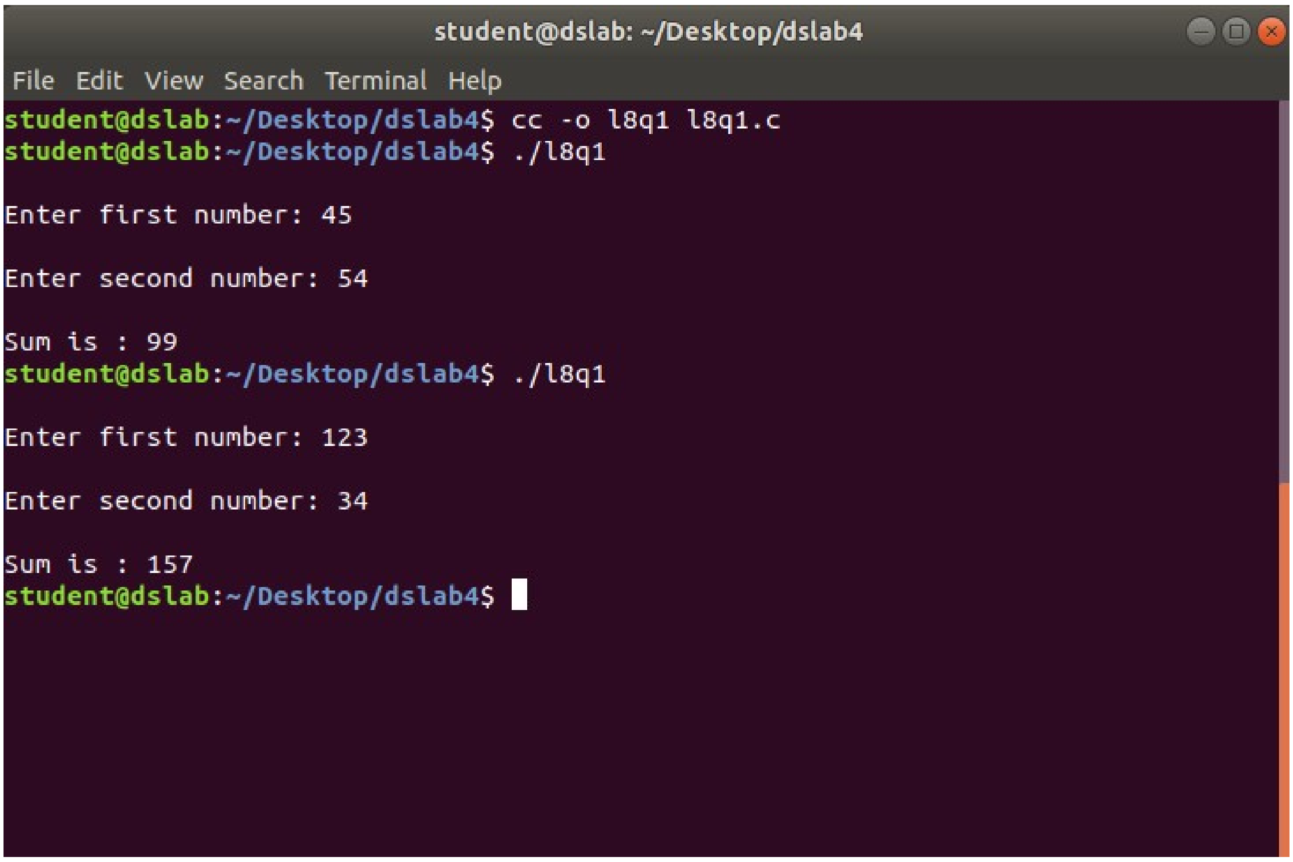
Ayush Goyal
190905522

DSA Lab 8 (Session 4)

Q1) Add two long positive integers represented using circular doubly linked list with header node.

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

typedef struct node{
	int data;
	struct node * next;
	struct node * prev;
} * NODE;

void insertFront(NODE head, int val){
	NODE first = head->next;
	head->data++;
	NODE n = (NODE)malloc(sizeof(struct node));
	n->data = val;
	n->next = NULL;
	n->prev = NULL;
	if(first == NULL){
		n->next = n;
		n->prev = n;
		head->next = n;
		return;
	}
	n->next = first;
	n->prev = first->prev;
	(first->prev)->next = n;
	first->prev = n;
	head->next = n;
	return;
}

void display(NODE head){
	if(head->data == 0){
		printf("\nList is empty\n");
		return;
	}
	NODE first = head->next;
	NODE temp = first;
	while(temp->next!=first){
		printf("%d",temp->data);
		temp = temp->next;
	}
	printf("%d\n",temp->data);
}
```

```
void insert(NODE head, int val){
        int x;
        while(val>0){
                x=val%10;
                val/=10;
                insertFront(head,x);
        }
}

NODE addLists(NODE head1, NODE head2){
        if(head1->data == 0){
                return head2;
        }
        if(head2->data == 0){
                return head1;
        }
        int c1 = head1->data;
        int c2 = head2->data;
        int diff = c1-c2;
        int s = 0,i;
        if(diff < 0){
                diff *= -1;
                for(i=0; i<diff; ++i){
                        insertFront(head1,0);
                }
        }
        else if(diff > 0){
                for(i = 0; i<diff; ++i){
                        insertFront(head2,0);
                }
        }
        NODE sum = (NODE)malloc(sizeof(struct node));
        sum->data = 0;
        int carry = 0;
        NODE f1 = head1->next;
        NODE f2 = head2->next;
        NODE op1 = f1->prev;
        NODE op2 = f2->prev;
        while(op1!=f1 && op2!=f2){
                s = (op1->data)+(op2->data)+carry;
                carry = s/10;
                s%=10;
                insertFront(sum,s);
                op1 = op1->prev;
                op2 = op2->prev;
        }
        s = (op1->data)+(op2->data)+carry;
        carry = s/10;
        s%=10;
        insertFront(sum,s);
        if(carry != 0){
                insertFront(sum,carry);
        }
        return sum;
}


int main(){
        NODE head1 = (NODE)malloc(sizeof(struct node));
        NODE head2 = (NODE)malloc(sizeof(struct node));
        NODE sum = NULL;
        int v1,v2;
        head1->data = 0;
        head2->data = 0;
        printf("\nEnter first number: ");
        scanf("%d",&v1);
        insert(head1,v1);
        printf("\nEnter second number: ");
        scanf("%d",&v2);
        insert(head2,v2);
        sum = addLists(head1,head2);
        printf("\nSum is : ");
        display(sum);
        return 0;
}
```


student@dslab: ~/Desktop/dslab4
File Edit View Search Terminal Help

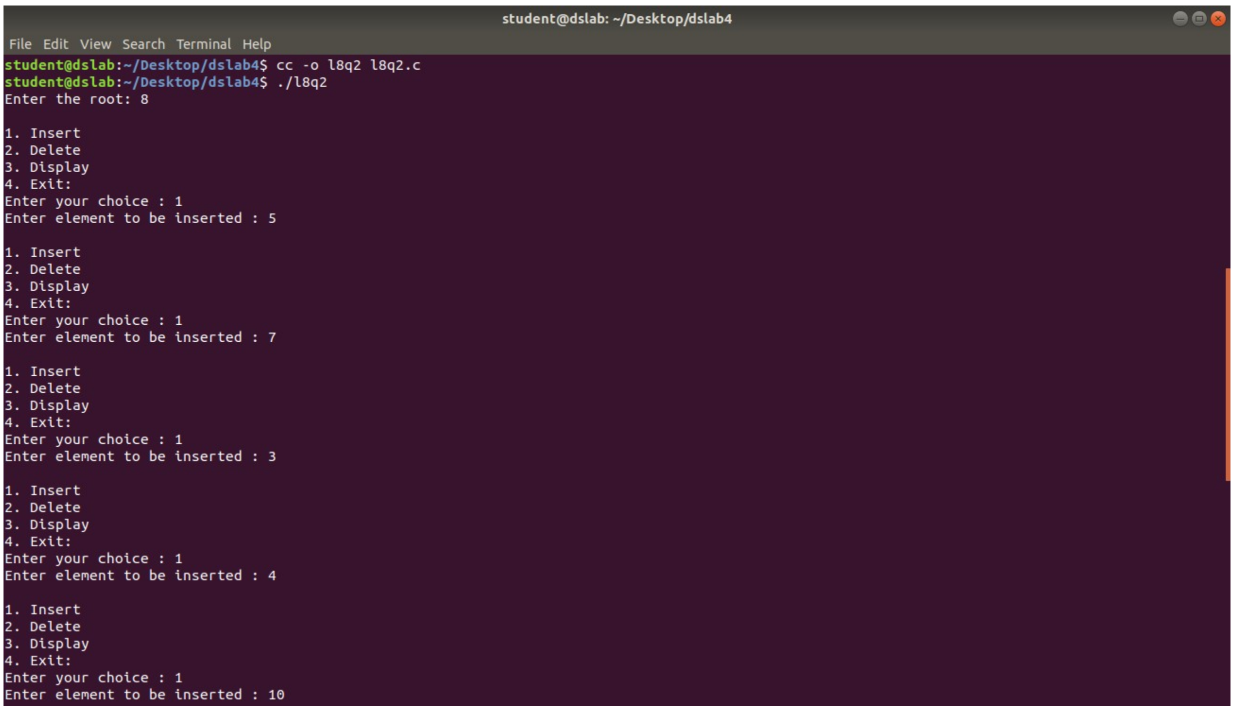
```
student@dslab:~/Desktop/dslab4$ cc -o l8q1 l8q1.c
student@dslab:~/Desktop/dslab4$ ./l8q1

Enter first number: 45

Enter second number: 54

Sum is : 99
student@dslab:~/Desktop/dslab4$ ./l8q1

Enter first number: 123

Enter second number: 34

Sum is : 157
student@dslab:~/Desktop/dslab4$ 
```

Q2) Write a menu driven program to do the following using iterative functions:
i) To create a BST for a given set of integer numbers
ii) To delete a given element from BST.
iii) Display the elements using iterative in-order traversal.

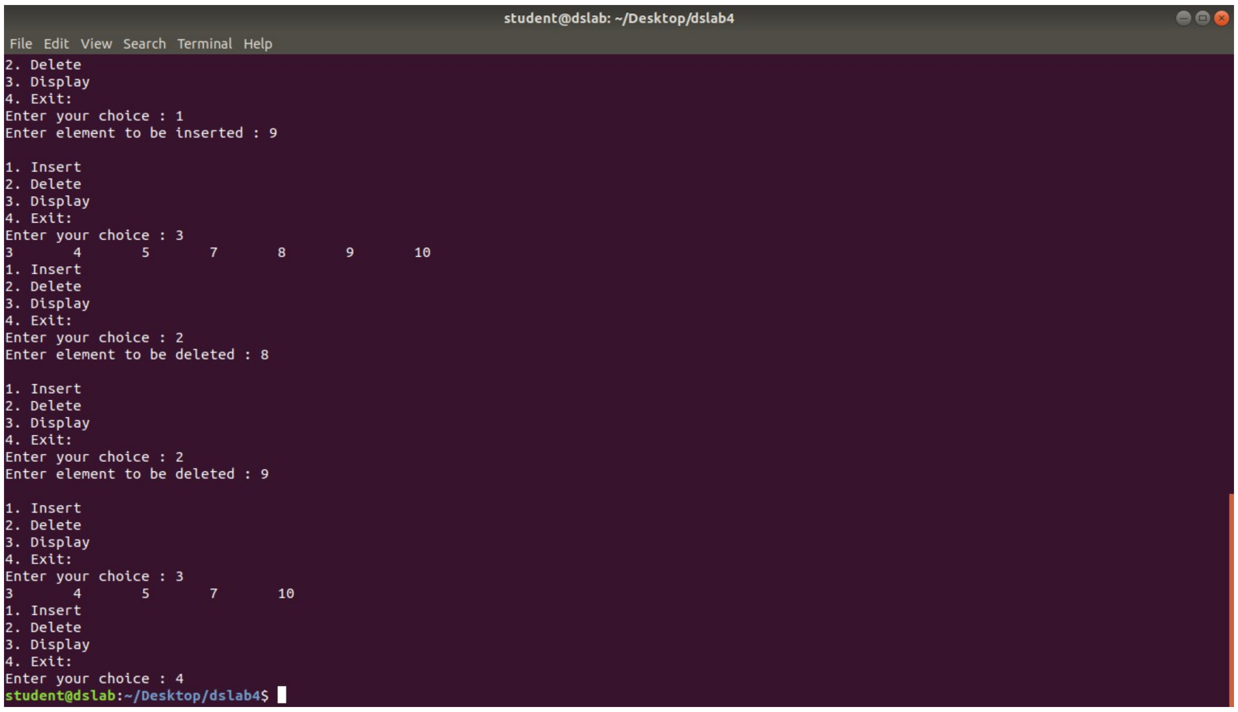
```
#include <stdio.h>
#include <stdlib.h>
#define MAX 10

typedef struct node{
        int key;
        struct node *left, *right;
}* NODE;

typedef struct{
        NODE S[MAX];
        int tos;
}STACK;

NODE newNODE (int item){
        NODE temp = (NODE)malloc(sizeof(struct node));
        temp->key = item;
        temp->left = temp->right = NULL;
        return temp;
}

void push (STACK *s, NODE n){
        s->S[++(s->tos)] = n;
}

NODE pop (STACK *s){
        return s->S[(s->tos)--];
}

void inorder (NODE root){
        NODE curr;
        curr = root;
        STACK S;
        S.tos = -1;
        push(&S, root);
        curr = curr->left;
        while (S.tos != -1 || curr != NULL){
                while (curr != NULL){
                        push(&S, curr);
                        curr = curr->left;
                }
                curr = pop(&S);
                printf("%d\t", curr->key);
                curr = curr->right;
        }
}
```

```
NODE insert (NODE node, int key){
	if (node == NULL)
		return newNODE(key);
	if (key < node->key)
		node->left = insert(node->left, key);
	else if (key > node->key)
       node->right = insert(node->right, key);
   return node;
}

NODE minValueNode (NODE node){
	NODE current = node;
	while (current && current->left != NULL)
		current = current->left;
	return current;
}

NODE deleteNode (NODE root, int key){
	if (root == NULL)
		return root;
	if (key < root->key)
		root->left = deleteNode(root->left, key);
	else if (key > root->key)
		root->right = deleteNode(root->right, key);
	else{
		if (root->left == NULL){
			NODE temp = root->right;
			free(root);
			return temp;
		}
		else if (root->right == NULL){
			NODE temp = root->left;
			free(root);
			return temp;
		}
		NODE temp = minValueNode(root->right);
		root->key = temp->key;
		root->right = deleteNode(root->right, temp->key);
	}
	return root;
}
int main(){
	NODE root = NULL;
	int k;
	printf("Enter the root:\t");
	scanf("%d", &k);
	root = insert(root, k);
	int ch;
	while(1){
		printf("\n1. Insert\n2. Delete\n3. Display\n4. Exit:\n");
		printf("Enter your choice : ");
		scanf("%d", &ch);
```

```
                switch (ch){
                        case 1: printf("Enter element to be inserted : ");
                                        scanf("%d", &k);
                                        root = insert(root, k);
                                        break;
                        case 2: printf("Enter element to be deleted : ");
                                        scanf("%d", &k);
                                        root = deleteNode(root, k);
                                        break;
                        case 3: inorder(root);
                                        break;
                        case 4: return 0;
                }
        }
}
```



```
student@dslab:~/Desktop/dslab4$ cc -o l8q2 l8q2.c
student@dslab:~/Desktop/dslab4$ ./l8q2
Enter the root: 8

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 1
Enter element to be inserted : 5

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 1
Enter element to be inserted : 7

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 1
Enter element to be inserted : 3

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 1
Enter element to be inserted : 4

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 1
Enter element to be inserted : 10
```



```
2. Delete
3. Display
4. Exit:
Enter your choice : 1
Enter element to be inserted : 9

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 3
3       4       5       7       8       9       10
1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 2
Enter element to be deleted : 8

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 2
Enter element to be deleted : 9

1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 3
3       4       5       7       10
1. Insert
2. Delete
3. Display
4. Exit:
Enter your choice : 4
student@dslab:~/Desktop/dslab4$
```