NAME - AKRITI CHOUDHARY

ROLL NUMBER - 2005776

SUBJECT - DSA LAB

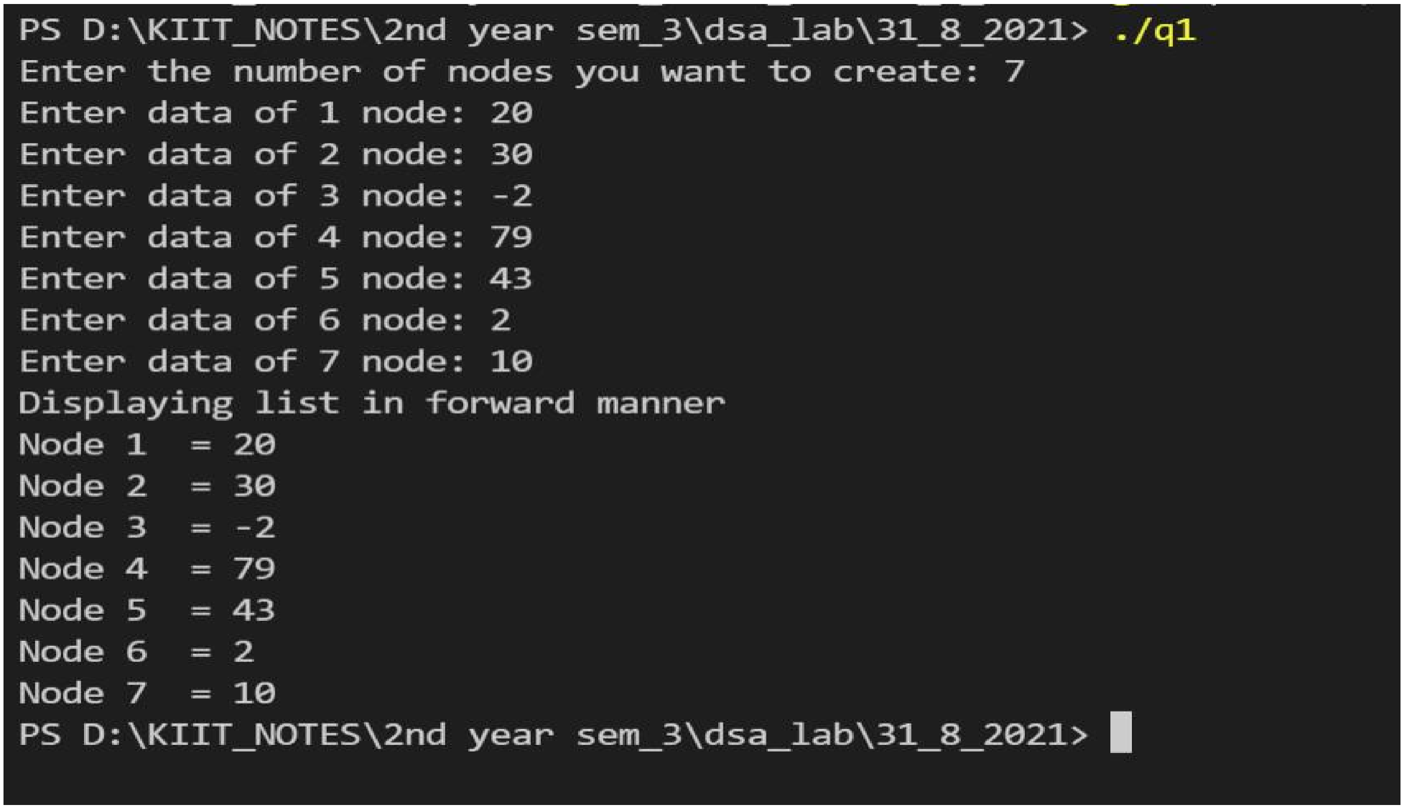
DATE - 31/8/2021

CLASS - B14

BRANCH - CSE

Question 1 : WAP to create a double linked list of n nodes and display the linked list by using suitable user defined functions for create and display operations.

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

struct node
{
    int data;
    struct node *prev;
    struct node *next;
} * head, *last;

void createList(int n);
void displayFromFirst();

int main()
{
    int n, choice;

    head = NULL;
    last = NULL;

    printf("Enter the number of nodes you want to create: ");
    scanf("%d", &n);

    createList(n);

    printf("Displaying list in forward manner");

    displayFromFirst();

    return 0;
}

void createList(int n)
{
    int i, data;
    struct node *newNode;

    if (n >= 1)
    {
        head = (struct node *)malloc(sizeof(struct node));

        if (head != NULL)
        {
            printf("Enter data of 1 node: ");
            scanf("%d", &data);

            head->data = data;
            head->prev = NULL;
            head->next = NULL;
            last = head;

            for (i = 2; i <= n; i++)
            {
                newNode = (struct node *)malloc(sizeof(struct node));

                if (newNode != NULL)
                {
                    printf("Enter data of %d node: ", i);
                    scanf("%d", &data);

                    newNode->data = data;
                    newNode->prev = last;
                    newNode->next = NULL;

                    last->next = newNode;
                    last = newNode;
                }
                else
                {
                    printf("Unable to allocate memory.");
                    break;
                }
            }
        }
        else
        {
            printf("Unable to allocate memory");
        }
    }
}

void displayFromFirst()
{
    struct node *temp;
    int n = 1;

    if (head == NULL)
    {
        printf("List is empty.");
    }
    else
    {
        temp = head;
        puts("");

        while (temp != NULL)
        {
            printf("Node %d  = %d\n", n, temp->data);

            n++;

            temp = temp->next;
    }
  }
}
```

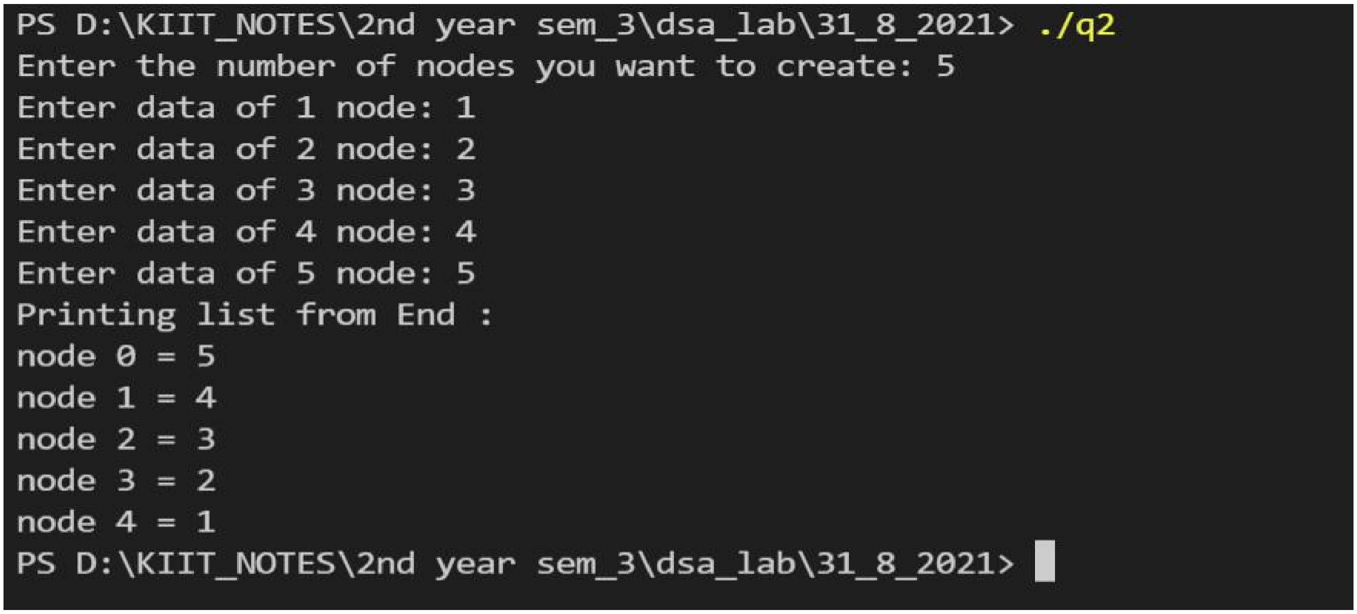


```
PS D:\KIIT_NOTES\2nd year sem_3\dsa_lab\31_8_2021> ./q1
Enter the number of nodes you want to create: 7
Enter data of 1 node: 20
Enter data of 2 node: 30
Enter data of 3 node: -2
Enter data of 4 node: 79
Enter data of 5 node: 43
Enter data of 6 node: 2
Enter data of 7 node: 10
Displaying list in forward manner
Node 1  = 20
Node 2  = 30
Node 3  = -2
Node 4  = 79
Node 5  = 43
Node 6  = 2
Node 7  = 10
PS D:\KIIT_NOTES\2nd year sem_3\dsa_lab\31_8_2021>
```

Question 2 : WAP to reverse the sequence elements in a double linked list.

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

struct node
{
    int data;
    struct node *prev;
    struct node *next;
} * head, *last;

void createList(int n);

void displayListFromEnd();

int main()
{
    int n, choice;

    head = NULL;
    last = NULL;

    printf("Enter the number of nodes you want to create: ");
    scanf("%d", &n);

    createList(n);

    printf("Printing list from End : ");

    displayListFromEnd();

    return 0;
}

void createList(int n)
{
    int i, data;
    struct node *newNode;

    if (n >= 1)
    {
        head = (struct node *)malloc(sizeof(struct node));

        if (head != NULL)
        {
            printf("Enter data of 1 node: ");
            scanf("%d", &data);

            head->data = data;
            head->prev = NULL;
            head->next = NULL;
            last = head;

            for (i = 2; i <= n; i++)
            {
                newNode = (struct node *)malloc(sizeof(struct node));

                if (newNode != NULL)
                {
                    printf("Enter data of %d node: ", i);
                    scanf("%d", &data);

                    newNode->data = data;
                    newNode->prev = last;
                    newNode->next = NULL;

                    last->next = newNode;
                    last = newNode;
                }
                else
                {
                    printf("Unable to allocate memory.");
                    break;
                }
            }
        }
        else
        {
            printf("Unable to allocate memory");
        }
    }
}

void displayListFromEnd()
{
    struct node *temp;
    int n = 0;

    if (last == NULL)
    {
        printf("List is empty.");
    }
    else
    {
        temp = last;
        puts("");
        while (temp != NULL)
        {
            printf("node %d = %d\n", n, temp->data);

            n++;

            temp = temp->prev;
        }
```

```
  }
}
```



```
PS D:\KIIT_NOTES\2nd year sem_3\dsa_lab\31_8_2021> ./q2
Enter the number of nodes you want to create: 5
Enter data of 1 node: 1
Enter data of 2 node: 2
Enter data of 3 node: 3
Enter data of 4 node: 4
Enter data of 5 node: 5
Printing list from End :
node 0 = 5
node 1 = 4
node 2 = 3
node 3 = 2
node 4 = 1
PS D:\KIIT_NOTES\2nd year sem_3\dsa_lab\31_8_2021>
```

Question 3 : Write a menu driven program to perform the following operations in a double linked list by using suitable user defined functions for each case.

a) Traverse the list forward

b) Traverse the list backward

c) Check if the list is empty

d) Insert a node at the certain position (at beginning/end/any position)

e) Delete a node at the certain position (at beginning/end/any position)

f) Delete a node for the given key

g) Count the total number of nodes

h) Search for an element in the linked list

Verify & validate each function from main method.

```
#include <stdio.h>
#include <stdlib.h>
struct node
{
int data;
struct node * prev;
struct node * next;
}* head=NULL, * tail=NULL;
void input()
{
struct node * cur;
int n;
printf("enter the number of nodes");
scanf("%d",&n);
for(int i=0;i<n;i++)
{
cur=malloc(sizeof(struct node));
printf("\nenter the %d th node",i+1);
scanf("%d",&cur->data);
if(head==NULL)
{
head=tail=cur;
head->prev=NULL;
tail->next=NULL;
}
else
{
tail->next=cur;
cur->prev=tail;
tail=cur;
tail->next=NULL;
}
}
}
```

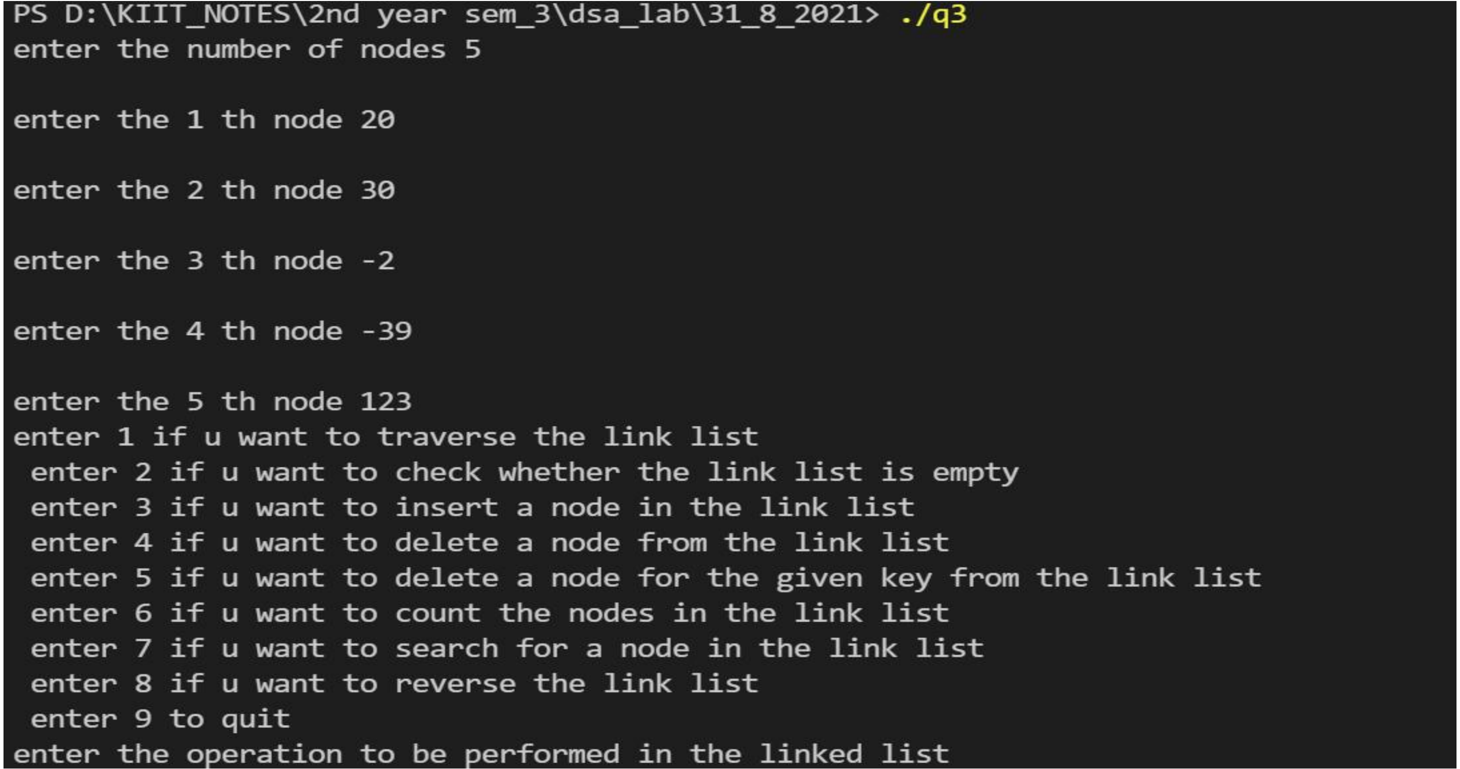
```
void display()
{
struct node * cur=head;
if(head==NULL)
printf("link is empty");
else
{
printf("nodes of double link list are\n");
while(cur!=NULL)
{
printf("%d\n",cur->data);
cur=cur->next;
}
}
}
void checkEmpty()
{
int c=0;
struct node * ptr;
if(head !=NULL)
{
ptr=head;
while(ptr!=NULL)
{
c++;
ptr=ptr->next;
}
c++;
}
if(c>0)
printf("the link list is not empty\n");
else
printf("the link list is empty\n");
}
void countNode()
{
int c=0;
struct node * ptr;
if(head !=NULL)
{
ptr=head;
while(ptr->next!=NULL)
{
c++;
ptr=ptr->next;
}
c++;
}
printf("the no. of nodes in the link list is %d\n",c);
}
void SearchNode()
{
int s;
printf("enter the element to be searched");
```

```
scanf("%d",&s);
struct node * ptr;
ptr=head;
   int flag=0;
   while (ptr!= NULL)
   {
     if(ptr->data==s)
     {
        flag=1;
        break;
     }
     else
     {
      ptr = ptr->next;
     }

   }
   if(flag)
   {
      printf("element found\n");
   }
   else
   {
     printf("element not found\n");
   }
   printf("end of searching \n");
}
void insertNode()
{
int val,pos;
printf("enter the value to be inserted");
scanf("%d",&val);
printf("enter the position where the node is to be inserted");
scanf("%d",&pos);
struct node *cur,*ptr;
cur=malloc(sizeof(struct node));
cur->data=val;
cur->next=cur->prev=NULL;
if(head==NULL)
head=cur;
else if(pos==1)
{
cur->next=head;
head->prev=cur;
head=cur;
}
else
{
ptr=head;
int i=1;
while(i<pos-1 && ptr->next!=NULL)
{
i++;
ptr=ptr->next;
```

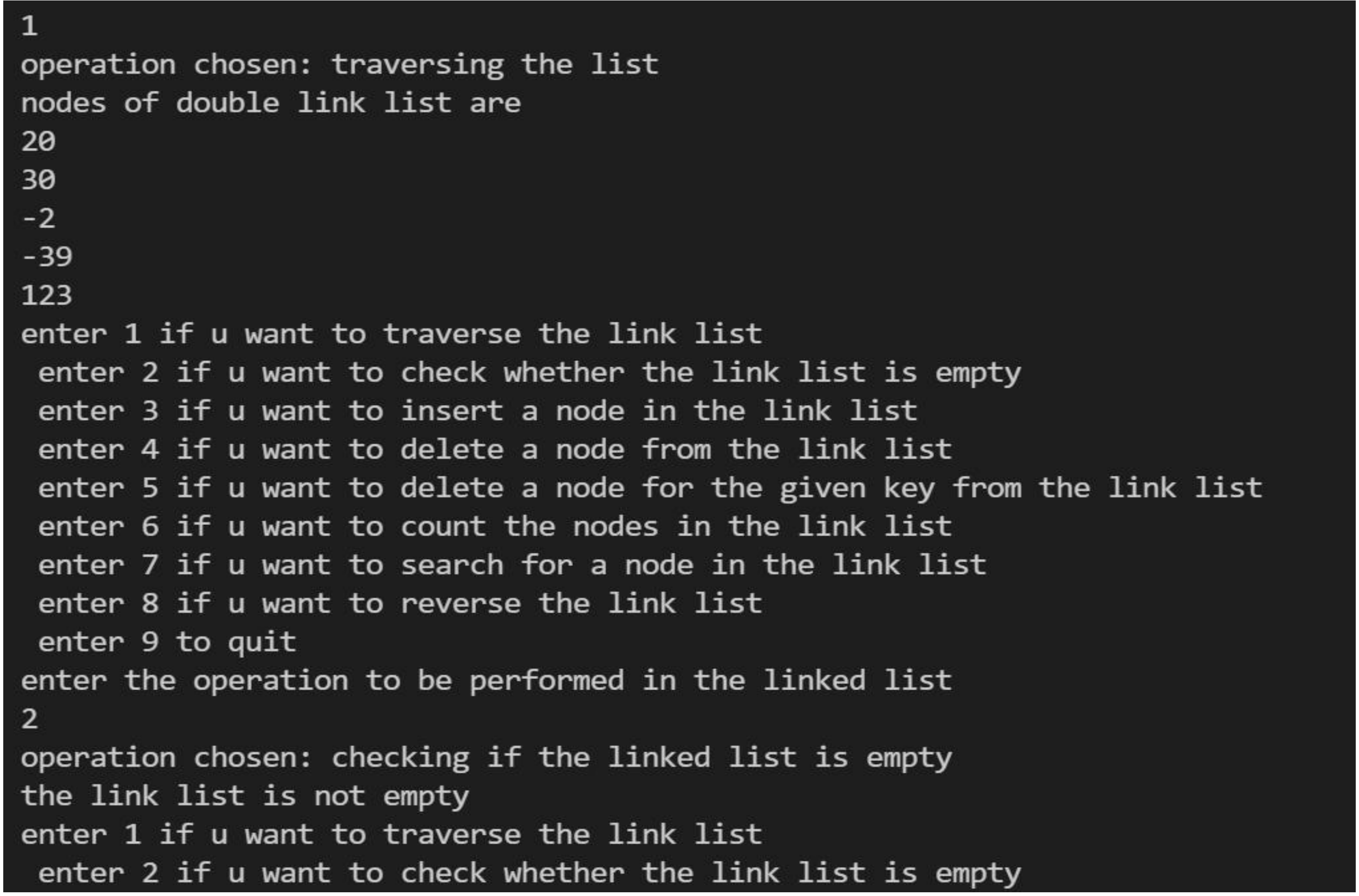
```
}
if(ptr->next==NULL)
{
cur->prev=ptr;
ptr->next=cur;
}
else
{
cur->prev=ptr;
cur->next=ptr->next;
cur->next->prev=cur;
ptr->next=cur;
}
}
display();
}
void deletekey()
{int val;
printf("enter the value to be deleted");
scanf("%d",&val);
struct node *ptr;
if(head==NULL)
printf("link list is empty");
else
{
ptr=head;
while(ptr!=NULL)
{
if (ptr->data==val)
break;
ptr=ptr->next;
}
if(ptr==NULL)
printf("data not found");
else if(head==ptr && ptr->next==NULL)
{
head=NULL;
free(ptr);
}
else if(head==ptr)
{
head=head->next;
head->prev=NULL;
free(ptr);
}
else if(ptr->next==NULL)
{
ptr->prev->next=NULL;
free(ptr);
}
else
{
ptr->prev->next=ptr->next;
ptr->next->prev=ptr->prev;
```

```
free(ptr);
}
}
display();
}
void traversebackwards()
{
struct node * temp=NULL;
struct node * cur;
cur=head;
while(cur!=NULL)
{
temp=cur->prev;
cur->prev=cur->next;
cur->next=temp;
cur=cur->prev;
}
if(temp!=NULL)
head=temp->prev;
display();
}
void deleteNode()
{int n;
printf("enter the position where the node is to be deleted");
scanf("%d",&n);
if(head==NULL)
printf("the link list is empty");
struct node * cur=head;
int i=1;
while(cur!=NULL && i<n)
{
cur=cur->next;
i++;
}
if(cur==NULL || head==NULL)
printf("position not in the link list");
else if(head==cur)
{
head=cur->next;
head->prev=NULL;
free(cur);
}
else if(cur->next==NULL)
{cur=tail;
tail=tail->prev;
tail->next=NULL;
free(cur);
}
else
{
cur->prev->next=cur->next;
cur->next->prev=cur->prev;
free(cur);
}
```

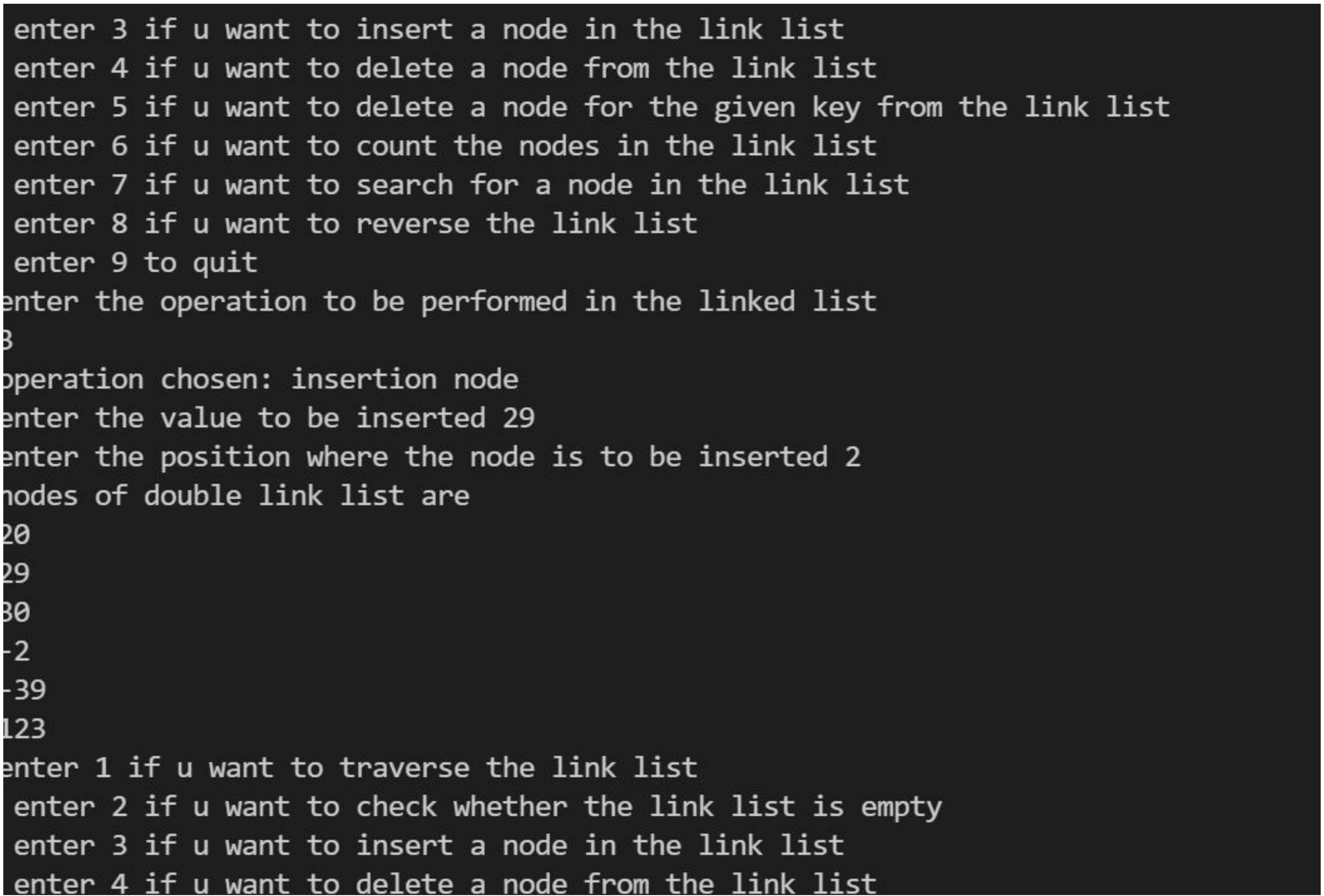
```
display();
}
int main()
{
 int op;
 input();
    do
   {
    printf("enter 1 if u want to traverse the link list\n ");
    printf("enter 2 if u want to check whether the link list is empty\n ");
    printf("enter 3 if u want to insert a node in the link list\n ");
    printf("enter 4 if u want to delete a node from the link list\n ");
    printf("enter 5 if u want to delete a node for the given key from the link list\n ");
    printf("enter 6 if u want to count the nodes in the link list\n ");
    printf("enter 7 if u want to search for a node in the link list\n ");
    printf("enter 8 if u want to reverse the link list\n ");
    printf("enter 9 to quit\n");
    printf("enter the operation to be performed in the linked list\n");
    scanf("%d", &op);
    switch (op)
    {
    case 1:
        printf("operation chosen: traversing the list \n");
        display();
        break;
    case 2:
        printf("operation chosen: checking if the linked list is empty \n");
        checkEmpty();
        break;
    case 3:
        printf("operation chosen: insertion node \n");
        insertNode();
        break;
   case 4:
        printf("operation chosen: deletion node \n");
        deleteNode();
        break;
   case 5:
        printf("operarion chosen:delete a node for a given key \n");
        deletekey();
        break;
   case 6:
        printf("operation chosen: counting nodes \n");
        countNode();
        break;
   case 7:
        printf("operation chosen: searching nodes \n");
        SearchNode();
        break;
   case 8:
        printf("operation chosen: traverse backwards \n");
        traversebackwards();
        break;
  case 9:
      break;
   }
   }while(op!=9);
}
```



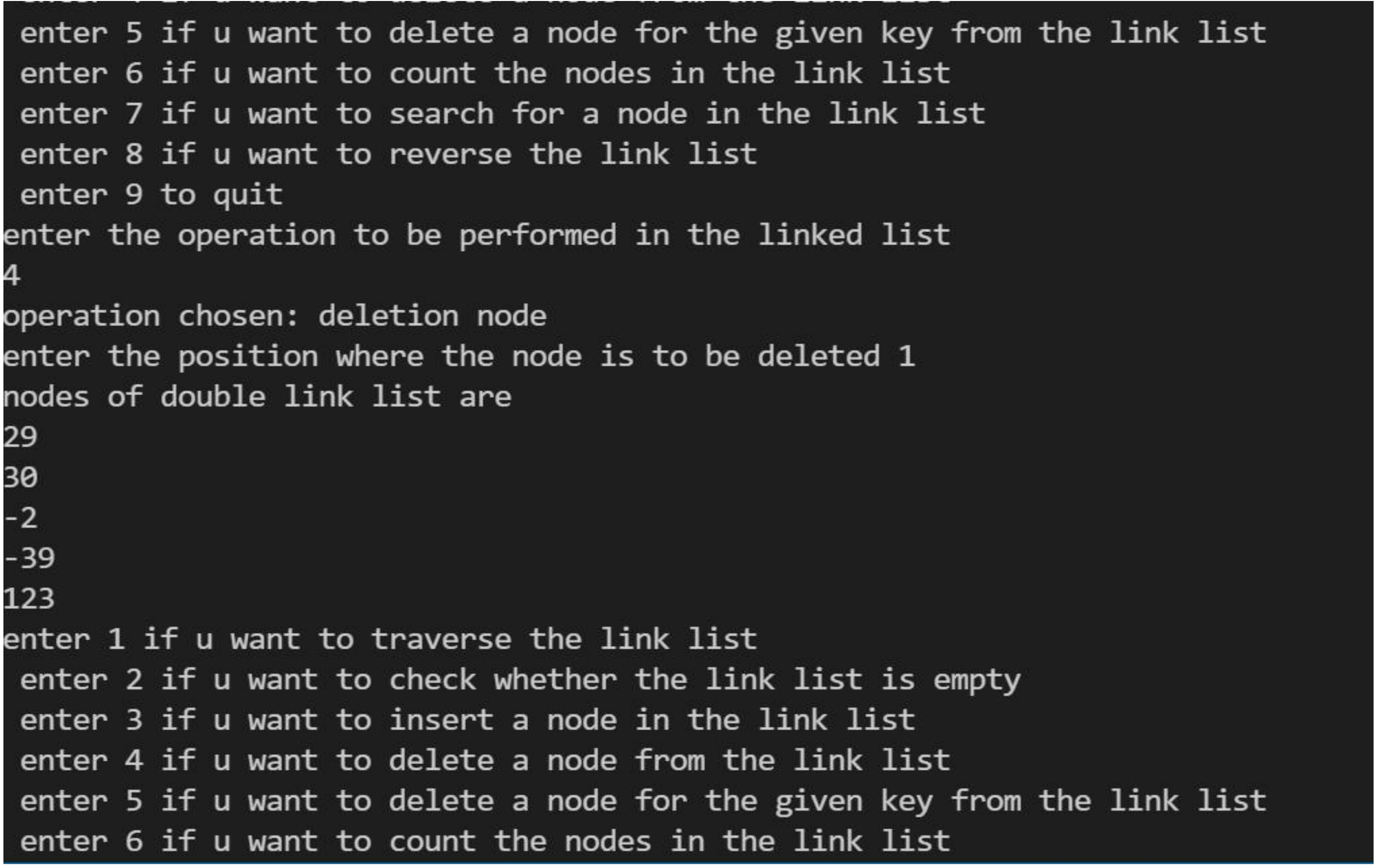
```
PS D:\KIIT_NOTES\2nd year sem_3\dsa_lab\31_8_2021> ./q3
enter the number of nodes 5

enter the 1 th node 20

enter the 2 th node 30

enter the 3 th node -2

enter the 4 th node -39

enter the 5 th node 123
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
```



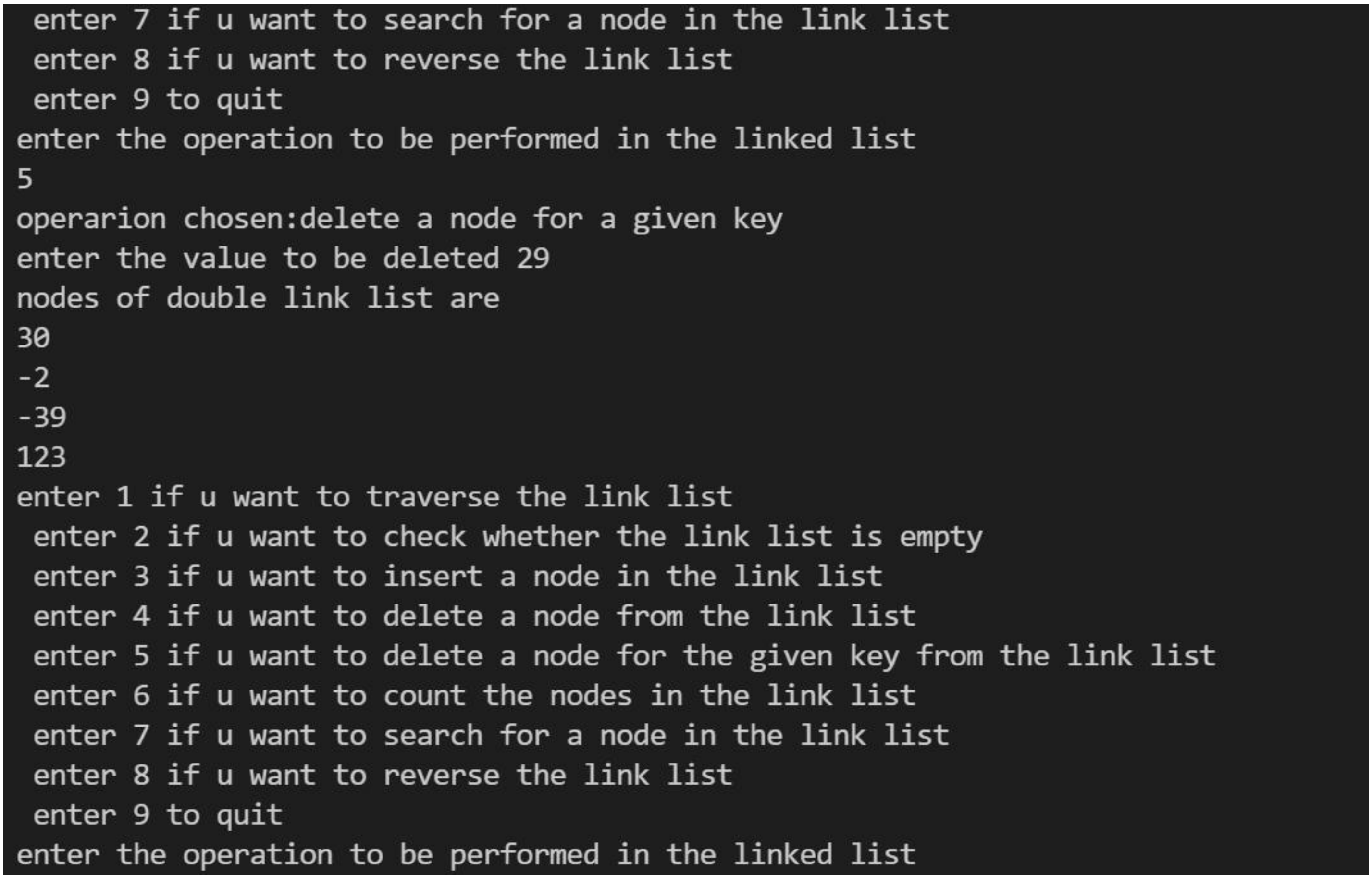
```
1
operation chosen: traversing the list
nodes of double link list are
20
30
-2
-39
123
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
2
operation chosen: checking if the linked list is empty
the link list is not empty
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
```



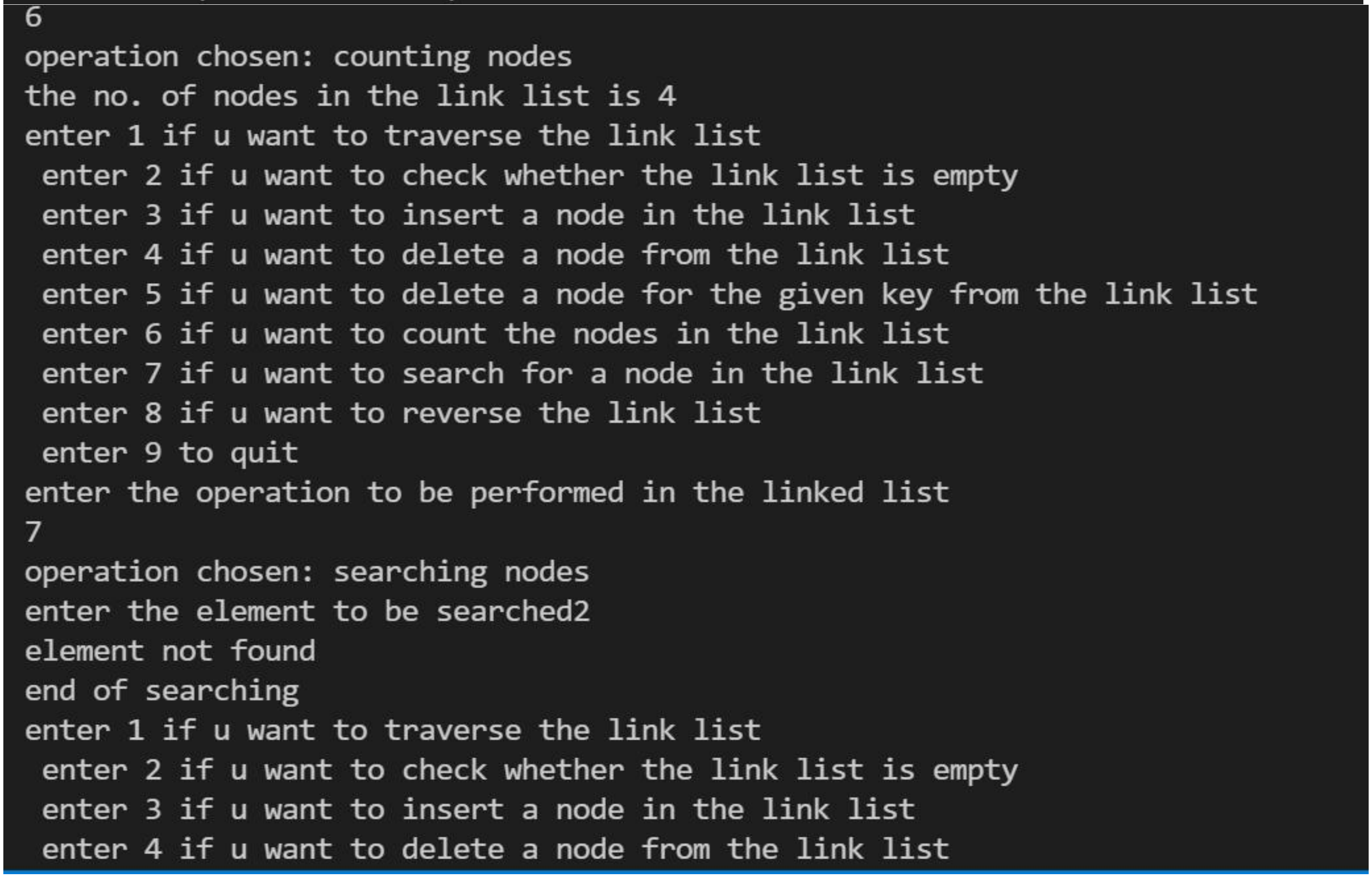
```
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
3
operation chosen: insertion node
enter the value to be inserted 29
enter the position where the node is to be inserted 2
nodes of double link list are
20
29
30
-2
-39
123
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
```



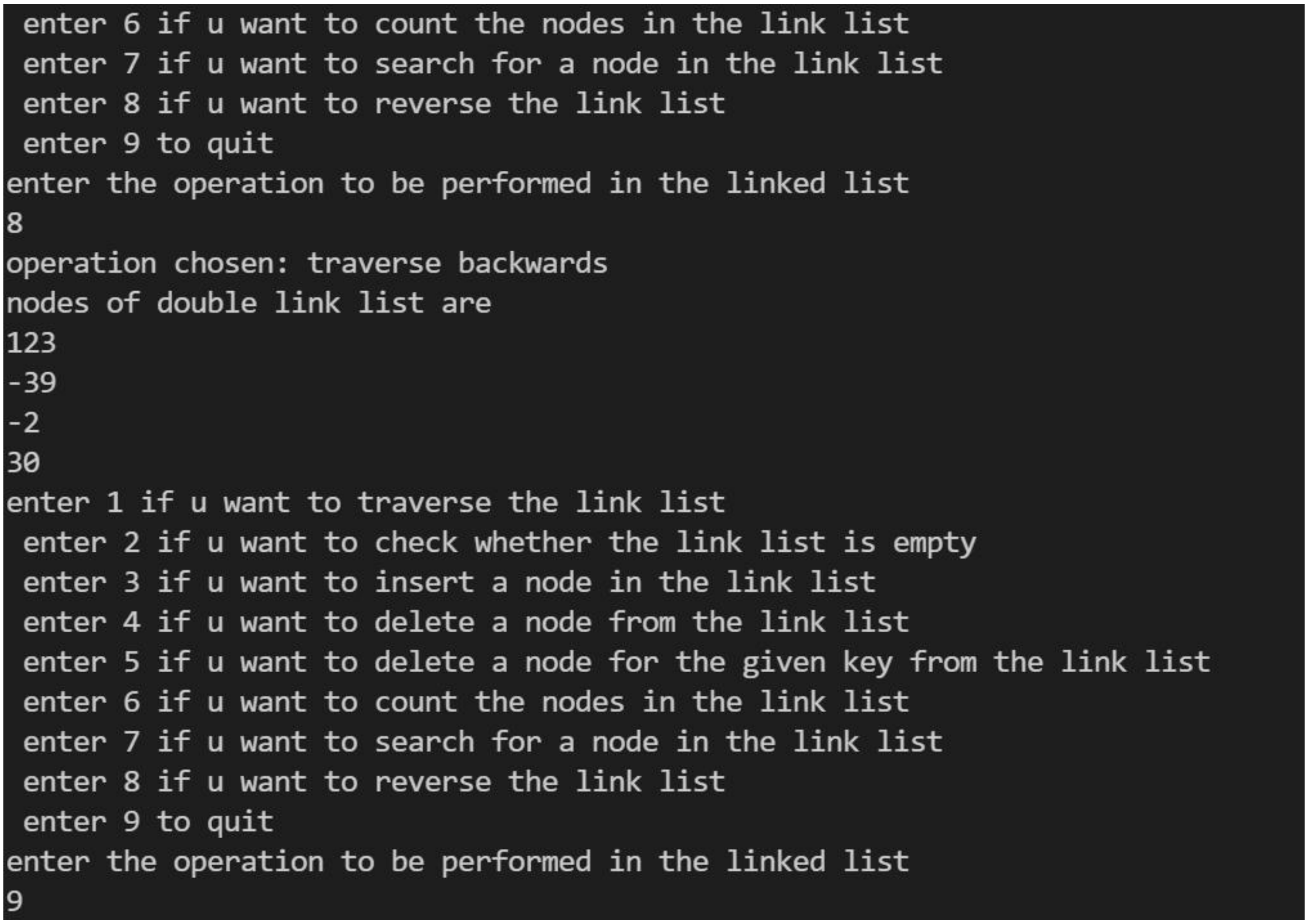
```
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
4
operation chosen: deletion node
enter the position where the node is to be deleted 1
nodes of double link list are
29
30
-2
-39
123
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
```



```
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
5
operarion chosen:delete a node for a given key
enter the value to be deleted 29
nodes of double link list are
30
-2
-39
123
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
```



```
6
operation chosen: counting nodes
the no. of nodes in the link list is 4
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
7
operation chosen: searching nodes
enter the element to be searched2
element not found
end of searching
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
```

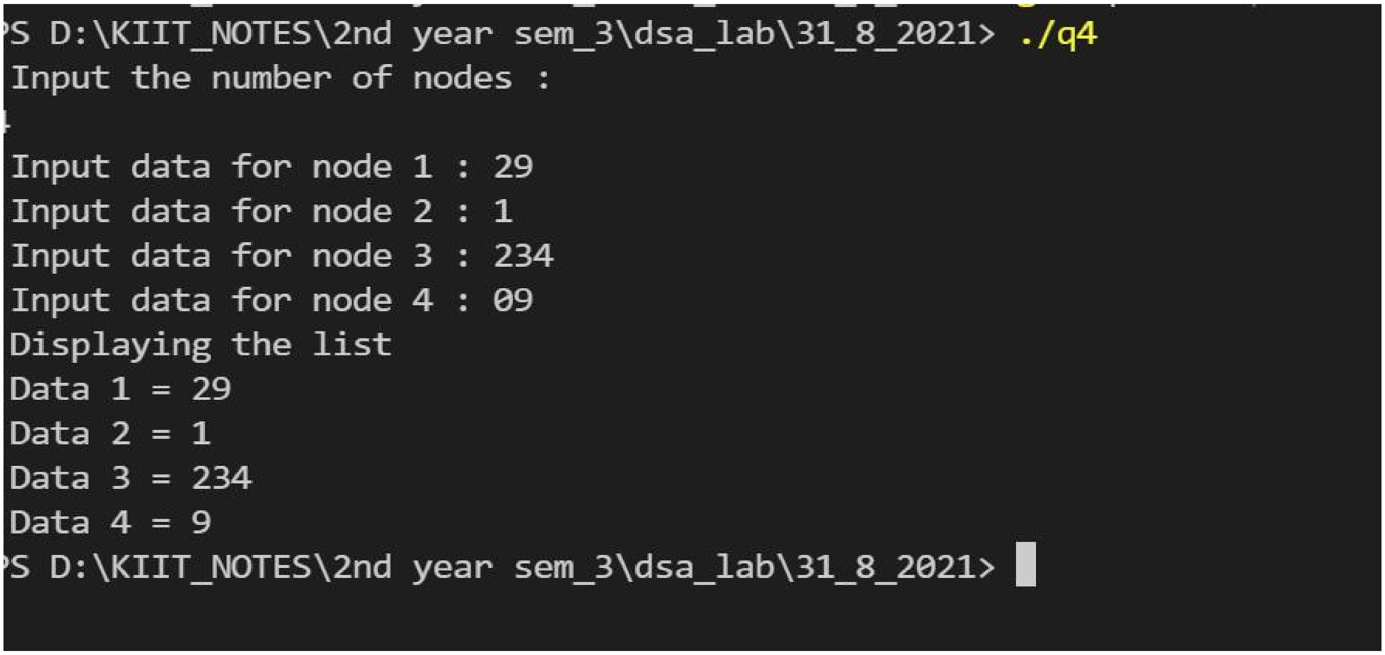


```
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
8
operation chosen: traverse backwards
nodes of double link list are
123
-39
-2
30
enter 1 if u want to traverse the link list
 enter 2 if u want to check whether the link list is empty
 enter 3 if u want to insert a node in the link list
 enter 4 if u want to delete a node from the link list
 enter 5 if u want to delete a node for the given key from the link list
 enter 6 if u want to count the nodes in the link list
 enter 7 if u want to search for a node in the link list
 enter 8 if u want to reverse the link list
 enter 9 to quit
enter the operation to be performed in the linked list
9
```

Question 4: WAP to create a single circular double linked list of n nodes and display the linked list by using suitable user defined functions for create and display operations.

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

struct node
{
   int value;
   struct node *nextptr;
} * startnode;

void create(int n);
void display();

int main()
{
   int n;
   startnode = NULL;

   printf(" Input the number of nodes : ");
   scanf("%d", &n);

   create(n);
   display();
   return 0;
}

void create(int n)
{
   int i, value;
   struct node *preptr, *newnode;

   if (n >= 1)
   {
      startnode = (struct node *)malloc(sizeof(struct node));

      printf(" Input data for node 1 : ");
      scanf("%d", &value);
      startnode->value = value;
      startnode->nextptr = NULL;
      preptr = startnode;
      for (i = 2; i <= n; i++)
      {
         newnode = (struct node *)malloc(sizeof(struct node));
         printf(" Input data for node %d : ", i);
         scanf("%d", &value);
         newnode->value = value;
         newnode->nextptr = NULL;
         preptr->nextptr = newnode;
         preptr = newnode;
```

```
        }
        preptr->nextptr = startnode;
    }
}

void display()
{
    struct node *tmp;
    int n = 1;

    if (startnode == NULL)
    {
        printf(" No data found in the List yet.\n");
    }
    else
    {
        tmp = startnode;
        printf(" Displaying the list\n");

        do
        {
            printf(" Data %d = %d\n", n, tmp->value);

            tmp = tmp->nextptr;
            n++;
        } while (tmp != startnode);
    }
}
```



```
PS D:\KIIT_NOTES\2nd year sem_3\dsa_lab\31_8_2021> ./q4
 Input the number of nodes :
4
 Input data for node 1 : 29
 Input data for node 2 : 1
 Input data for node 3 : 234
 Input data for node 4 : 09
 Displaying the list
 Data 1 = 29
 Data 2 = 1
 Data 3 = 234
 Data 4 = 9
PS D:\KIIT_NOTES\2nd year sem_3\dsa_lab\31_8_2021>
```