Data Structures Practical 3

Aim: Implementation of stacks (Using arrays and Linked List)

A. Implementation of stack using Array.

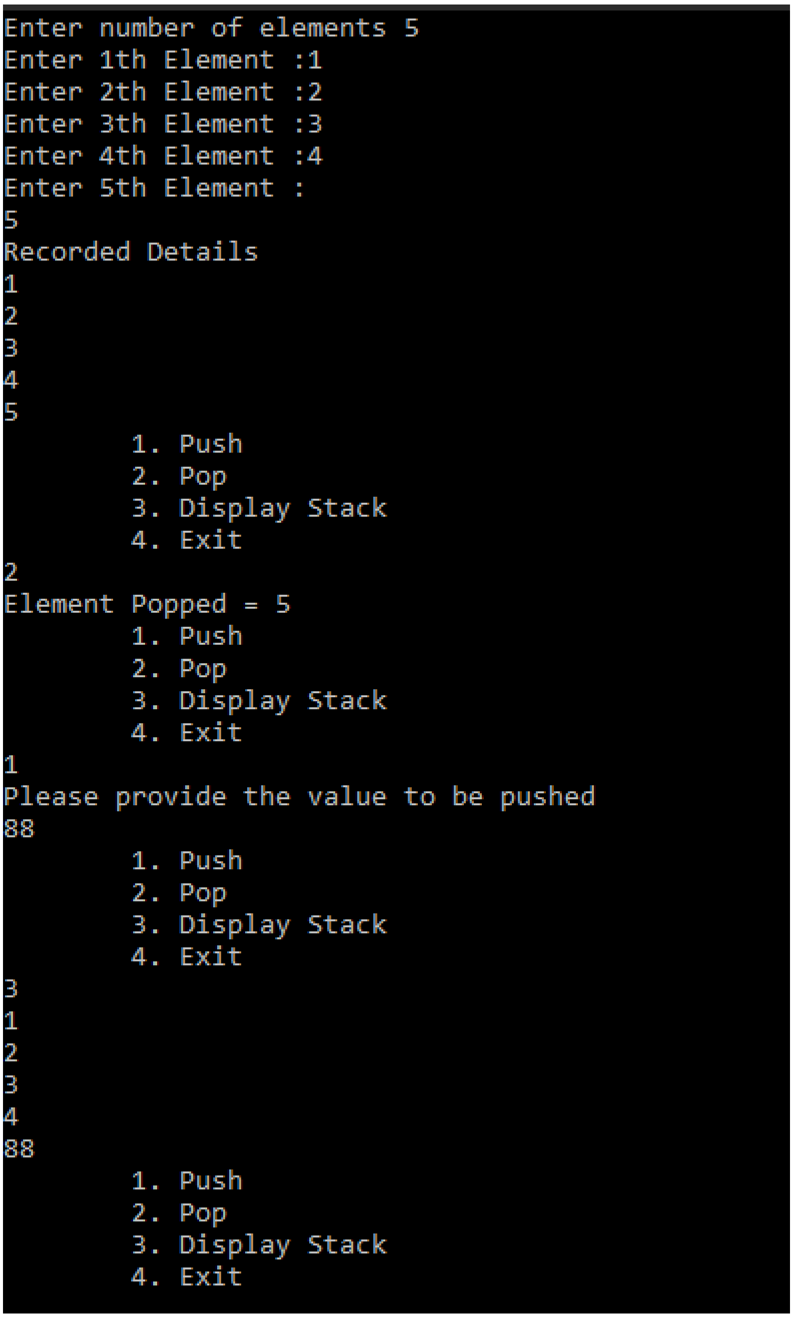
Code:

```
//Stack Implementation with Arrays.
//Date: 18-Mar-2021
#include<iostream>
using namespace std;
void showArray(int arr[],int size) {
    //cout<<"Saved Array is \n";
    for(int i=0;i<size;i++){
        cout<<arr[i]<<"\n";
    }
}
int main() {
    int n,i;
    int stackCounter = -1;
    int choice;
    int new_value=0;
    cout<<"Enter number of elements ";
    cin>>n;
    int arr[10];
    for(int i=0;i<n;i++) {
        cout<<"Enter "<<i+1<<"th Element :";
        cin>>arr[i];
        stackCounter++;
    }
    cout<<"Recorded Details \n";
    showArray(arr,n);
    do{
        cout<<"\t1. Push\n\t2. Pop\n\t3. Display Stack\n\t4. Exit\n";
        cin>>choice;
```

```
switch(choice){
    case 1:
            if(stackCounter==9){
                cout<<"Stack is Full! Cannot add more than 10 elements\n";
            }
            else{
                stackCounter++;
                cout<<"Please provide the value to be pushed \n";
                cin>>new_value;
                arr[stackCounter]=new_value;
            }
            break;
    case 2:
            if(stackCounter==-1){
                cout<<"Stack is Empty!\n";
            }
            else{
                cout<<"Element Popped = "<<arr[stackCounter]<<"\n";
                stackCounter--;
            }
            break;
    case 3:
            if(stackCounter==-1){
                cout<<"Stack is Empty!\n";
            }
            else{
                showArray(arr,stackCounter+1);
            }
            break;
    case 4: break;
    default: cout<<"Invalid Data! Please select again.\n";
}
```

```
        }
        while(choice!=4);
        return 0;
}
```

Output:



```
Enter number of elements 5
Enter 1th Element :1
Enter 2th Element :2
Enter 3th Element :3
Enter 4th Element :4
Enter 5th Element :
5
Recorded Details
1
2
3
4
5
        1. Push
        2. Pop
        3. Display Stack
        4. Exit
2
Element Popped = 5
        1. Push
        2. Pop
        3. Display Stack
        4. Exit
1
Please provide the value to be pushed
88
        1. Push
        2. Pop
        3. Display Stack
        4. Exit
3
1
2
3
4
88
        1. Push
        2. Pop
        3. Display Stack
        4. Exit
```

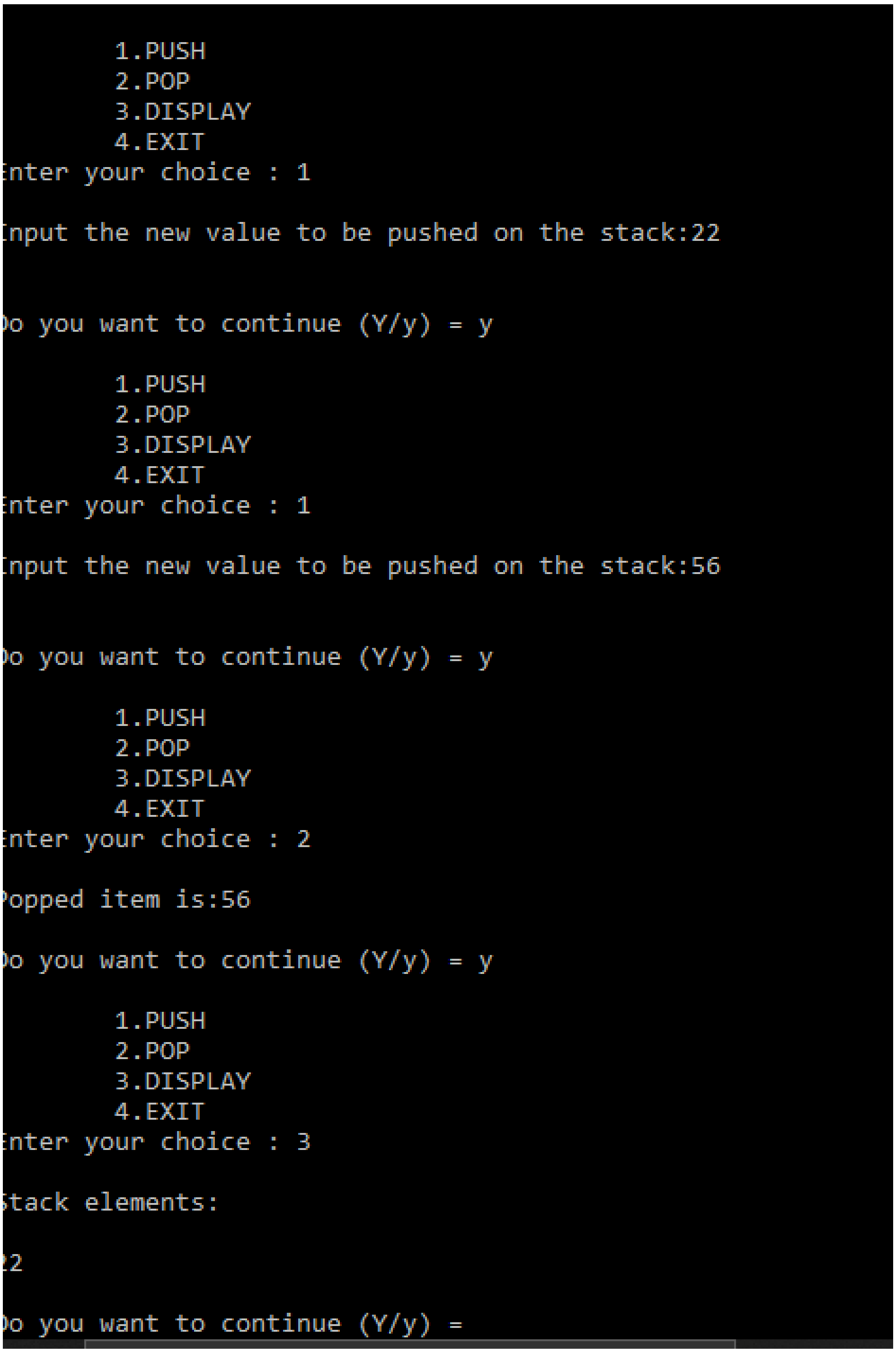
B. Implementation of stack using LinkedList.

Code:

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

```
class Stack_Linked {
        struct node{
                int info;
                struct node *link;//A link to the next node
        };
        struct node *top;
        typedef struct node *NODE;
        public:
        Stack_Linked(){
                top=NULL;
        }
//function declarations
        void push();
        void pop();
        void display();
};
//This function is to perform the push operation
void Stack_Linked::push() {
        NODE NewNode;
        int pushed_item;
        //A new node is created dynamically
        NewNode=(NODE)new(struct node);
        cout<<"\nInput the new value to be pushed on the stack:";
        cin>>pushed_item;
        NewNode->info=pushed_item;//Data is pushed to the stack
        NewNode->link=top;//Link pointer is set to the next node
        top=NewNode;//Top pointer is set
}/*End of push()*/
//Following function will implement the pop operation
void Stack_Linked::pop(){
        NODE tmp;
        if(top == NULL)//checking whether the stack is empty or not
        {
            cout<<"\nStack is empty\n";
        }
    else{
        tmp=top;//popping the element
        cout<<"\nPopped item is:"<<tmp->info;
        top=top->link;//resetting the top pointer
        tmp->link=NULL;
        delete(tmp);//freeing the popped node
    }
}/*End of pop()*/
//This is to display all the element in the stack
void Stack_Linked::display() {
    if(top==NULL)//Checking whether the stack is empty or not
        cout<<"\nStack is empty\n";
    else {
        NODE ptr=top;
        cout<<"\nStack elements:\n";
        while(ptr != NULL){
            cout<<"\n"<<ptr->info;
            ptr = ptr->link;
        }/*End of while */
    }/*End of if*/
}
int main() {
    Stack_Linked So;
    int choice;
    char opt;
    do{
        //##MENU##
        cout<<"\n\t1.PUSH";
        cout<<"\n\t2.POP";
        cout<<"\n\t3.DISPLAY";
        cout<<"\n\t4.EXIT";
        cout<<"\nEnter your choice : ";
        cin>>choice;
        switch(choice){
            case 1:
                So.push();//push function is called
                break;
            case 2:
                So.pop();//pop function is called
                break;
            case 3:
                So.display();//display function is called
                break;
            case 4:
                exit(1);
            default:
                cout<<"\nWrong choice\n";
        }
        cout<<"\n\nDo you want to continue (Y/y) = ";
        cin>>opt;
    }while((opt == 'Y') || (opt == 'y'));
}
```

Output:



```
       1.PUSH
       2.POP
       3.DISPLAY
       4.EXIT
nter your choice : 1

nput the new value to be pushed on the stack:22


o you want to continue (Y/y) = y

       1.PUSH
       2.POP
       3.DISPLAY
       4.EXIT
nter your choice : 1

nput the new value to be pushed on the stack:56


o you want to continue (Y/y) = y

       1.PUSH
       2.POP
       3.DISPLAY
       4.EXIT
nter your choice : 2

opped item is:56

o you want to continue (Y/y) = y

       1.PUSH
       2.POP
       3.DISPLAY
       4.EXIT
nter your choice : 3

tack elements:

2

o you want to continue (Y/y) =
```