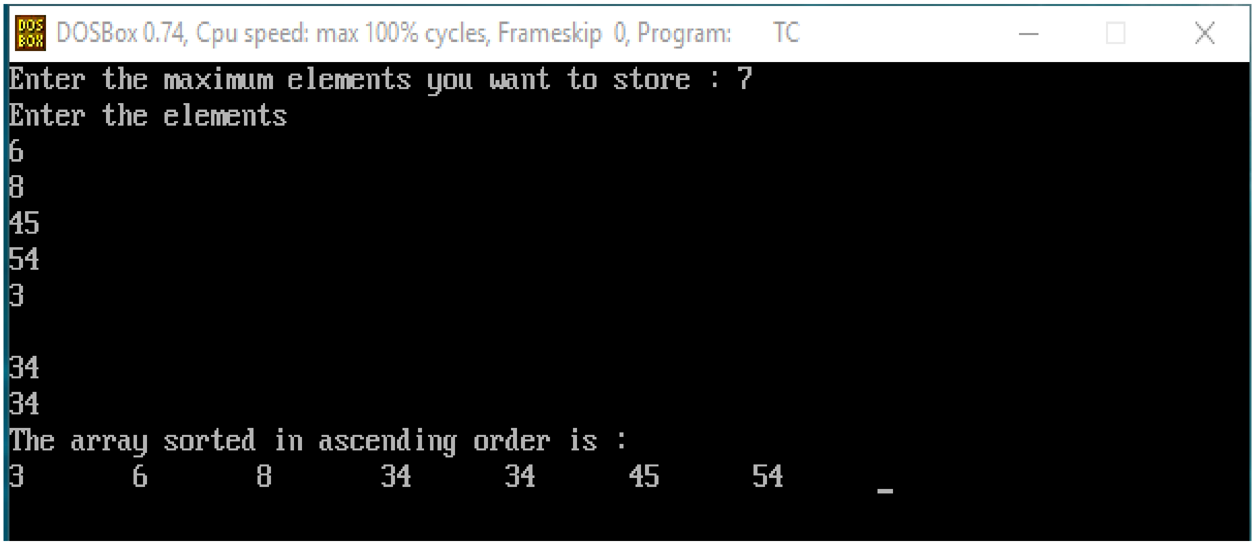


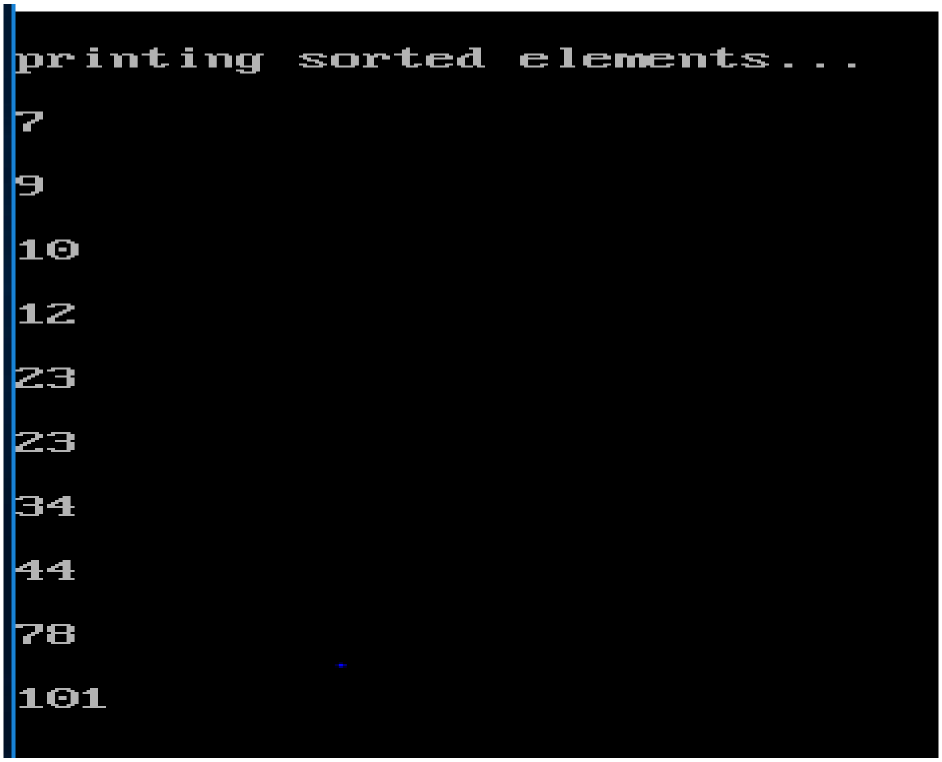
DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC

```
Enter the maximum elements you want to store : 7
Enter the elements
6
8
45
54
3

34
34
The array sorted in ascending order is :
3       6       8       34      34      45      54      _
```

Practical No : 1

Aim : Implement program for Bubble sort

```
#include <stdio.h>
#include <stdlib.h>
int main()
{
 int I, n, temp, j, arr[10];
 printf(“Enter the maximum elements you want to store : “);
 scanf(“%d”, &n);
 printf(“Enter the elements \n”);
 for(i=0;i<n;i++)
 {
 scanf(“%d”, & arr[i]);
 }
for(i=0;i<n;i++)
 {
 for(j=0;j<n-1;j++)
 {
 if(arr[j]>arr[j+1])
 {
 temp = arr[j];
 arr[j] = arr[j+1];
 arr[j+1] = temp;
 }
 }
 }
 printf(“The array sorted in ascending order is :\n”);
 for(i=0;i<n;i++)
 printf(“%d\t”, arr[i]);
 getch();
 return 0;
}
```

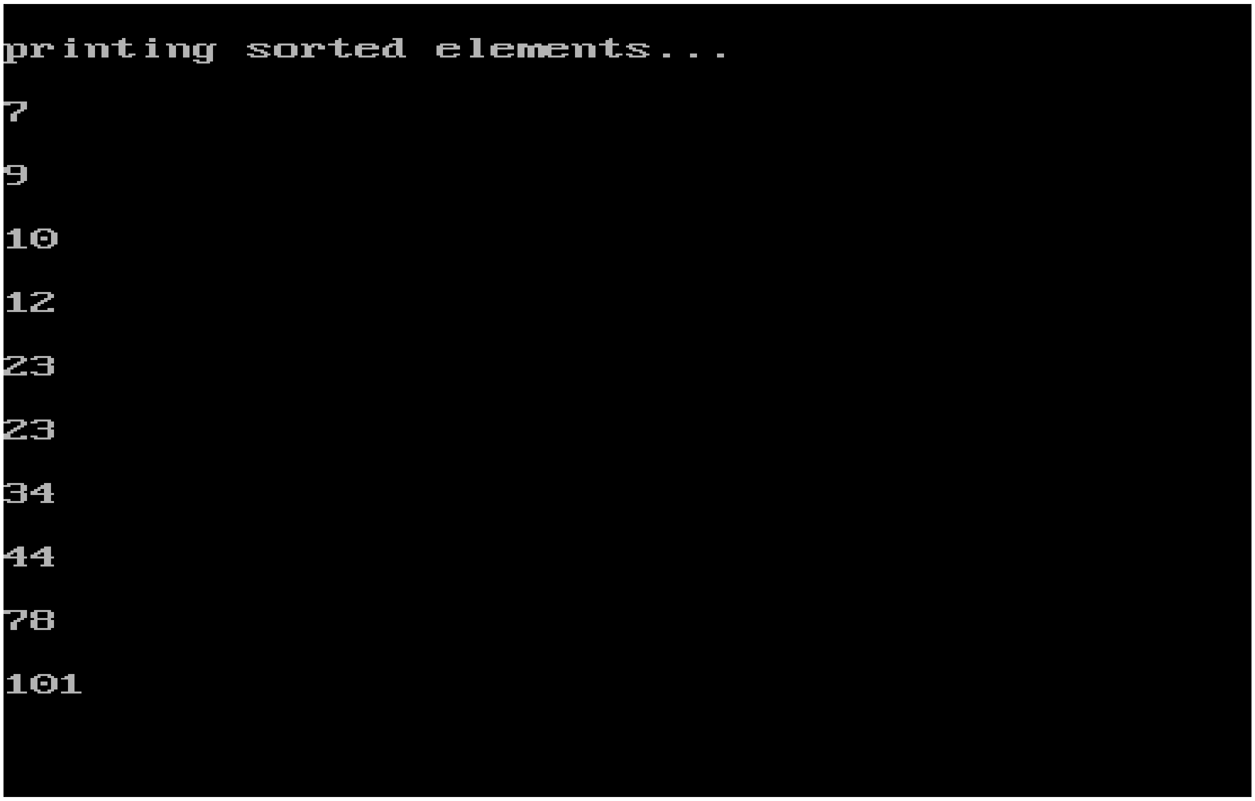


```
printing sorted elements...
7
9
10
12
23
23
34
44
78
101
```

Practical No : 2

Aim : Implement program for Insertion sort

```
#include<stdio.h>
# include<conio.h>
void main()
{
int I,j,k,temp;
int a[10]=
{10,9,7,101,23,44,12,78,34,23};
printf (“\n printing sorted
elements...\n”);
for (k=1;k<10;k++)
{temp = a[k];
j=k-1;
while (j>=0&&temp<=a[j])
{a[j+1]= a[j];
j=j-1;

}
a[j+1]=temp;

}
for (i=0;i<10;i++)
{printf(“\n%d\n”,a[i]);
}
getch();

}
```



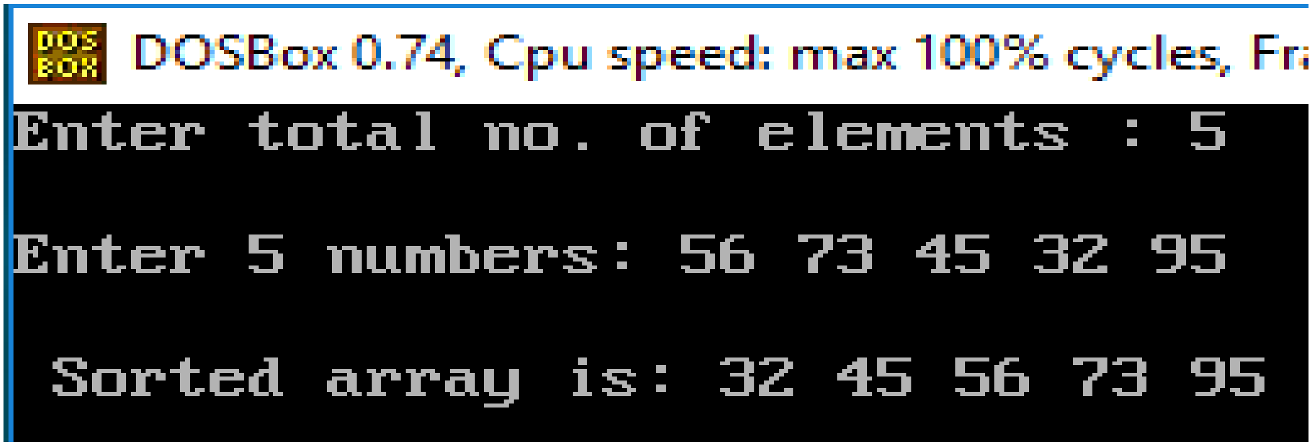
```
printing sorted elements...
7
9
10
12
23
23
34
44
78
101
```

Practical No : 3

Aim : Implement program for Selection Sort

```
#include<stdio.h>
# include<conio.h>
int smallest(int[],int,int);
void main()
{
int
a[10]={10,9,7,101,23,44,12,78,34,23};
int i,j,k,pos,temp;
for(i=0;i<10;i++){
pos=smallest(a,10,i);
temp = a[i];
a[i] = a[pos];
a[pos] = temp;
}
printf("\nprinting sorted element\n");
for(i=0;i<10;i++){
printf("%d\n",a[i]);

}
}
```

```
int smallest(int a[],int
n,int i){
 int small, pos, j;
 small =a[i];
 pos=i;
 for(j=i+1;j<10;j++){
 if(a[j]<small){
 small=a[j];
 pos=j;

 }
 }
 getch();
 return pos;
}
```



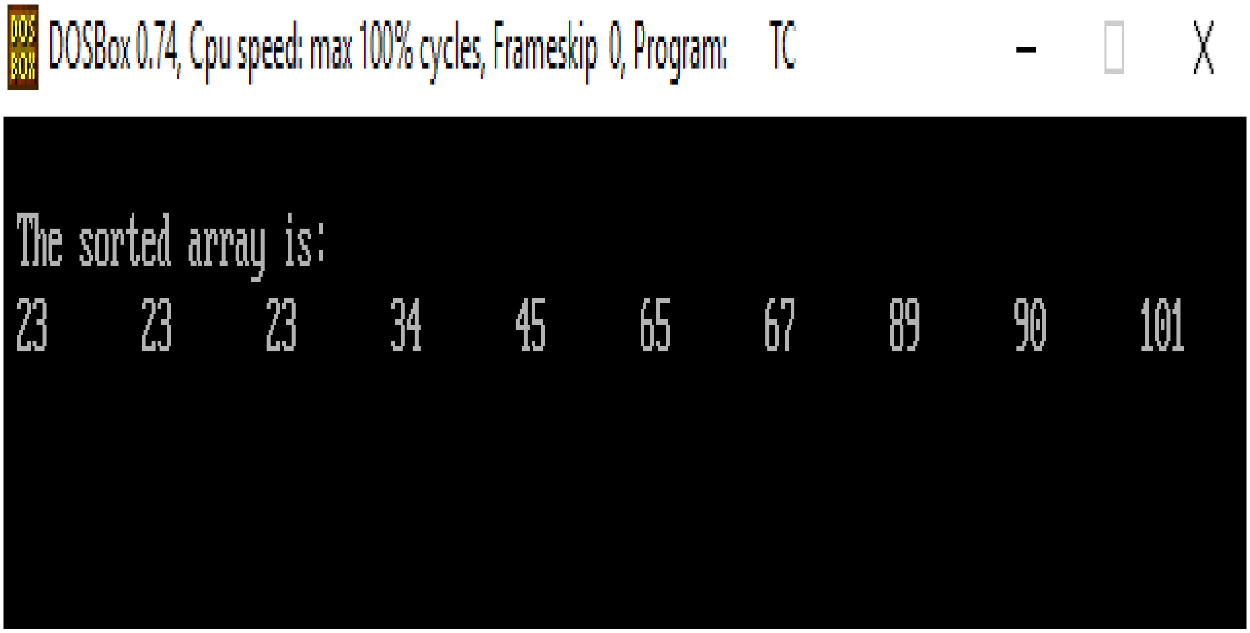
```
Enter total no. of elements : 5

Enter 5 numbers: 56 73 45 32 95

 Sorted array is: 32 45 56 73 95
```

Practical No : 4

Aim : Implement program for Shell Sort

```
#include <stdio.h>
#include <conio.h>
void shellsort(int arr[], int num)
{
int i, j, k, tmp;
for (i = num / 2; i > 0; i = i / 2)
{
for (j = i; j < num; j++)
{
for(k = j - i; k >= 0; k = k - i)
{
if (arr[k+i] >= arr[k])
break;
else
{
tmp = arr[k];
arr[k] = arr[k+i];
arr[k+i] = tmp;
}
}
```

```
int main()
{
int arr[30];
int k, num;
printf("Enter total no. of elements : ");
scanf("%d", &num);
printf("\nEnter %d numbers: ", num);
for (k = 0 ; k < num; k++)
{
scanf("%d", &arr[k]);
}
shellsort(arr, num);
printf("\n Sorted array is: ");
for (k = 0; k < num; k++)
printf("%d ", arr[k]);
return 0;
}
}
}
}
```



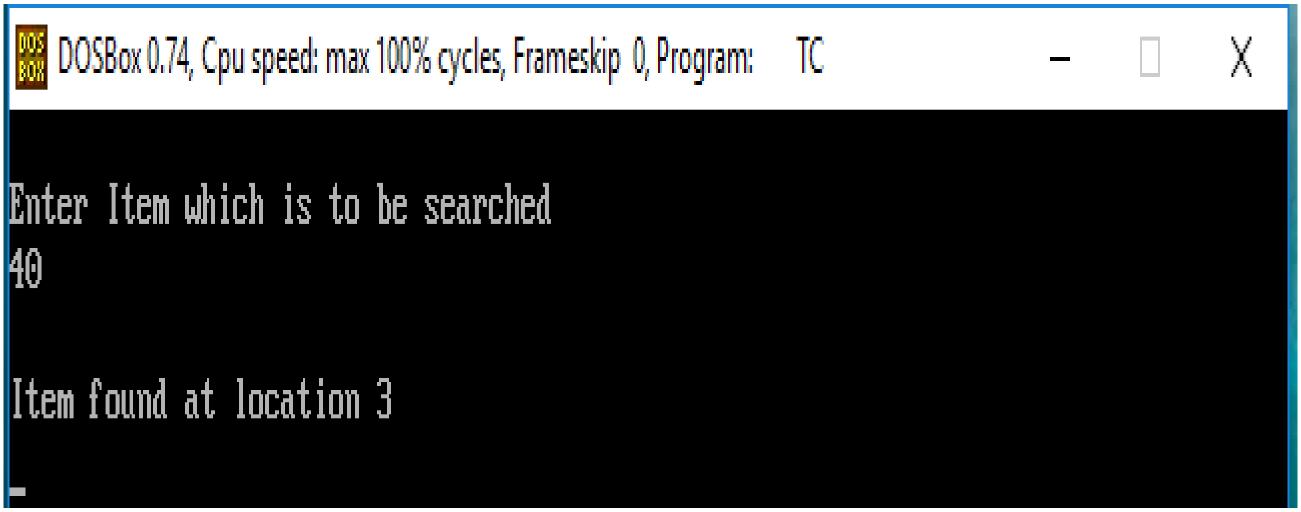
DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC

```
The sorted array is:
23      23      23      34      45      65      67      89      90      101
```

Practical No : 5

Aim : Implement program for Radix Sort

```
#include <stdio.h>
#include <conio.h>
int largest(int a[]);
void radix_sort(int a[]);
void main()
{
int i;
 int a[10]={90,23,101,45,65,23,67,89,34,23};
 radix_sort(a);
 printf("\n The sorted array is: \n");
 for(i=0;i<10;i++)
 printf(" %d\t", a[i]);
}
int largest(int a[])
{
 int larger=a[0], i;
 for(i=1;i<10;i++)
 {
 if(a[i]>larger)
 larger = a[i];
 }
 return larger;
}
void radix_sort(int a[])
{
 int bucket[10][10], bucket_count[10];
 int i, j, k, remainder, NOP=0, divisor=1, larger, pass;
larger = largest(a);
 while(larger>0)
 {
 NOP++;
 larger/=10;
 }
 for(pass=0;pass<NOP;pass++) // Initialize the buckets
 {
 for(i=0;i<10;i++)
 bucket_count[i]=0;
 for(i=0;i<10;i++)
 {
 // sort the numbers according to the digit at passth place
 remainder = (a[i]/divisor)%10;

bucket[remainder][bucket_count[remainder]] = a[i];
 bucket_count[remainder] += 1;
 }
 // collect the numbers after PASS pass
 i=0;
 for(k=0;k<10;k++)
 {
 for(j=0;j<bucket_count[k];j++)
{
 a[i] = bucket[k][j];
 i++;
 }
 }
 divisor *= 10;
}
getch();
}
```



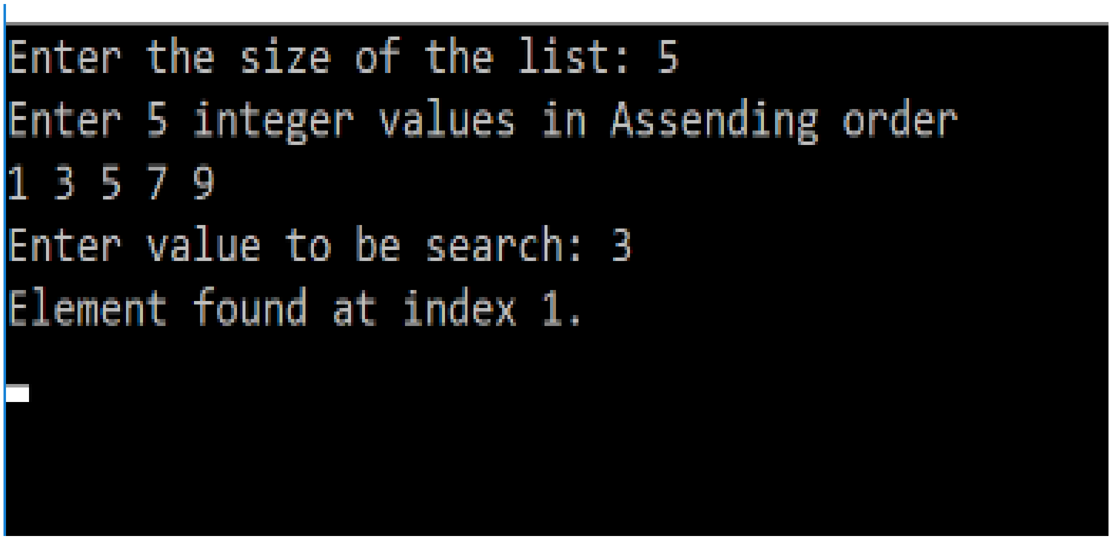
DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC

```
Enter Item which is to be searched
40

Item found at location 3

_
```

Practical No : 6

Aim : Implement   program for Linear Search

```
#include<stdio.h>
#include<conio.h>
void main ()
{
int a[10] = {10, 23, 40, 1, 2, 0,
14, 13, 50, 9};
int item, i, flag;
printf("\nEnter Item which is
to be searched\n");
scanf("%d",&item);
for (i = 0; i< 10; i++)
{
if(a[i] == item)
{
flag = i+1;
break;
}
else
{
flag = 0;
}
}
if(flag != 0)
{
printf("\nItem found at
location %d\n",flag);
}
else
{
printf("\nItem not found\n");
}
getch();
}
```

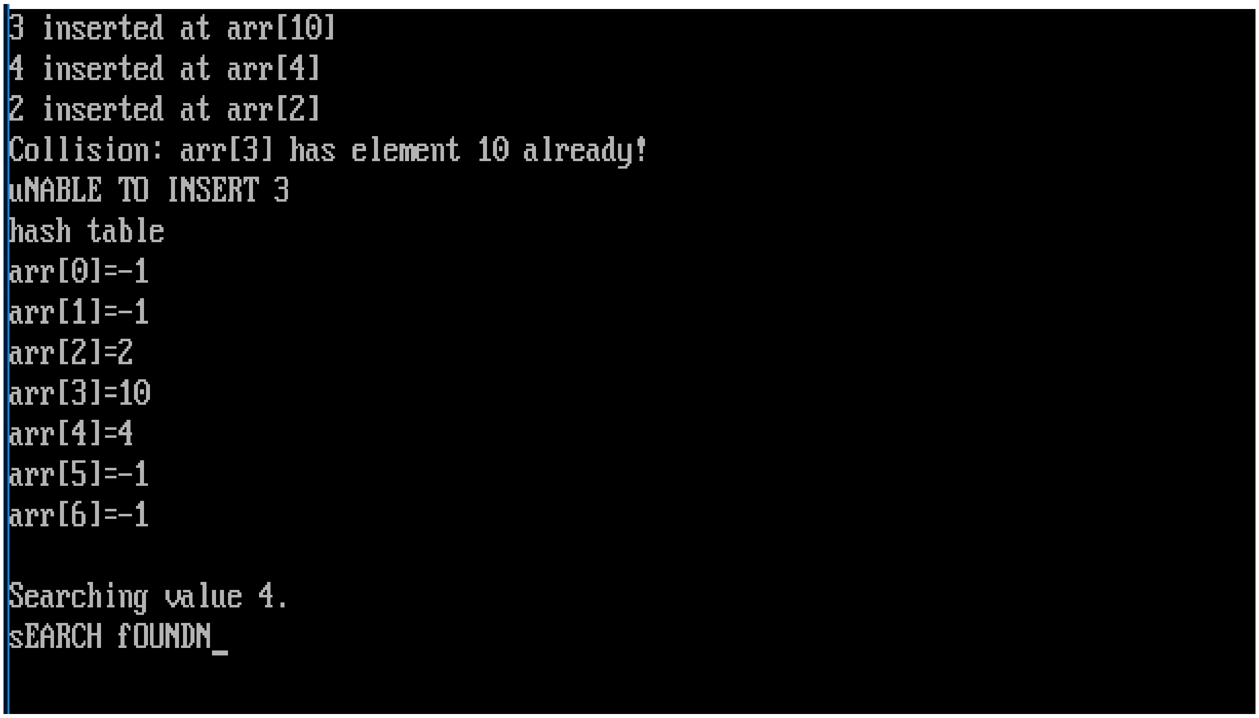


```
Enter the size of the list: 5
Enter 5 integer values in Assending order
1 3 5 7 9
Enter value to be search: 3
Element found at index 1.
```

Practical No : 7

Aim : Implement program for Binary Search.

```
#include<stdio.h>
#include<conio.h>
void main()
{
   int first, last, middle, size, i, sElement, list[100];
   clrscr();

   printf("Enter the size of the list: ");
   scanf("%d",&size);

   printf("Enter %d integer values in Assending order\n", size);

   for (i = 0; i < size; i++)
      scanf("%d",&list[i]);

   printf("Enter value to be search: ");
   scanf("%d", &sElement);

   first = 0;
   last = size - 1;

   middle = (first+last)/2;

   while (first <= last) {
      if (list[middle] < sElement)
         first = middle + 1;
      else if (list[middle] == sElement) {
         printf("Element found at index %d.\n",middle);
         break;
      }
      else
         last = middle - 1;

      middle = (first + last)/2;
   }
   if (first > last)
      printf("Element Not found in the list.");
   getch();
}
```

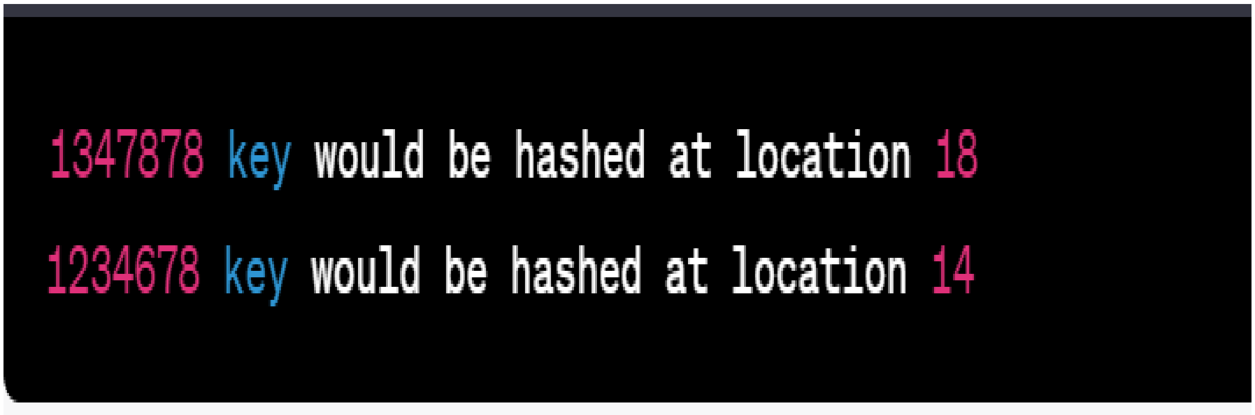


```
3 inserted at arr[10]
4 inserted at arr[4]
2 inserted at arr[2]
Collision: arr[3] has element 10 already!
uNABLE TO INSERT 3
hash table
arr[0]=-1
arr[1]=-1
arr[2]=2
arr[3]=10
arr[4]=4
arr[5]=-1
arr[6]=-1

Searching value 4.
sEARCH fOUNDN_
```

Practical No : 8

Aim : Implement program for Modulo Division

```
#include<stdio.h>
#include<conio.h>
#define size 7
int arr[size];
void init()
{
int i;
for(i=0;i<size;i++){
arr[i]=-1;
}
}
void insert(int value)
{
int key = value%size;
if(arr[key]==-1)
{
 arr[key]=value;
 printf("%d inserted at arr[%d]\n",key,arr[key]);

}
else{
printf("Collision: arr[%d] has element %d already!\n",key,arr[key]);
printf("uNABLE TO INSERT %d\n",value);
}
}
void search(int value)
{
int key = value%size;
if(arr[key]==value)
{
printf("sEARCH fOUND\N");
}
else{
printf("Search not found\n");
}
}

void display(){
int i;
for(i=0;i<size;i++)
{
printf("arr[%d]=%d\n",i,arr[i]);
}
}
int main(){
init();
insert(10);
insert(4);
insert(2);
insert(3);
printf("hash table\n");
display();
printf("\n");
printf("Searching value 4.\n");
search(4);
getch();
return 0;
}
```

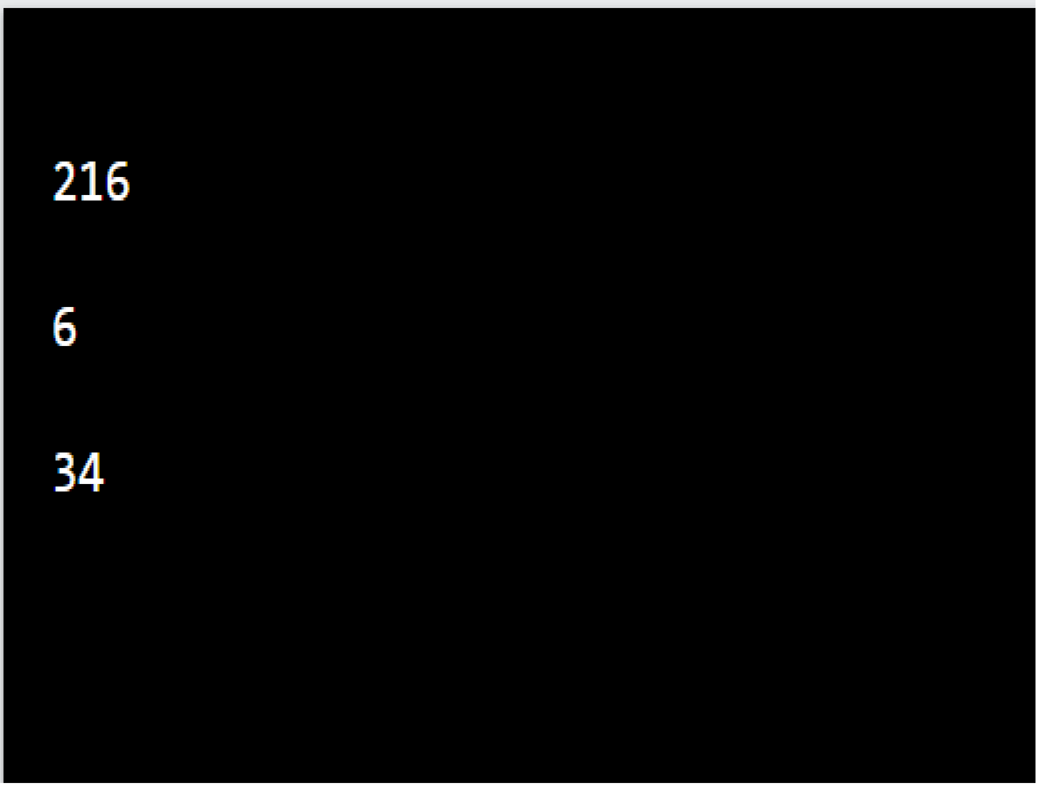


```
1347878 key would be hashed at location 18
1234678 key would be hashed at location 14
```

Practical No : 9

Aim: Implement program for Digit Extraction.

```
#include<stdio.h>

void digit_extraction(int key)
{
   int first_digit = key % 10000000 / 1000000;
   int fourth_digit = key % 10000 / 100;
   printf("%d key would be hashed at location %d%d\n", key, first_digit, fourth_digit);
}

int main()
{
   digit_extraction(1347878); //18
   digit_extraction(1234678); //14
   return 0;
```

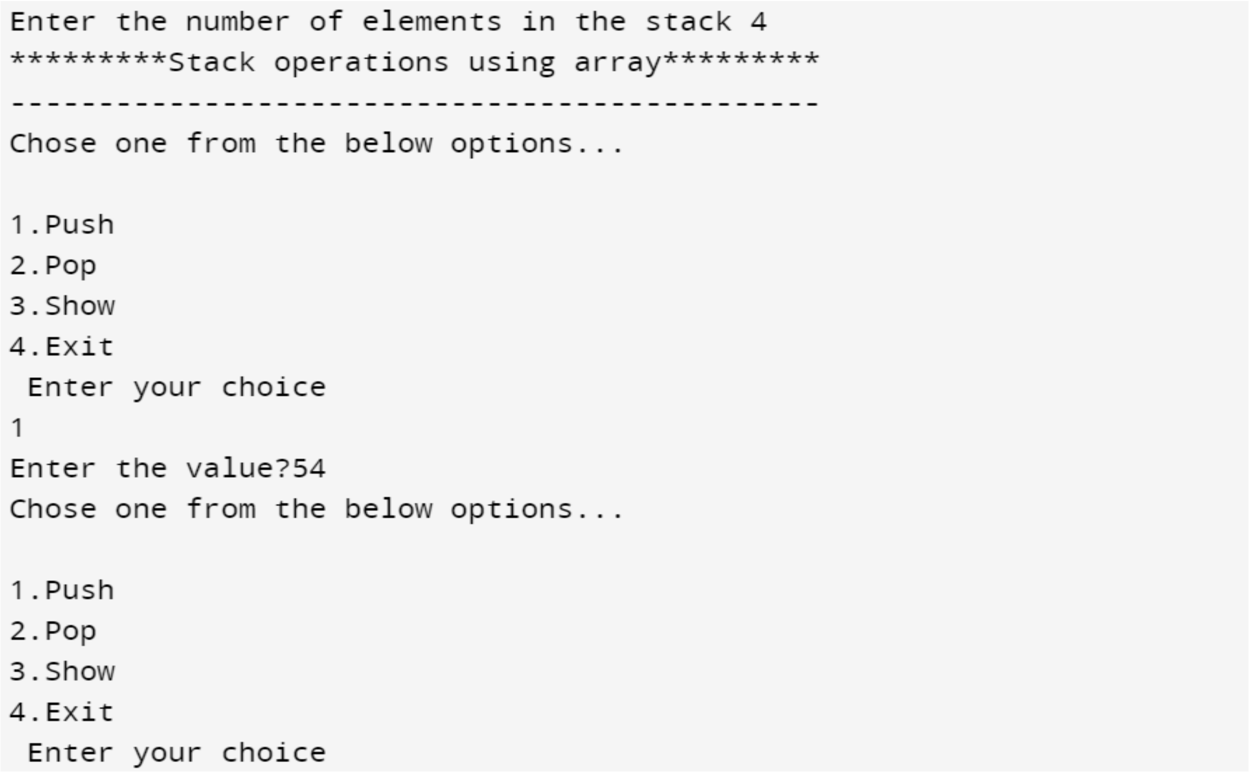


```
216

6

34
```

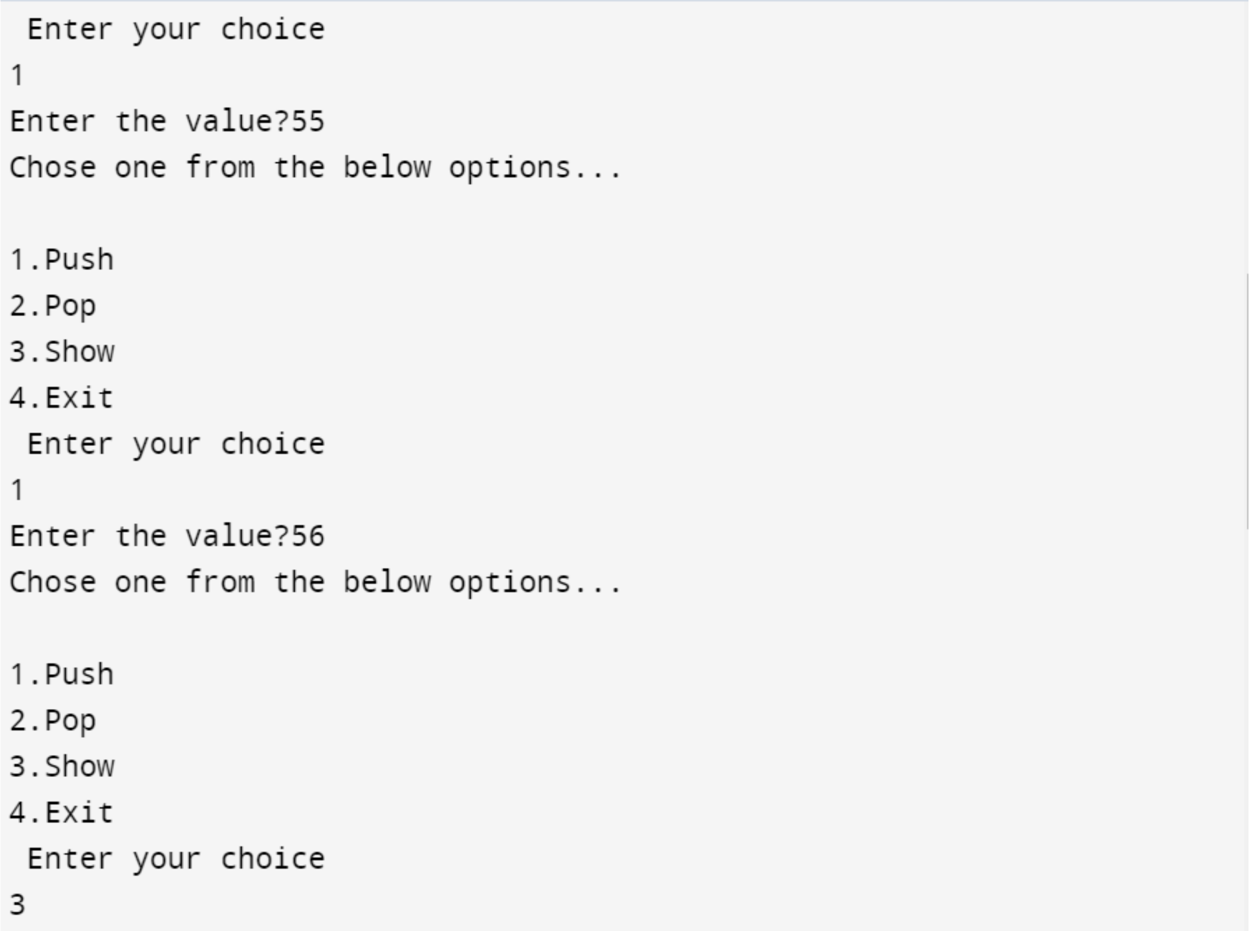
Practical No : 10

Aim: Implement program for Fold Shift.

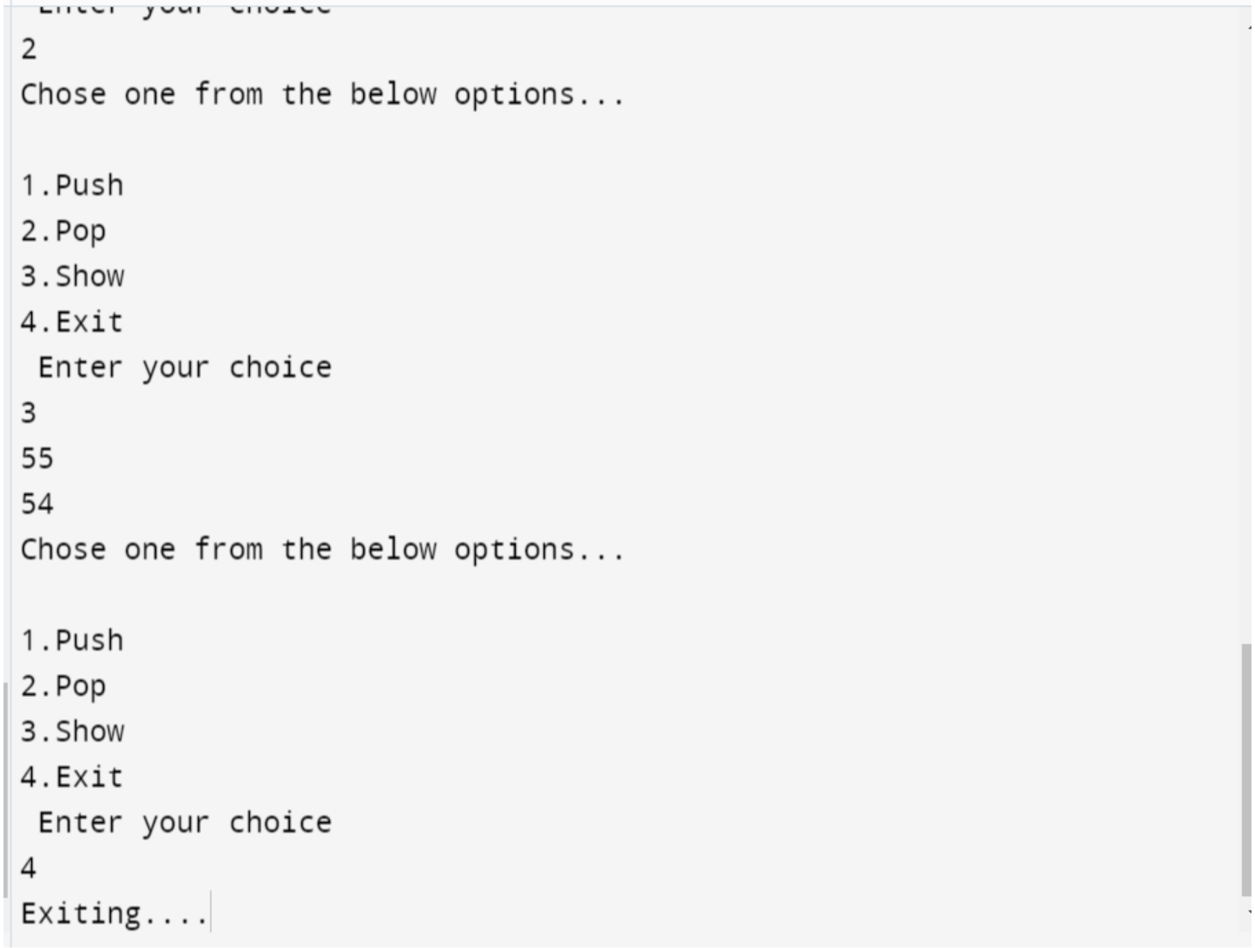
```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include <math.h>
int count_digits(int key)
{
int count=0;
 while(key != 0)
 {
 key /= 10;
 ++count;
 }
return count;
}
int fold_shift(int key, int size)
{
int key_roll=key;
int key_sum=0;
int key_frac=0;
int key_length=0;
int fraction = size;
key_length =
count_digits(key_roll);
while (key_length > 0)
{
 if (key_length >fraction)
 {
 key_frac = key_roll / (int)pow(10,
(key_length - fraction));
 key_sum += key_frac;
 key_roll = key_roll % (int)pow(10,
(key_length -
fraction));
 key_length = key_length -
fraction;
 }
 else
 {
 key_sum += key_roll;
 break;
 }
}
return key_sum % (int)pow(10,
(fraction));
}
int main()
{
clrscr();
printf("\n\n%d",fold_shift(12789,
3)); //216
printf("\n\n%d",fold_shift(123456
78, 1)); //6
printf("\n\n%d",fold_shift(5678,
2)); //34
getch();
return 0;
}
```



```
Enter the number of elements in the stack 4
*********Stack operations using array*********
----------------------------------------------
Chose one from the below options...

1.Push
2.Pop
3.Show
4.Exit
 Enter your choice
1
Enter the value?54
Chose one from the below options...

1.Push
2.Pop
3.Show
4.Exit
 Enter your choice
```



```
 Enter your choice
1
Enter the value?55
Chose one from the below options...

1.Push
2.Pop
3.Show
4.Exit
 Enter your choice
1
Enter the value?56
Chose one from the below options...

1.Push
2.Pop
3.Show
4.Exit
 Enter your choice
3
```

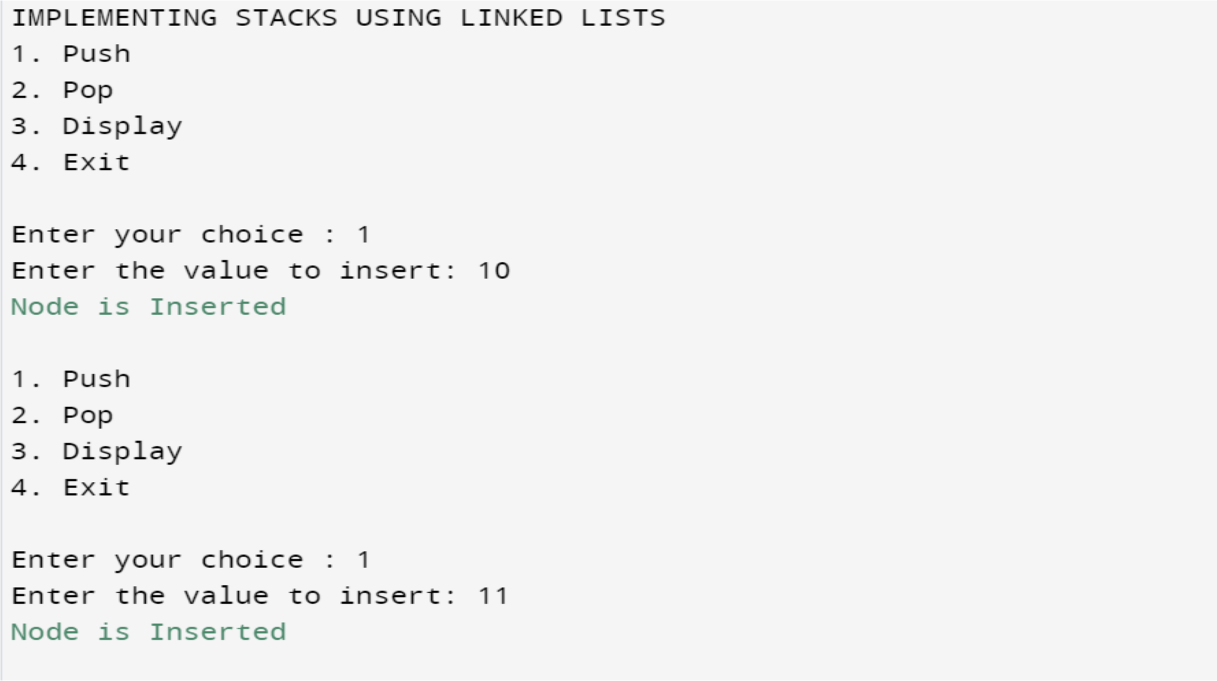


```
 Enter your choice
2
Chose one from the below options...

1.Push
2.Pop
3.Show
4.Exit
 Enter your choice
3
55
54
Chose one from the below options...

1.Push
2.Pop
3.Show
4.Exit
 Enter your choice
4
Exiting....
```

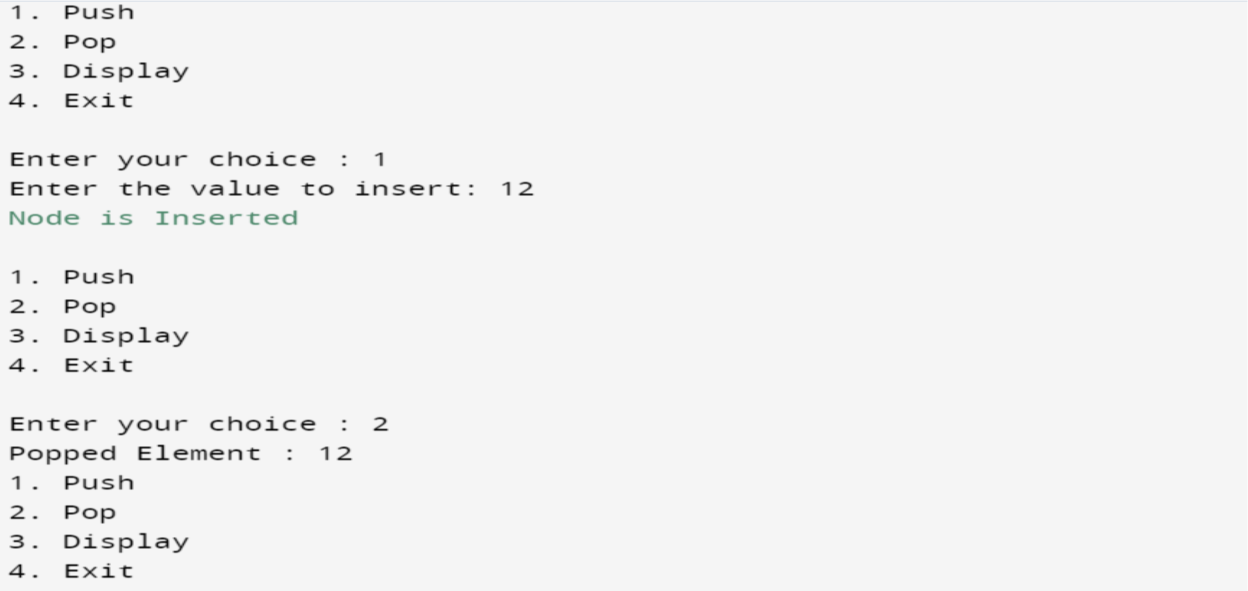
Practical No : 11

Aim: Implement program for Stack using Arrays.

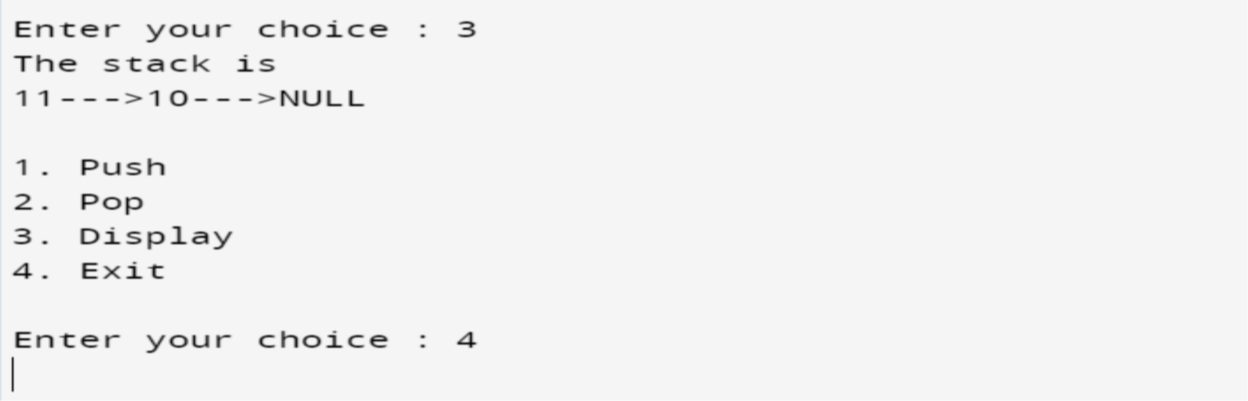
```
#include <stdio.h>
int stack[100],i,j,choice=0,n,top=-1;
void push();
void pop();
void show();
void main ()
{

    printf("Enter the number of elements in the
stack ");
    scanf("%d",&n);
    printf("*********Stack operations using
array*********");
printf("\n----------------------------------------------
\n");
    while(choice != 4)
    {
        printf("Chose one from the below
options...\n");
        printf("\n1.Push\n2.Pop\n3.Show\n4.Exit");
        printf("\n Enter your choice \n");
        scanf("%d",&choice);
        switch(choice)
        {
            case 1:
            {
                push();
                break;
            }
            case 2:
            {
                pop();
                break;
            }
            case 3:
{
                show();
                break;
            }
            case 4:
            {
printf("Exiting....");
                break;
            }

    default:
            {
                printf("Please Enter valid
choice ");
            }
        };
    }
}
void push ()
{
    int val;
    if (top == n )
    printf("\n Overflow");
    else
    {
        printf("Enter the value?");
        scanf("%d",&val);
        top = top +1;
        stack[top] = val;
    }
}

void pop ()
{
    if(top == -1)
    printf("Underflow");
    else
    top = top -1;
}
void show()
{
    for (i=top;i>=0;i--)
    {
        printf("%d\n",stack[i]);
    }
    if(top == -1)
    {
        printf("Stack is empty");
    }
}
```



```
IMPLEMENTING STACKS USING LINKED LISTS
1. Push
2. Pop
3. Display
4. Exit

Enter your choice : 1
Enter the value to insert: 10
Node is Inserted

1. Push
2. Pop
3. Display
4. Exit

Enter your choice : 1
Enter the value to insert: 11
Node is Inserted
```



```
1. Push
2. Pop
3. Display
4. Exit

Enter your choice : 1
Enter the value to insert: 12
Node is Inserted

1. Push
2. Pop
3. Display
4. Exit

Enter your choice : 2
Popped Element : 12
1. Push
2. Pop
3. Display
4. Exit
```

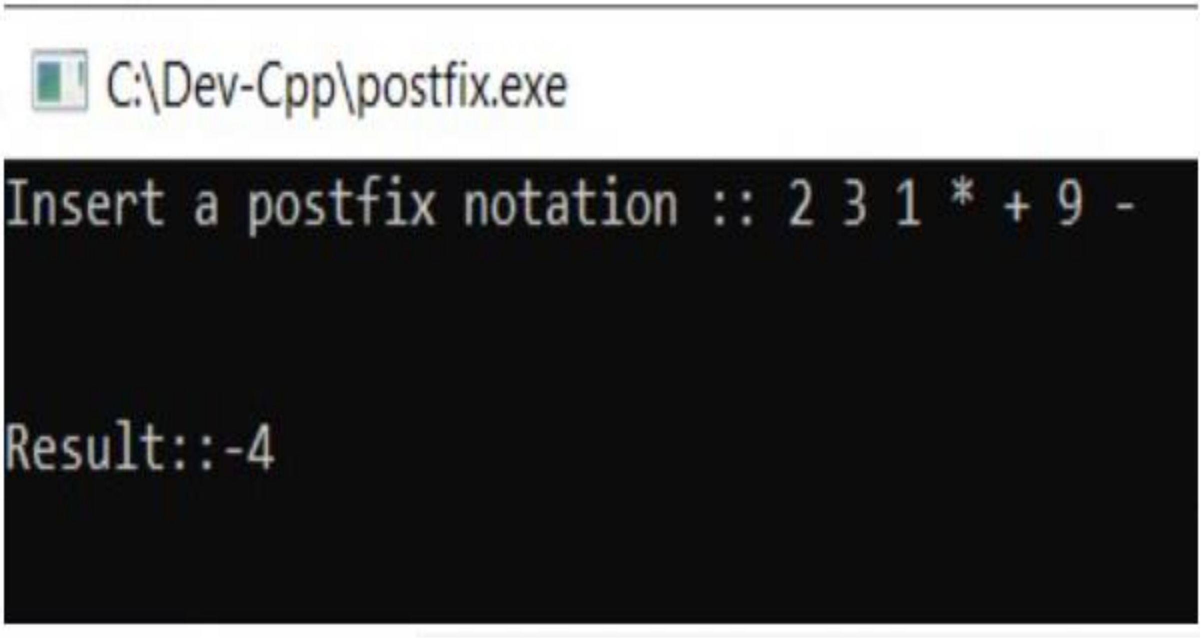


```
Enter your choice : 3
The stack is
11--->10--->NULL

1. Push
2. Pop
3. Display
4. Exit

Enter your choice : 4
```

Practical No : 12

Aim: Implement program for Stack using Linked List.

```
#include<stdio.h>
#include<stdlib.h>
/* Structure to create a node with data and pointer */
struct Node
{
int data;
struct Node *next;
}
*top = NULL; // Initially the list is empty
void push(int);
void pop();
void display();
int main()
{
 int choice, value;
 printf("\nIMPLEMENTING STACKS USING LINKED LISTS\n");
while(1)
{
printf("1. Push\n2. Pop\n3. Display\n4. Exit\n");
printf("\nEnter your choice : ");
scanf("%d",&choice);
switch(choice)
{
case 1: printf("\nEnter the value to insert: ");
scanf("%d", &value);
push(value);
break;

case 2: pop();
break;
case 3: display();
break;
case 4: exit(0);
break;
default: printf("\nInvalid Choice\n");
}
}
}
void push(int value)
{
struct Node *newNode;
newNode = (struct Node*)malloc(sizeof(struct Node));
newNode->data = value; // get value for the node
if(top == NULL)
newNode->next = NULL;
else
newNode->next = top; // Make the node as TOP
top = newNode;
printf("Node is Inserted\n\n");
}
void pop()
{
if(top == NULL)
printf("\nEMPTY STACK\n");
else{
struct Node *temp = top;
printf("\nPopped Element : %d", temp->data);
printf("\n");
top = temp->next; // After popping, make the next node as TOP
free(temp);
}
}
void display()
{
if(top == NULL)
printf("\nEMPTY STACK\n");
else

{
printf("The stack is \n");
struct Node *temp = top;
while(temp->next != NULL){
printf("%d--->",temp->data);
temp = temp -> next;
}
printf("%d--->NULL\n\n",temp->data);
}
}
```

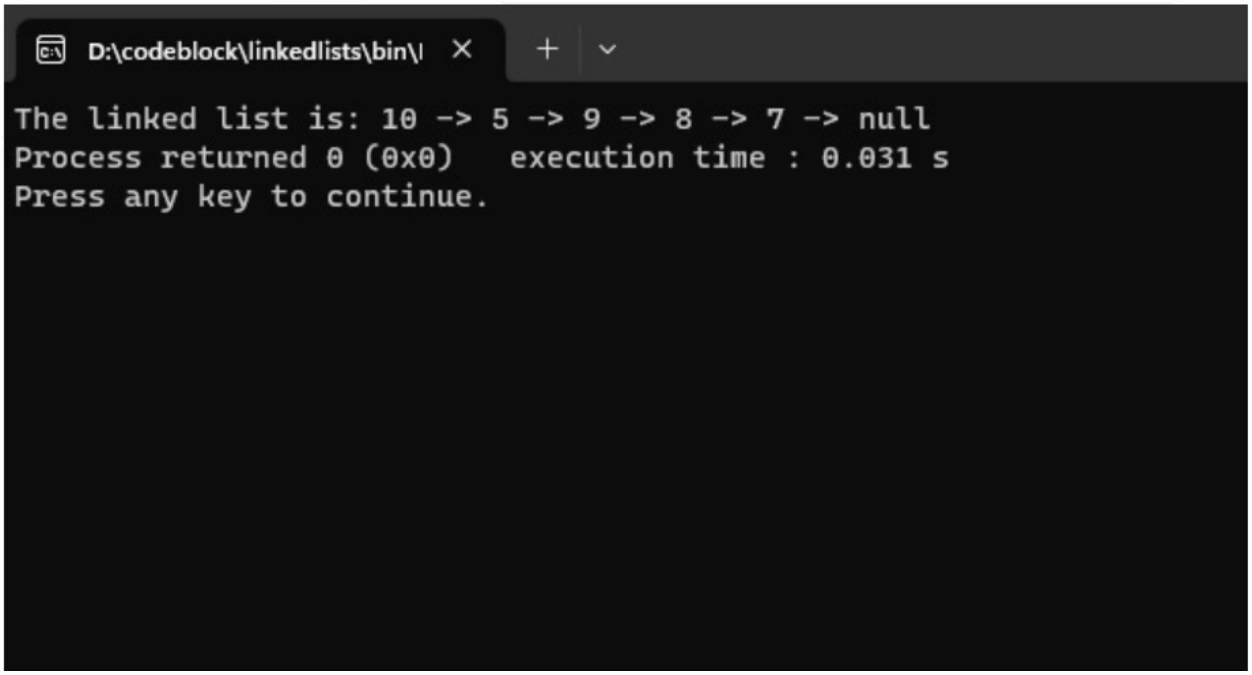


```
Insert a postfix notation :: 2 3 1 * + 9 -


Result::-4
```

Practical No : 13

Aim: Implement program for Evaluation of Postfix Expression.

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#define MAX 50 //max size defined
int stack[MAX]; //a global stack
char post[MAX]; //a global postfix stack
int top=-1; //initializing top to -1
void pushstack(int tmp); //push function
void evaluate(char c); //calculate function
void main()
{
 int i,l;
 //clrscr();
 printf("Insert a postfix notation :: ");
 gets(post); //getting a postfix expression
 l=strlen(post); //string length
 for(i=0;i<l;i++)
 {
 if(post[i]>='0' && post[i]<='9')
 {
 pushstack(i); //if the element is a number
push it
 }
 if(post[i]=='+' || post[i]=='-' || post[i]=='*' ||
 post[i]=='/' || post[i]=='^') //if element is an
operator

 {
 evaluate(post[i]); //pass it to the evaluate
 }
 } //print the result from the top
 printf("\n\nResult :: %d",stack[top]);
 getch();
}
void pushstack(int tmp) //definiton for push
{
top++; //incrementing top
 stack[top]=(int)(post[tmp]-48); //type casting
the string to its integer
value
}
void evaluate(char c) //evaluate function
{
 int a,b,ans; //variables used
 a=stack[top]; //a takes the value stored in the
top
 stack[top]='\0'; //make the stack top NULL as
its a string
 top--; //decrement top's value
 b=stack[top]; //put the value at new top to b
 stack[top]='\0'; //make it NULL
 top--; //decrement top
 switch(c) //check operator been passed to
evaluate
 {
 case '+': //addition
 ans=b+a;
 break;
 case '-': //subtraction
 ans=b-a;
 break;
 ans=b^a;
case '*': //multiplication
 ans=b*a;
 break;
 case '/': //division
 ans=b/a;
break;
 case '^': //power
break;
 default:
ans=0; //else 0
 }
 top++; //increment top
 stack[top]=ans; //store the answer at top
}
```

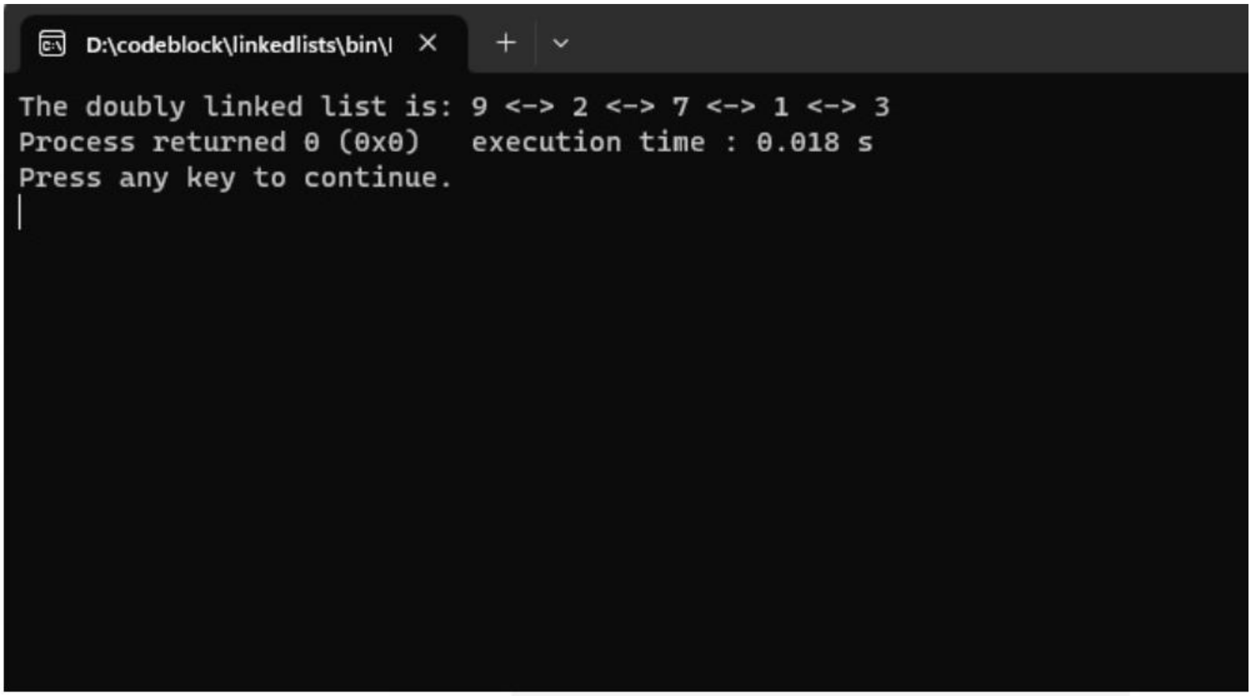


```
The linked list is: 10 -> 5 -> 9 -> 8 -> 7 -> null
Process returned 0 (0x0)   execution time : 0.031 s
Press any key to continue.
```

Practical No : 14

Aim : Implement a singly linked list

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

struct Node
{
    int data;
    struct Node *next;
};

struct Node *head = NULL;

void insert(int new_data)
{
    struct Node *new_node = (struct Node *)malloc(sizeof(struct Node));
    new_node->data = new_data;
    new_node->next = head;
    head = new_node;
}
void display()
{
    struct Node *ptr;
    ptr = head;
    while (ptr != NULL)
    {
        cout << ptr->data << " -> ";
        ptr = ptr->next;
    }
    cout << "null ";
}

int main()
{
    insert(7);
    insert(8);
    insert(9);
    insert(5);
    insert(10);
    cout << "The linked list is: ";
    display();
    return 0;
}
```

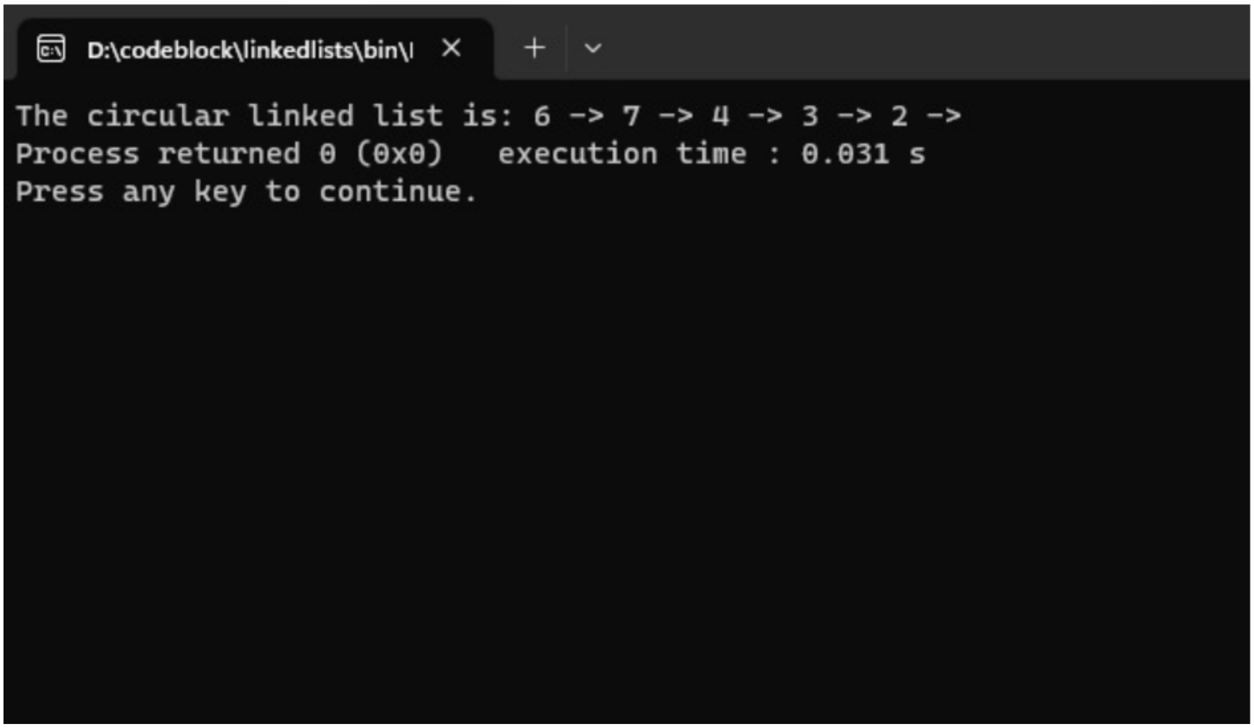


```
The doubly linked list is: 9 <-> 2 <-> 7 <-> 1 <-> 3
Process returned 0 (0x0)   execution time : 0.018 s
Press any key to continue.
```

Practical No : 15

Aim : Implement a doubly linked list

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

struct Node
{
    int data;
    struct Node *prev;
    struct Node *next;
};
struct Node *head = NULL;

void insert(int newdata)
{
    struct Node *newnode = (struct Node *)malloc(sizeof(struct Node));
    newnode->data = newdata;
    newnode->prev = NULL;
    newnode->next = head;
    if (head != NULL)
        head->prev = newnode;
    head = newnode;
}

void display()
{
    struct Node *ptr;
    ptr = head;
    while (ptr != NULL)
    {
        if (ptr->next != NULL)
        {
            cout << ptr->data << " <-> ";
        }
        else
        {
            cout << ptr->data;
        }
        ptr = ptr->next;
    }
}

int main()
{
    insert(3);
    insert(1);
    insert(7);
    insert(2);
    insert(9);
    cout << "The doubly linked list is: ";
    display();
    return 0;
}
```



```
The circular linked list is: 6 -> 7 -> 4 -> 3 -> 2 ->
Process returned 0 (0x0)   execution time : 0.031 s
Press any key to continue.
```

Practical No : 16

Aim : Implement a circular linked list

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

struct Node
{
   int data;
   struct Node *next;
};

struct Node *head = NULL;

void insert(int newdata)
{
   struct Node *newnode = (struct Node *)malloc(sizeof(struct Node));
   struct Node *ptr = head;
   newnode->data = newdata;
   newnode->next = head;
   if (head != NULL)
   {
      while (ptr->next != head)
         ptr = ptr->next;
      ptr->next = newnode;
   }
   else
      newnode->next = newnode;
   head = newnode;
}
```

```
void display()
{
   struct Node *ptr;
   ptr = head;
   do
   {
      cout << ptr->data << " -> ";
      ptr = ptr->next;
   } while (ptr != head);
}

int main()
{
   insert(2);
   insert(3);
   insert(4);
   insert(7);
   insert(6);
   cout << "The circular linked list is: ";
   display();
   return 0;
}
```