Assignment No. 2

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Q.1 Write a menu driven c program implementing the operations like Insertion, deletion and search on Single Linked List.

Algorithms:

1. **For Create Function**

```
struct node * temp, *r
temp = malloc(sizeof(struct node))
enter the data
scanf(“%d”,&temp->data)
temp->next=NULL
if(head==NULL)
head=temp
else
r=temp
while(r->next!=NULL)
r=r->next
r->next = temp
```

2. **For Insertion at first**

```
struct node * temp
temp= malloc(sizeof(struct node))
enter the data for first node
scanf(“%d”,&temp->)
temp->next=head
head=temp
```

3. **For Insertion at Index**

```
struct node * temp
temp= malloc(sizeof(struct node))
int index=0;
enter the index and data
```

```
scanf(“%d%d”,&index,&temp->data)
struct node *p = head;
Int i=0
While(i!=index-1)
{p=p->next;
i++;}
temp->next= p->next
p->next=temp
```

4. **For Insertion at End**

```
struct node * temp
temp= malloc(sizeof(struct node))
enter the data for end node
scanf(“%d”,&temp->data)
struct node * p = head
If(head==NULL)
{
temp->next=NULL;
head=temp;
}
else
{
while(p->next != NULL)
p=p->next
p->next=temp
temp->next=NULL
}
```

5. **For deletion of first node**

```
struct Node *temp
temp= head
head= head->next;
free(temp)
```

6. **For deletion of Last node**

```
struct node *p,*q
p=head
q=head->next;
while(q->next!=NULL)
{p=p->next; q=q->next}
p->next = NULL
free(q)
```

7. **For deletion at Index**

```
struct node *p,*q
p=head
q=head->next
int index
enter the index of node
scanf(“%d”,&index)
for(int i=0;i<index;i++)
{p=p->next; q=q->next}
p->next=q->next;
free(q)
```

8. **Searching the node**

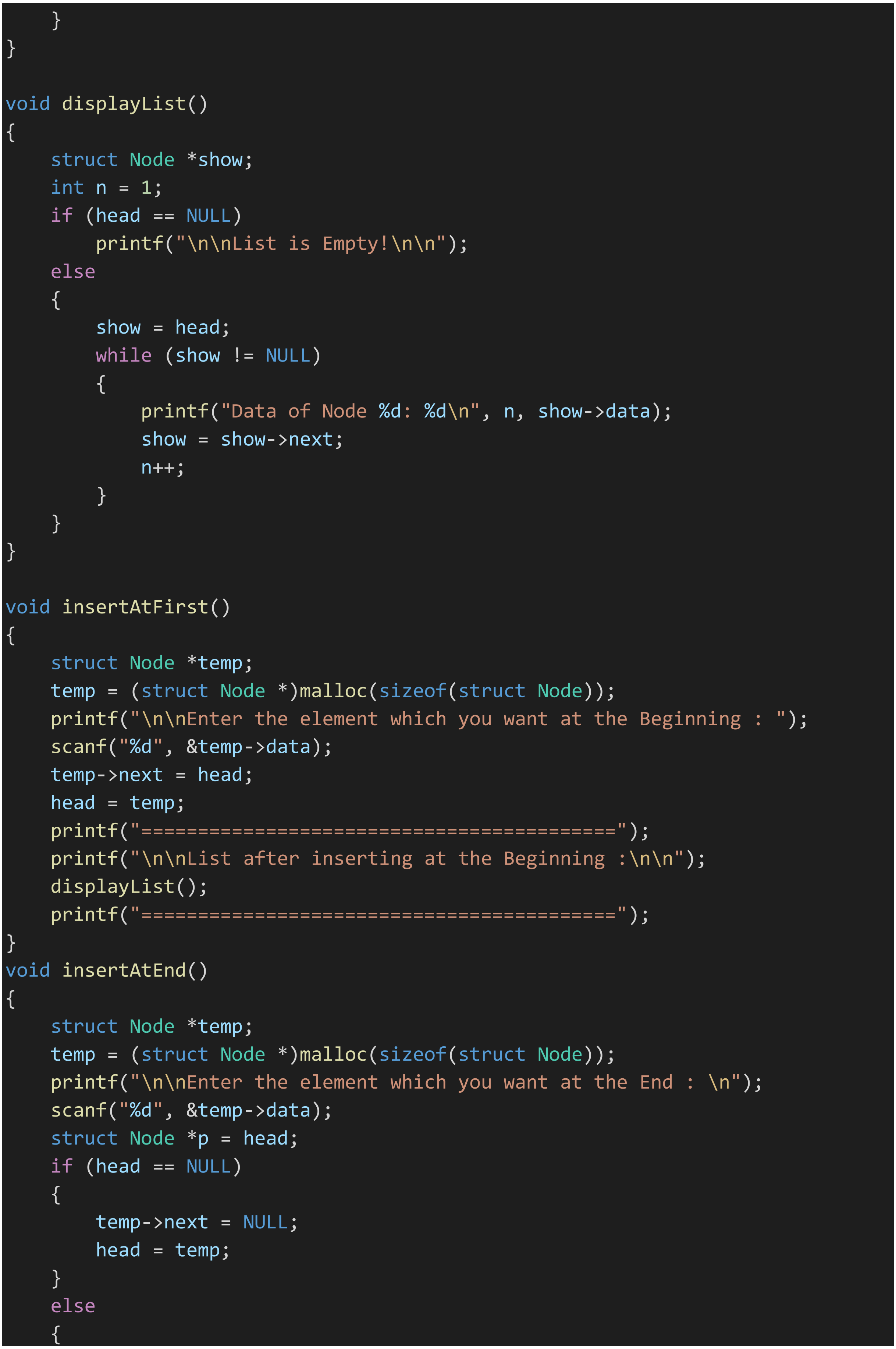
```
struct node *temp
int s, index=1
enter the data
scanf(“%d”,&s)
temp=head
while(temp!=NULL)
{
If(temp->data==s)
{print(element found);break;}
Temp=temp->next
Index++
}
If(temp==NULL)
print(not found)
```

Applications:

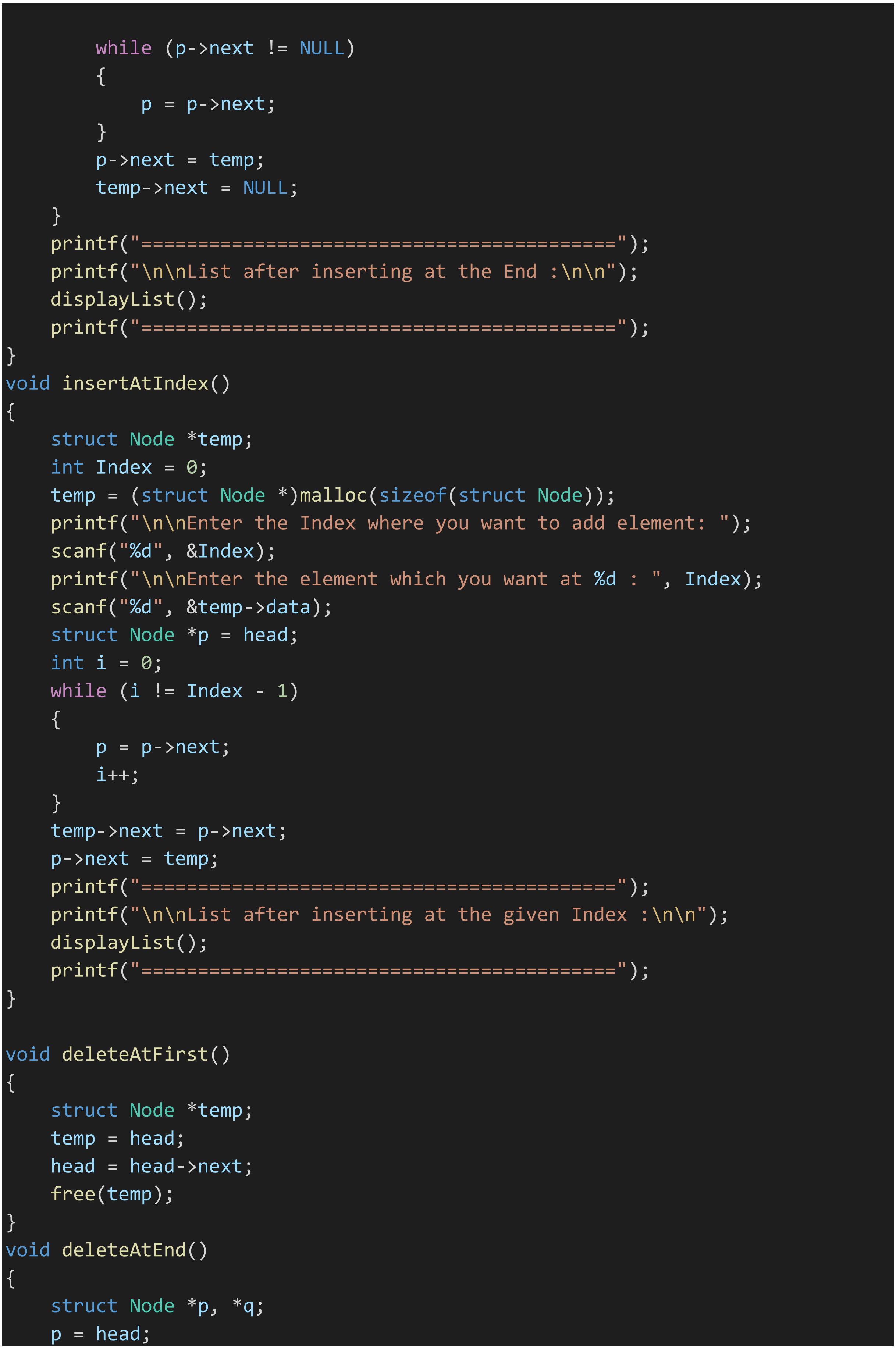
- Dynamic Memory Allocation
- Memory management
- Implementation of stacks and queues
- Linked allocation of files
- Real world applications like Image viewer and Music player

Program:

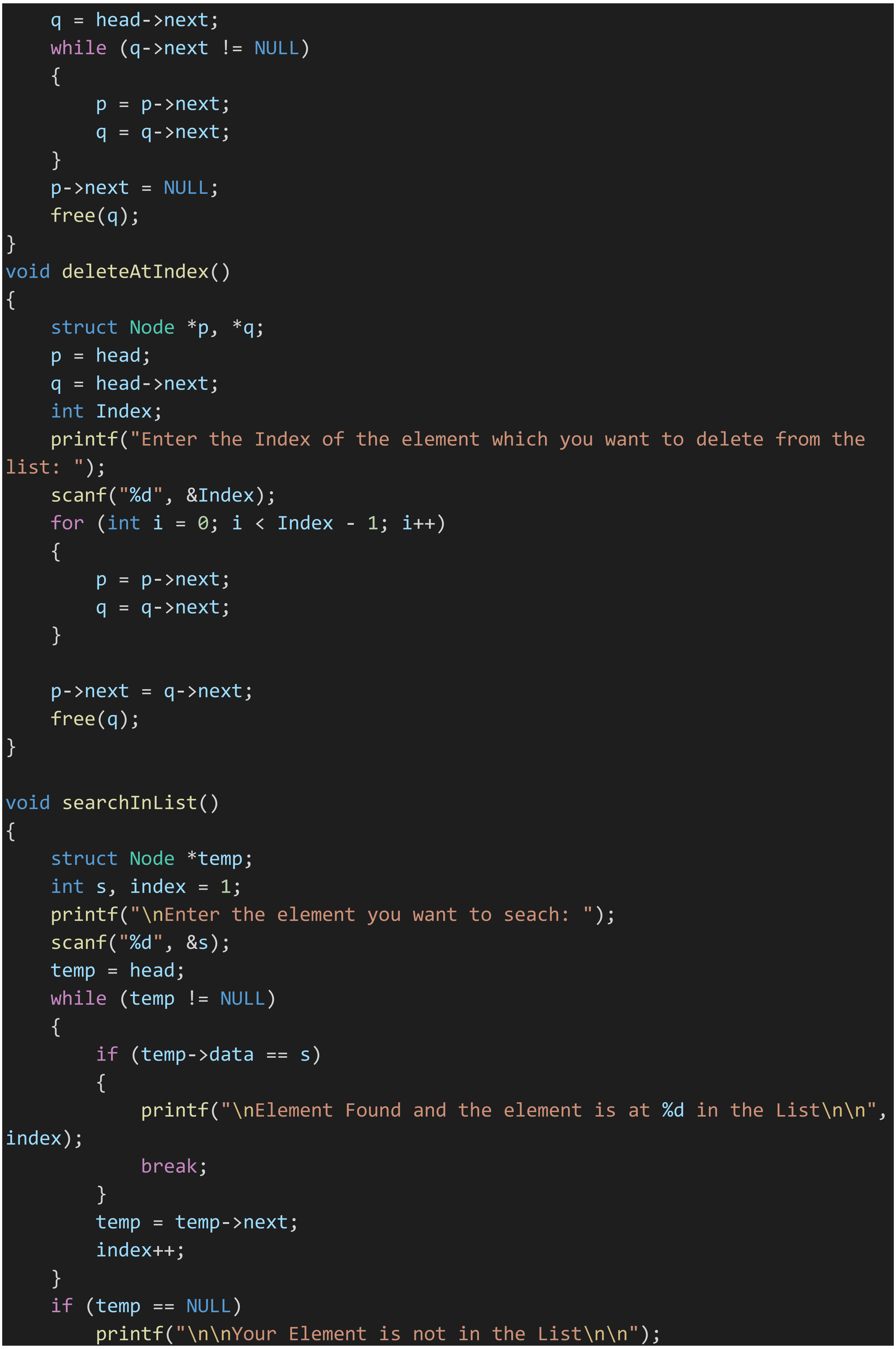
```c
#include <stdio.h>
#include <stdlib.h>
#include <malloc.h>

void deleteAtFirst();
void deleteAtEnd();
void deleteAtIndex();

struct Node
{
    int data;
    struct Node *next;
} * head;
void createList()
{
    struct Node *temp, *r;
    int n, index = 1;
    printf("Enter the Number of Elements you want in the List: ");
    scanf("%d", &n);
    for (int i = 0; i < n; i++)
    {
        temp = (struct Node *)malloc(sizeof(struct Node));
        printf("Enter data at Node %d: ", index);
        index++;
        scanf("%d", &temp->data);
        temp->next = NULL;
        if (head == NULL)
            head = temp;
        else
        {
            r = head;
            while (r->next != NULL)
                r = r->next;
            r->next = temp;
        }
```



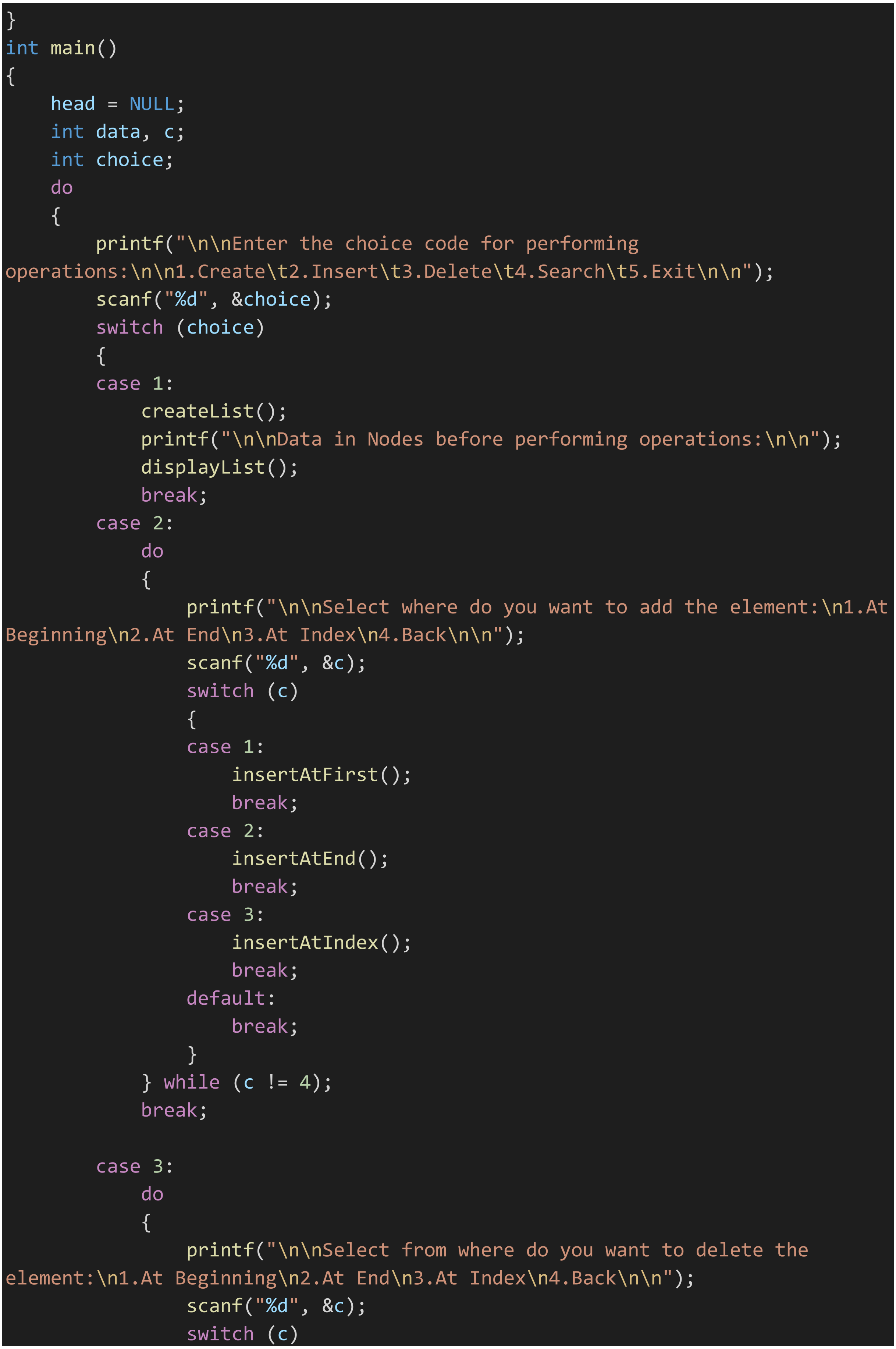
```
    }
}

void displayList()
{
    struct Node *show;
    int n = 1;
    if (head == NULL)
        printf("\n\nList is Empty!\n\n");
    else
    {
        show = head;
        while (show != NULL)
        {
            printf("Data of Node %d: %d\n", n, show->data);
            show = show->next;
            n++;
        }
    }
}

void insertAtFirst()
{
    struct Node *temp;
    temp = (struct Node *)malloc(sizeof(struct Node));
    printf("\n\nEnter the element which you want at the Beginning : ");
    scanf("%d", &temp->data);
    temp->next = head;
    head = temp;
    printf("==========================================");
    printf("\n\nList after inserting at the Beginning :\n\n");
    displayList();
    printf("==========================================");
}
void insertAtEnd()
{
    struct Node *temp;
    temp = (struct Node *)malloc(sizeof(struct Node));
    printf("\n\nEnter the element which you want at the End : \n");
    scanf("%d", &temp->data);
    struct Node *p = head;
    if (head == NULL)
    {
        temp->next = NULL;
        head = temp;
    }
    else
    {
```



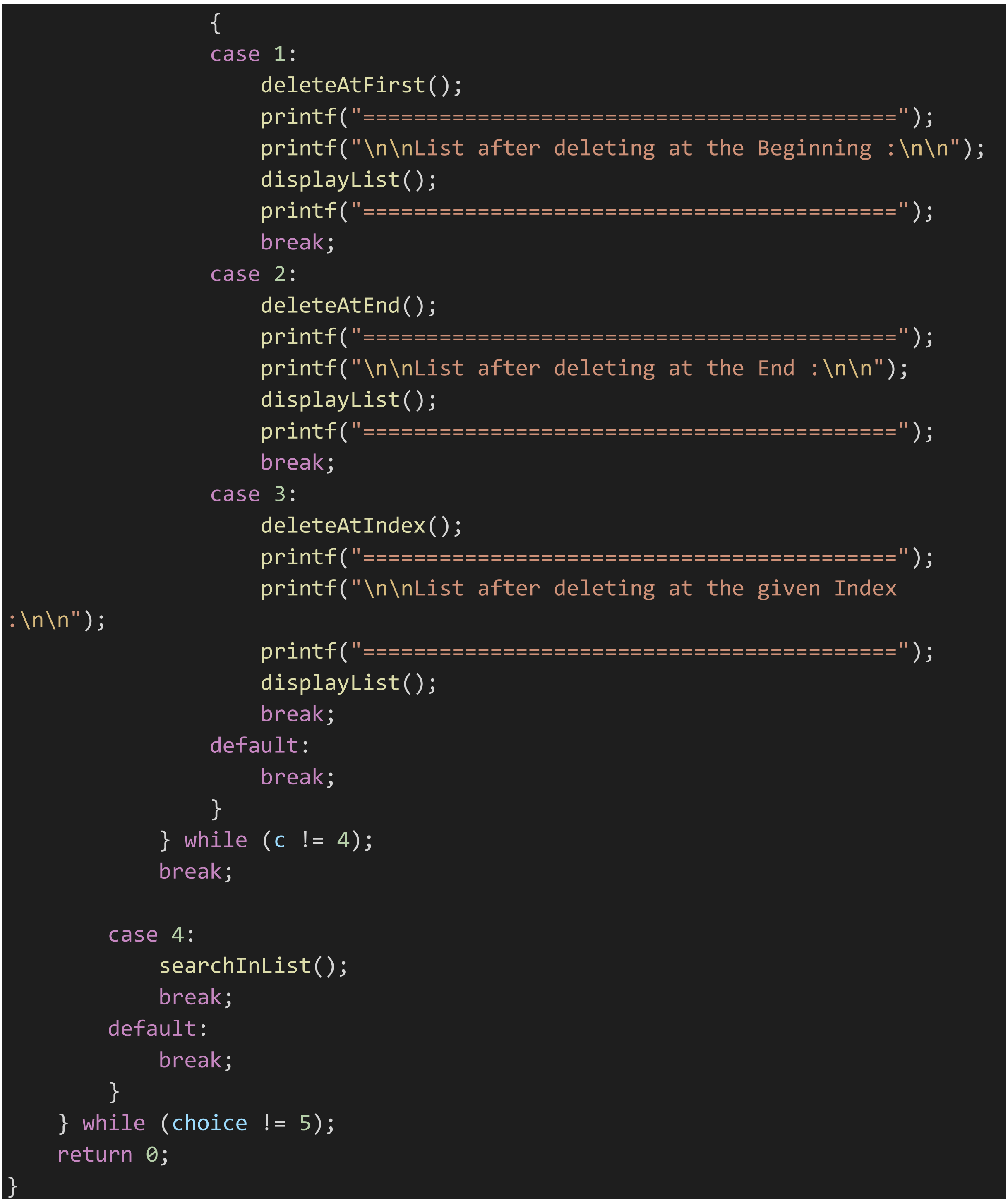
```
        while (p->next != NULL)
        {
            p = p->next;
        }
        p->next = temp;
        temp->next = NULL;
    }
    printf("==========================================");
    printf("\n\nList after inserting at the End :\n\n");
    displayList();
    printf("==========================================");
}
void insertAtIndex()
{
    struct Node *temp;
    int Index = 0;
    temp = (struct Node *)malloc(sizeof(struct Node));
    printf("\n\nEnter the Index where you want to add element: ");
    scanf("%d", &Index);
    printf("\n\nEnter the element which you want at %d : ", Index);
    scanf("%d", &temp->data);
    struct Node *p = head;
    int i = 0;
    while (i != Index - 1)
    {
        p = p->next;
        i++;
    }
    temp->next = p->next;
    p->next = temp;
    printf("==========================================");
    printf("\n\nList after inserting at the given Index :\n\n");
    displayList();
    printf("==========================================");
}

void deleteAtFirst()
{
    struct Node *temp;
    temp = head;
    head = head->next;
    free(temp);
}
void deleteAtEnd()
{
    struct Node *p, *q;
    p = head;
```



```c
    q = head->next;
    while (q->next != NULL)
    {
        p = p->next;
        q = q->next;
    }
    p->next = NULL;
    free(q);
}
void deleteAtIndex()
{
    struct Node *p, *q;
    p = head;
    q = head->next;
    int Index;
    printf("Enter the Index of the element which you want to delete from the
list: ");
    scanf("%d", &Index);
    for (int i = 0; i < Index - 1; i++)
    {
        p = p->next;
        q = q->next;
    }

    p->next = q->next;
    free(q);
}

void searchInList()
{
    struct Node *temp;
    int s, index = 1;
    printf("\nEnter the element you want to seach: ");
    scanf("%d", &s);
    temp = head;
    while (temp != NULL)
    {
        if (temp->data == s)
        {
            printf("\nElement Found and the element is at %d in the List\n\n",
index);
            break;
        }
        temp = temp->next;
        index++;
    }
    if (temp == NULL)
        printf("\n\nYour Element is not in the List\n\n");
```

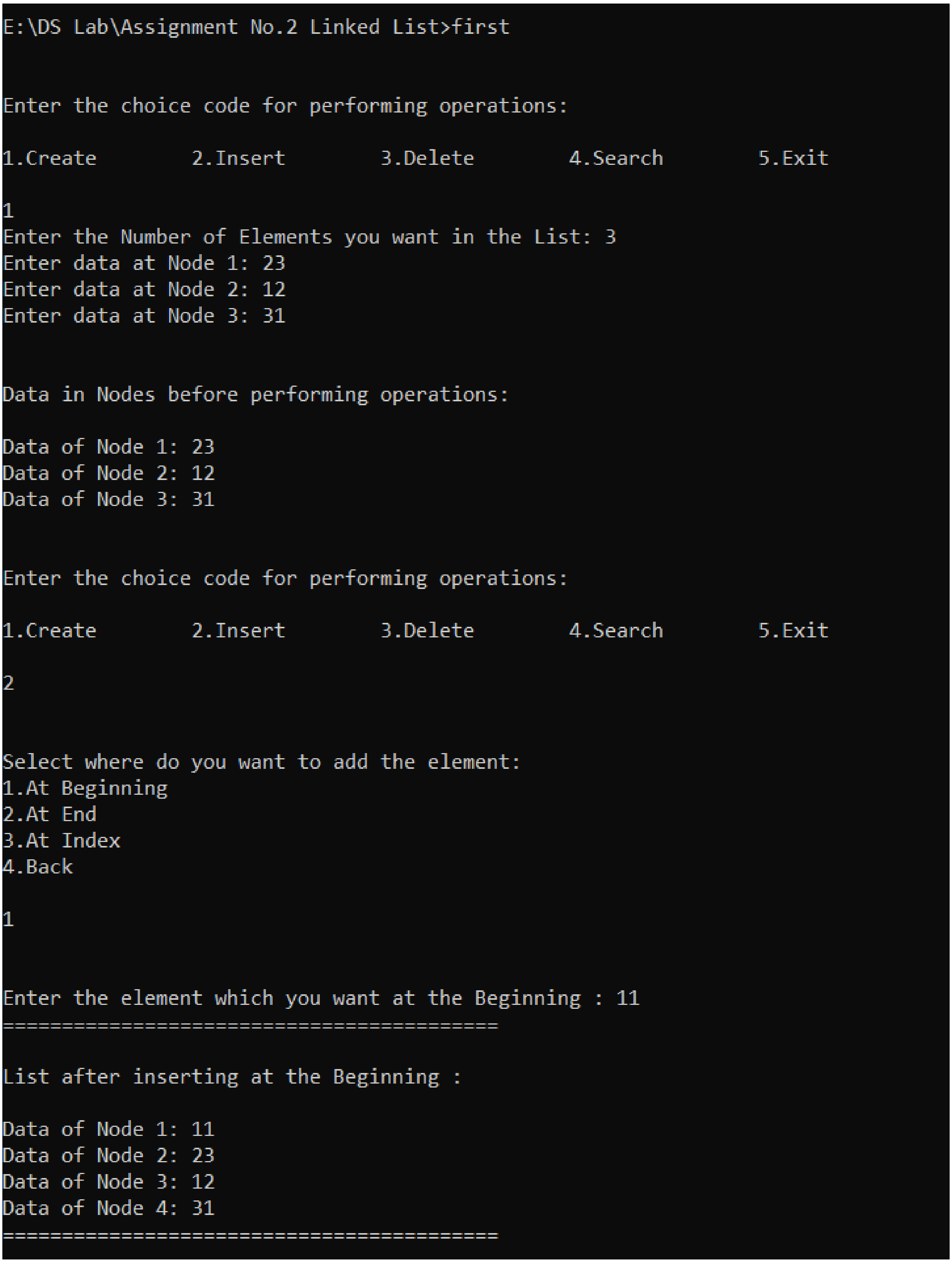


```
}
int main()
{
    head = NULL;
    int data, c;
    int choice;
    do
    {
        printf("\n\nEnter the choice code for performing 
operations:\n\n1.Create\t2.Insert\t3.Delete\t4.Search\t5.Exit\n\n");
        scanf("%d", &choice);
        switch (choice)
        {
        case 1:
            createList();
            printf("\n\nData in Nodes before performing operations:\n\n");
            displayList();
            break;
        case 2:
            do
            {
                printf("\n\nSelect where do you want to add the element:\n1.At 
Beginning\n2.At End\n3.At Index\n4.Back\n\n");
                scanf("%d", &c);
                switch (c)
                {
                case 1:
                    insertAtFirst();
                    break;
                case 2:
                    insertAtEnd();
                    break;
                case 3:
                    insertAtIndex();
                    break;
                default:
                    break;
                }
            } while (c != 4);
            break;

        case 3:
            do
            {
                printf("\n\nSelect from where do you want to delete the 
element:\n1.At Beginning\n2.At End\n3.At Index\n4.Back\n\n");
                scanf("%d", &c);
                switch (c)
```

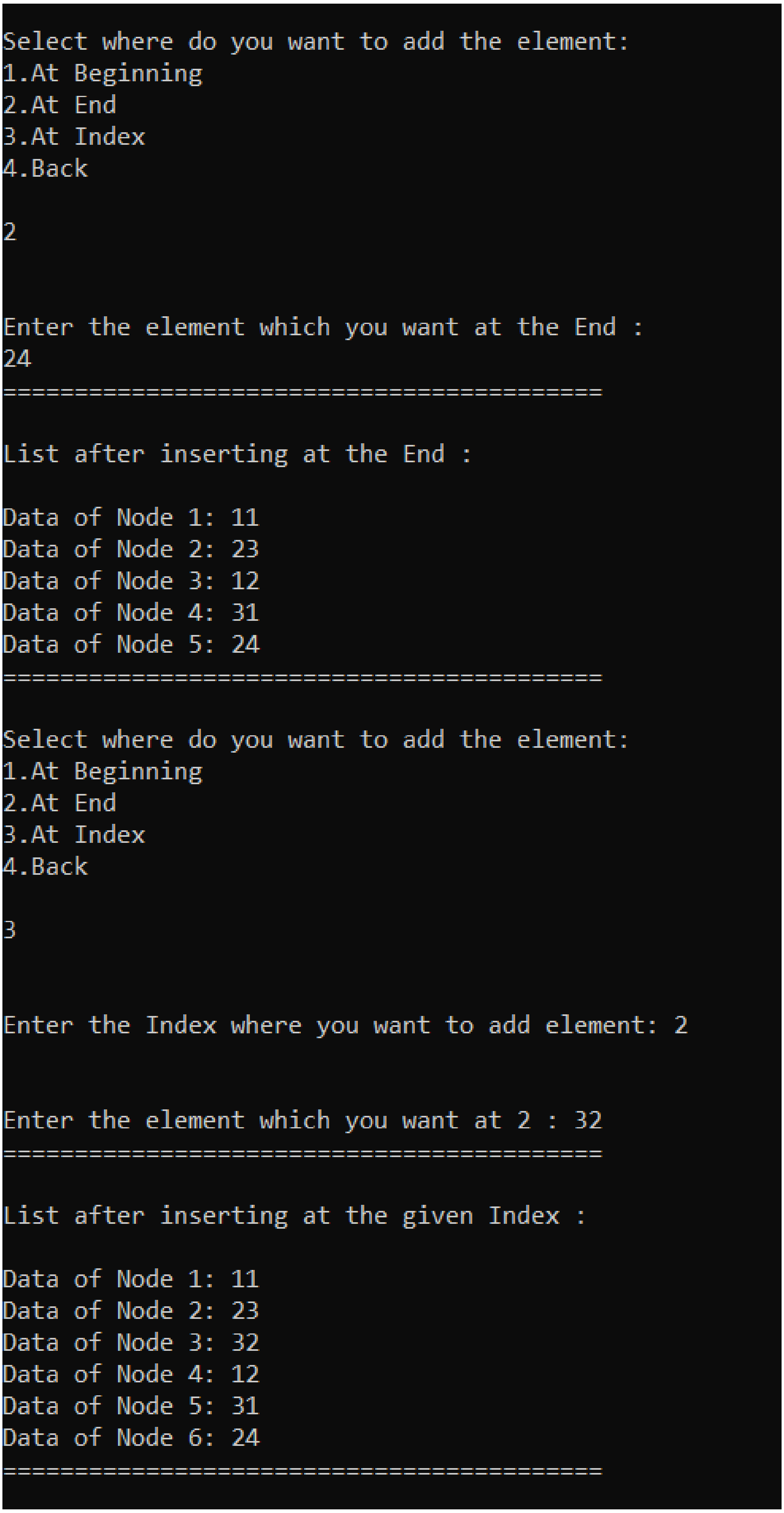


```
                {
                case 1:
                    deleteAtFirst();
                    printf("==========================================");
                    printf("\n\nList after deleting at the Beginning :\n\n");
                    displayList();
                    printf("==========================================");
                    break;
                case 2:
                    deleteAtEnd();
                    printf("==========================================");
                    printf("\n\nList after deleting at the End :\n\n");
                    displayList();
                    printf("==========================================");
                    break;
                case 3:
                    deleteAtIndex();
                    printf("==========================================");
                    printf("\n\nList after deleting at the given Index
:\n\n");

                    printf("==========================================");
                    displayList();
                    break;
                default:
                    break;
                }
            } while (c != 4);
            break;

        case 4:
            searchInList();
            break;
        default:
            break;
        }
    } while (choice != 5);
    return 0;
}
```

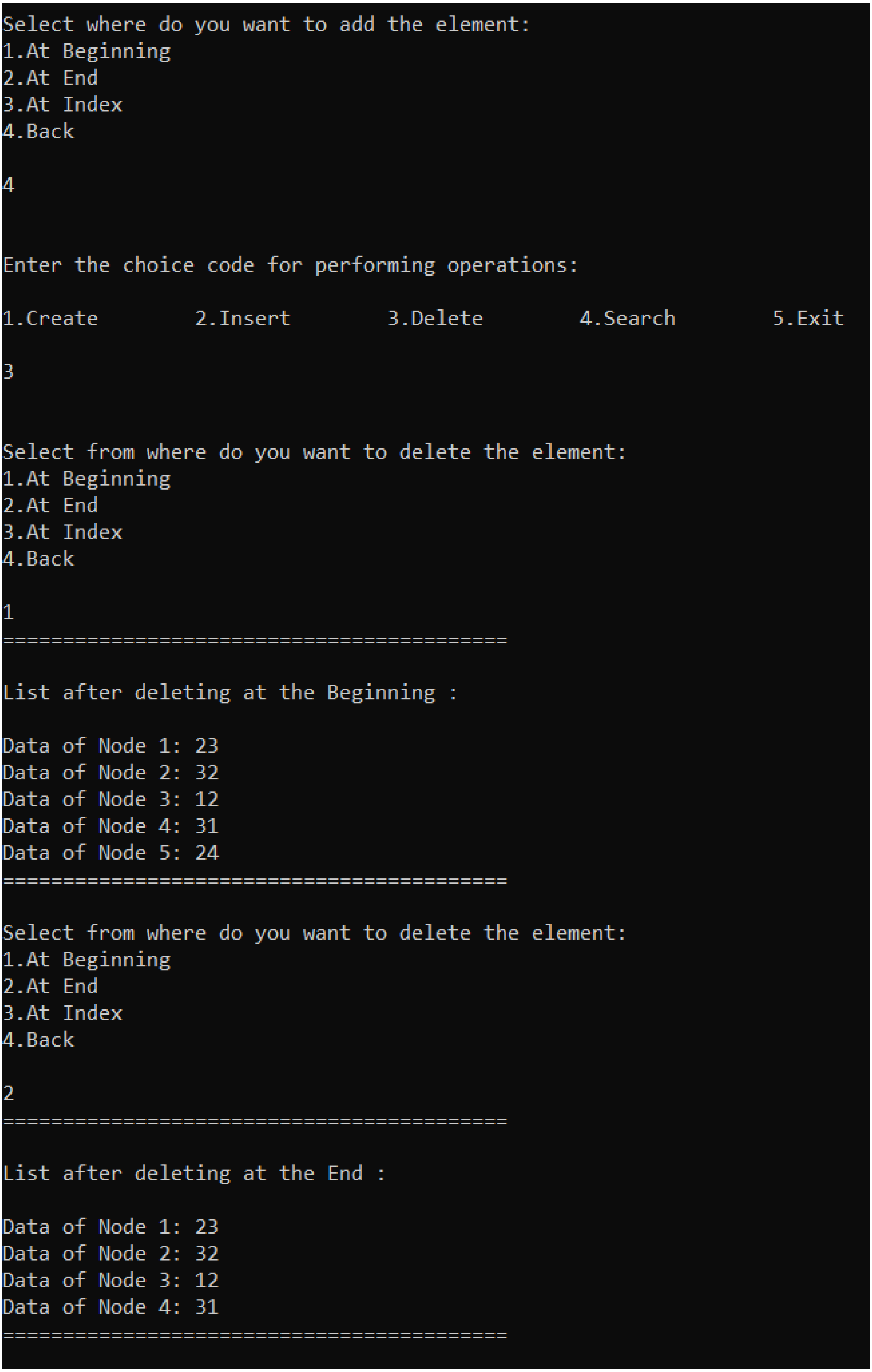
Output:



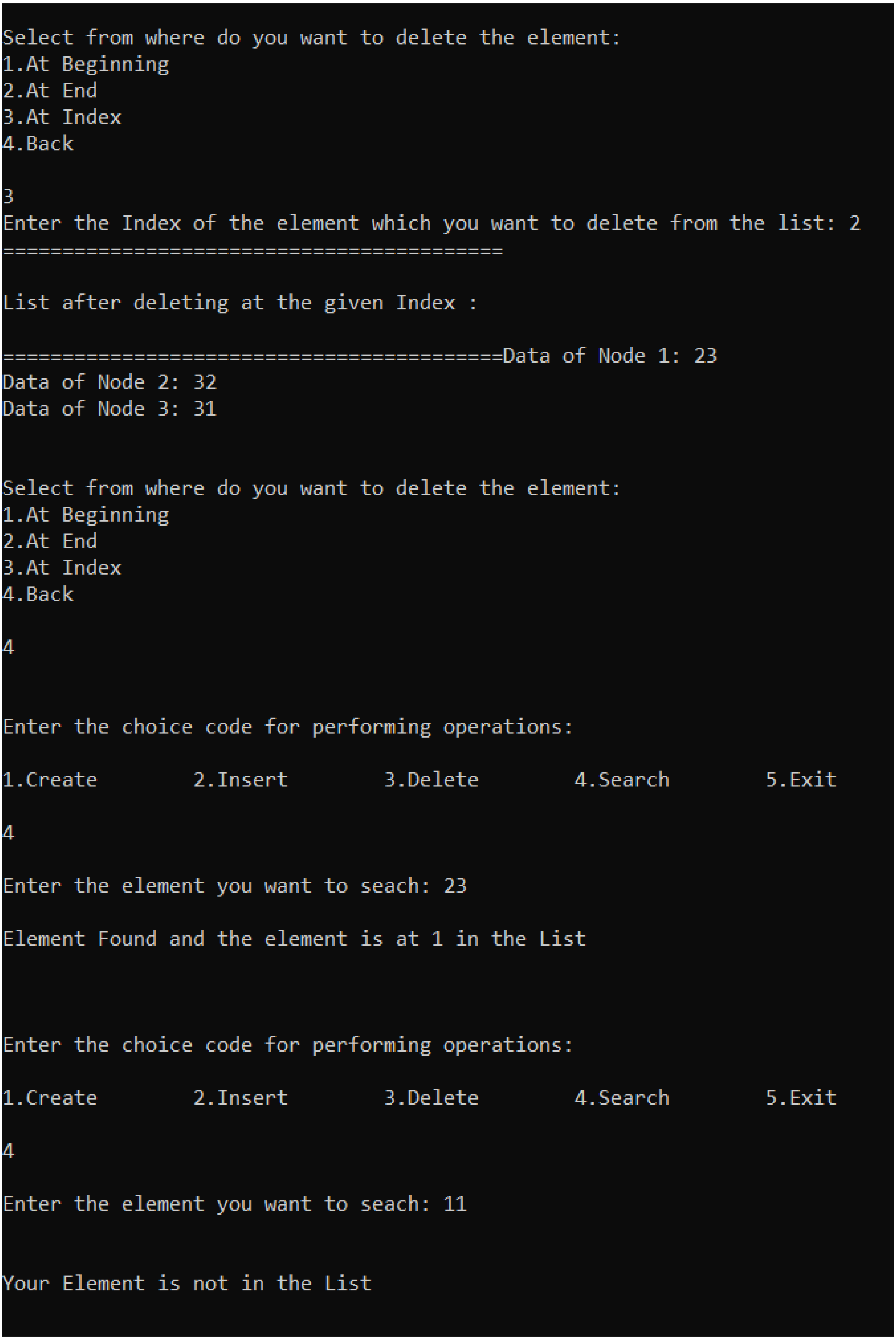
```
E:\DS Lab\Assignment No.2 Linked List>first


Enter the choice code for performing operations:

1.Create        2.Insert        3.Delete        4.Search        5.Exit

1
Enter the Number of Elements you want in the List: 3
Enter data at Node 1: 23
Enter data at Node 2: 12
Enter data at Node 3: 31


Data in Nodes before performing operations:

Data of Node 1: 23
Data of Node 2: 12
Data of Node 3: 31


Enter the choice code for performing operations:

1.Create        2.Insert        3.Delete        4.Search        5.Exit

2


Select where do you want to add the element:
1.At Beginning
2.At End
3.At Index
4.Back

1


Enter the element which you want at the Beginning : 11
==========================================

List after inserting at the Beginning :

Data of Node 1: 11
Data of Node 2: 23
Data of Node 3: 12
Data of Node 4: 31
==========================================
```



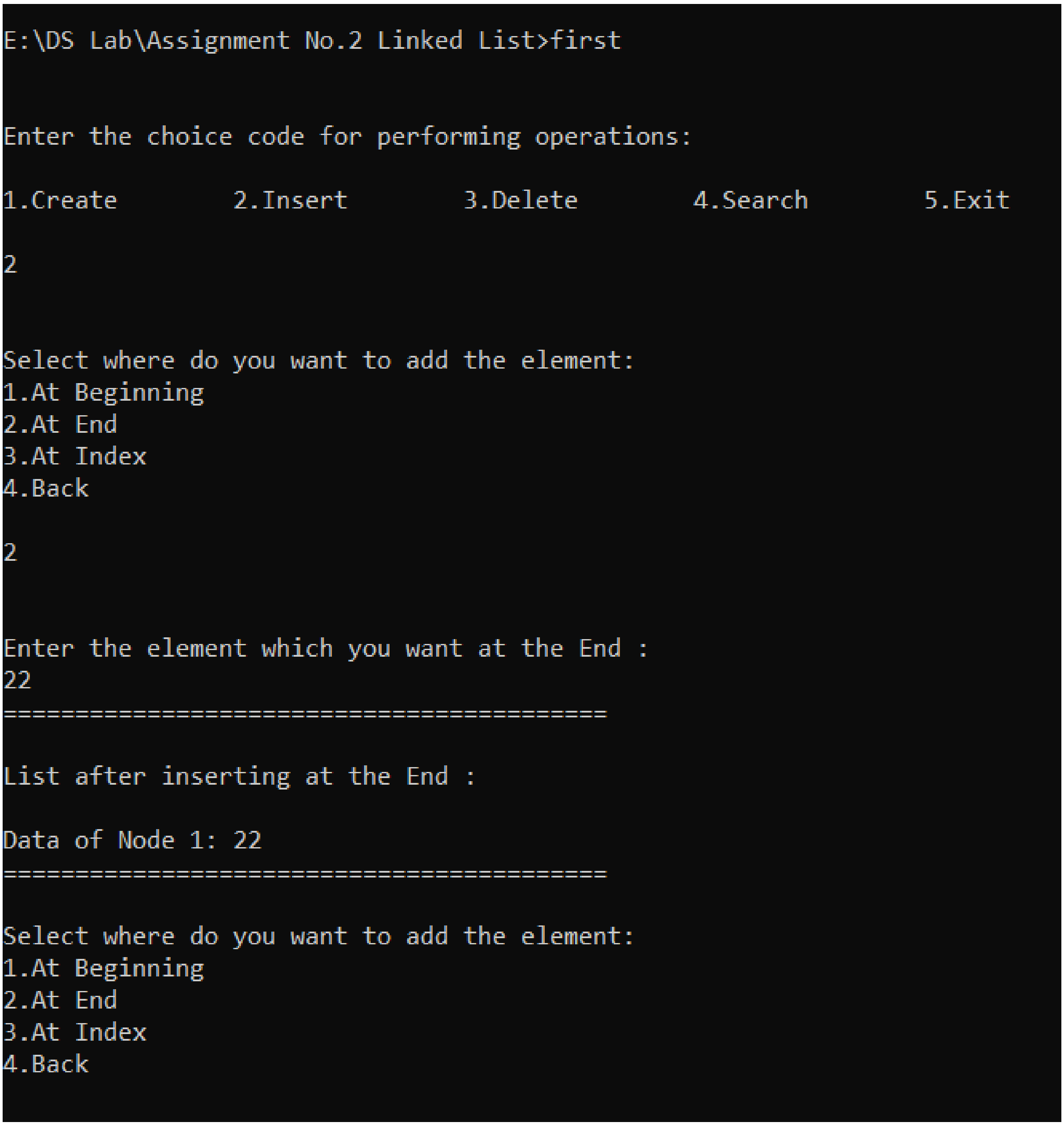
```
Select where do you want to add the element:
1.At Beginning
2.At End
3.At Index
4.Back

2


Enter the element which you want at the End :
24
==========================================

List after inserting at the End :

Data of Node 1: 11
Data of Node 2: 23
Data of Node 3: 12
Data of Node 4: 31
Data of Node 5: 24
==========================================

Select where do you want to add the element:
1.At Beginning
2.At End
3.At Index
4.Back

3


Enter the Index where you want to add element: 2


Enter the element which you want at 2 : 32
==========================================

List after inserting at the given Index :

Data of Node 1: 11
Data of Node 2: 23
Data of Node 3: 32
Data of Node 4: 12
Data of Node 5: 31
Data of Node 6: 24
==========================================
```



```
Select where do you want to add the element:
1.At Beginning
2.At End
3.At Index
4.Back

4


Enter the choice code for performing operations:

1.Create        2.Insert        3.Delete        4.Search        5.Exit

3


Select from where do you want to delete the element:
1.At Beginning
2.At End
3.At Index
4.Back

1
==========================================

List after deleting at the Beginning :

Data of Node 1: 23
Data of Node 2: 32
Data of Node 3: 12
Data of Node 4: 31
Data of Node 5: 24
==========================================

Select from where do you want to delete the element:
1.At Beginning
2.At End
3.At Index
4.Back

2
==========================================

List after deleting at the End :

Data of Node 1: 23
Data of Node 2: 32
Data of Node 3: 12
Data of Node 4: 31
==========================================
```



```
Select from where do you want to delete the element:
1.At Beginning
2.At End
3.At Index
4.Back

3
Enter the Index of the element which you want to delete from the list: 2
==========================================

List after deleting at the given Index :

==========================================Data of Node 1: 23
Data of Node 2: 32
Data of Node 3: 31


Select from where do you want to delete the element:
1.At Beginning
2.At End
3.At Index
4.Back

4


Enter the choice code for performing operations:

1.Create        2.Insert        3.Delete        4.Search        5.Exit

4

Enter the element you want to seach: 23

Element Found and the element is at 1 in the List



Enter the choice code for performing operations:

1.Create        2.Insert        3.Delete        4.Search        5.Exit

4

Enter the element you want to seach: 11


Your Element is not in the List
```



```
E:\DS Lab\Assignment No.2 Linked List>first


Enter the choice code for performing operations:

1.Create        2.Insert        3.Delete        4.Search        5.Exit

2


Select where do you want to add the element:
1.At Beginning
2.At End
3.At Index
4.Back

2


Enter the element which you want at the End :
22
==========================================

List after inserting at the End :

Data of Node 1: 22
==========================================

Select where do you want to add the element:
1.At Beginning
2.At End
3.At Index
4.Back
```