Assignment 4

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Q1

```
#include<iostream>
using namespace std;
class node
{
public:
int val;
node *next;
node(int val)
{
this->val=val;
next=NULL;
}
};
void insert_head(node *&head,int val)
{
node *new_node=new node(val);
new_node->next=head;
head=new_node;
}

void tail(int val,node *&head)
{
node *temp=head;
node *new_node=new node(val);
while(temp->next!=NULL)
{
temp=temp->next;
}
temp->next=new_node;
}
```

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```
void insert_pos(int pos,node *&head,int val)
{
if(pos==1)
{
insert_head(head,val);
return;
}
int c=1;
node *temp=head;
node *new_node=new node(val);
while(c<pos-1)
{
temp=temp->next;
c++;
}
new_node->next=temp->next;
temp->next=new_node;
}
void update(int val,int pos,node *&head)
{
int c=1;
node *temp=head;
while(c!=pos)
{
temp=temp->next;
c++;
}
temp->val=val;
}
void del_head(node *&head)
{
```

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```
node *temp=head;
head=head->next;
free(temp);
}
void del_tail(node *&head)
{
node *temp=head;
while((temp->next)->next!=NULL)
{
temp=temp->next;
}
free((temp->next)->next);
temp->next=NULL;

}
void del_pos(int pos,node *&head)
{
int c=1;
if(pos==1)
{
del_head(head);
return;
}
node *temp=head;
while(c<pos-1)
{
temp=temp->next;
c++;
}
node *fr=temp->next;
temp->next=(temp->next)->next;
```

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```
free(fr);
}
void print(node *head)
{
node *temp=head;
while(temp!=0)
{
cout<<temp->val<<" ";
temp=temp->next;
}
cout<<"\n";
}
int main()
{
node *n1=NULL;
insert_head(n1,1);
print(n1);
insert_head(n1,2);
print(n1);
tail(25,n1);
print(n1);
insert_pos(3,n1,69);
print(n1);
update(13,3,n1);
print(n1);
del_head(n1);
print(n1);
insert_head(n1,3);
print(n1);
del_tail(n1);
print(n1);
```

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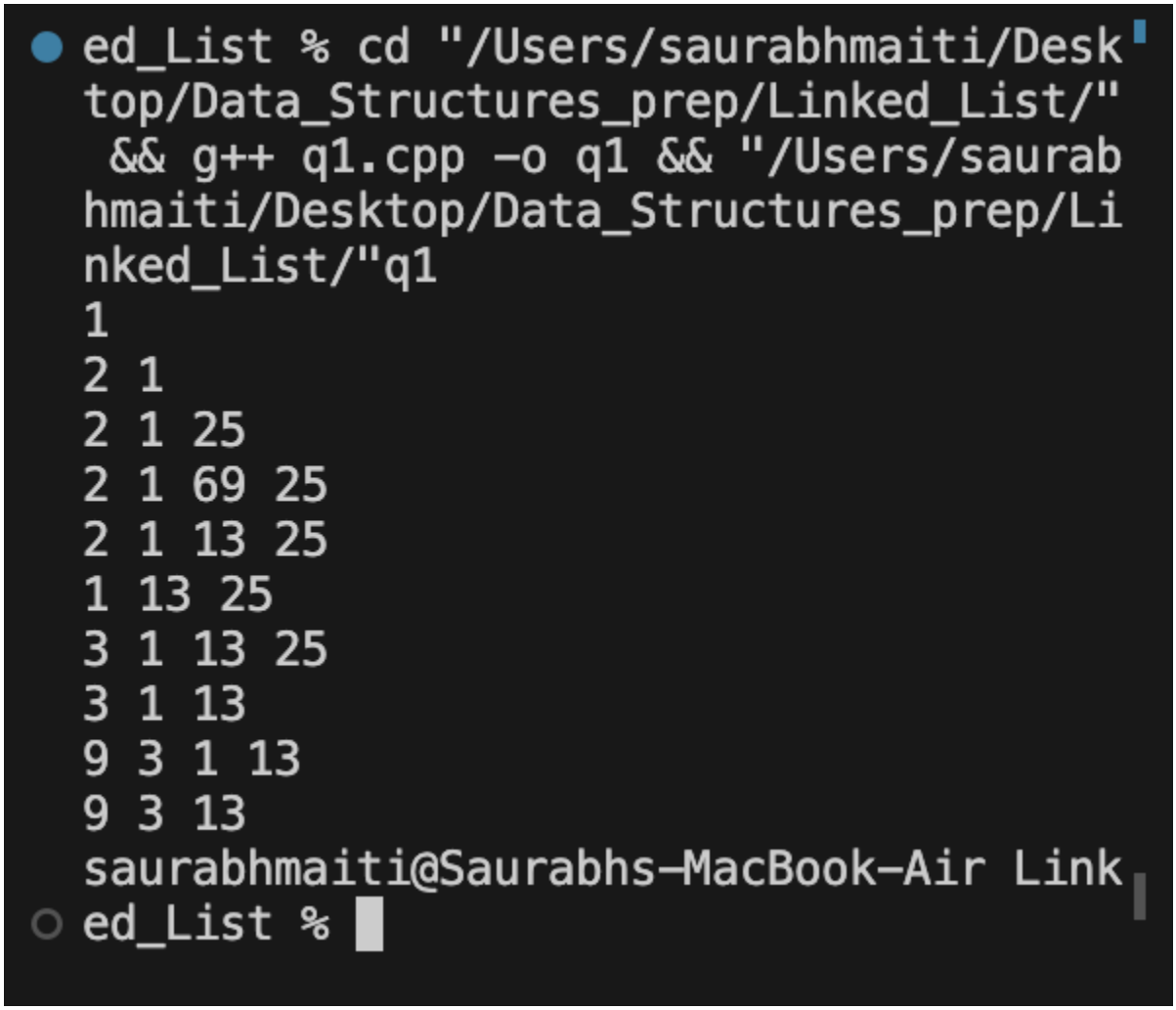
```
insert_head(n1,9);
print(n1);
del_pos(3,n1);
print(n1);
return 0;
}
```

Output



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Ques 2.

```
#include<iostream>
using namespace std;
class node
{
public:
int val;
node *pre;
node *next;
node(int val)
{
this->val=val;
pre=NULL;
next=NULL;
}
};
class doubly_linked_list
{
public:
node *head;
node *tail;
doubly_linked_list()
{
head=NULL;
tail=NULL;
}

void insert_head(int val)
{
node *new_node =new node(val);
if(head==NULL)
```

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```
{
head=new_node;
tail=new_node;
return;
}
new_node->next=head;
head->pre=new_node;
head=new_node;
return;
}
void insert_tail(int val)
{
node *new_node=new node(val);
tail->next=new_node;
new_node->pre=tail;
tail=new_node;
}
void insert_pos(int pos,int val)
{
node *temp=head;
int count=1;
while(count<pos-1)
{
temp=temp->next;
count++;
}
node *new_node=new node(val);
new_node->next=temp->next;
temp->next=new_node;
new_node->pre=temp;
new_node->next->pre=new_node;
```

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```
return;
}
void del_head()
{
node *temp=head;
if(head==NULL)
{
return;
}
head=head->next;
if(head==NULL)
{
tail=NULL;
}
else
{
head->pre=NULL;
}
free(temp);
return;

}
void del_tail()
{
if(head==NULL)
{
return;
}
node *temp=tail;
tail=tail->pre;
if(tail==NULL)
```

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```
{
head=NULL;
}
else
{
tail->next=NULL;

}
free(temp);

}
void display()
{
node *temp=head;
while(temp!=NULL)
{
cout<<temp->val<<" ";
temp=temp->next;
}
cout<<endl;
}
};
int main()
{
doubly_linked_list dl;
dl.insert_head(1);
dl.display();
dl.insert_head(2);
dl.display();
dl.insert_tail(3);
dl.display();
```

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```
dl.insert_pos(3,4);
dl.display();
dl.del_head();
dl.display();
dl.del_tail();
dl.display();
return 0;
}
```

Output:

```
ed_List % cd "/Users/saurabhmaiti/Desktop/Data_Structures_prep/Linked_List/" && g++ doubly.cpp -o doubly && "/Users/saurabhmaiti/Desktop/Data_Structures_prep/Linked_List/"doubly
1
2 1
2 1 3
2 1 4 3
1 4 3
1 4
saurabhmaiti@Saurabhs-MacBook-Air Linked_List %
```

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Ques 3.

```
#include <iostream>
using namespace std;
class Node {
public:
int data;
Node* next;
Node* prev;

Node(int value) {
data = value;
next = NULL;
prev = NULL;
}
};

class CircularDoublyLinkedList {
public:
Node* head;
CircularDoublyLinkedList() {
head = nullptr;
}
void insert_head(int data) {
Node* newNode = new Node(data);
if (head == nullptr) {
head = newNode;
head->next = head;
head->prev = head;
} else {
newNode->next = head;
newNode->prev = head->prev;
```

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```
head->prev->next = newNode;
head->prev = newNode;
head = newNode;
}
}

// Function to insert a node at the end
void insert_tail(int data) {
Node* newNode = new Node(data);
if (head == nullptr) {
head = newNode;
head->next = head;
head->prev = head;
} else {
newNode->next = head;
newNode->prev = head->prev;
head->prev->next = newNode;
head->prev = newNode;
}
}

void del_head() {
if (head == nullptr)
return;

if (head->next == head) {
delete head;
head = nullptr;
} else {
Node* temp = head;
head->prev->next = head->next;
```

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```
head->next->prev = head->prev;
head = head->next;
delete temp;
}
}

void del_tail() {
if (head == nullptr)
return;

if (head->next == head) {
delete head;
head = nullptr;
} else {
Node* temp = head->prev;
temp->prev->next = head;
head->prev = temp->prev;
delete temp;
}
}

void print() {
if (head == nullptr)
return;

Node* current = head;
do {
cout << current->data << " ";
current = current->next;
} while (current != head);
cout << endl;
```

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```
}
};

int main() {
CircularDoublyLinkedList list;

list.insert_head(1);
list.print();
list.insert_tail(2);
list.print();
list.insert_head(3);
list.print();
list.insert_tail(4);
list.print();
cout << "Circular Doubly Linked List: ";
list.print();

list.del_head();
cout<<"Delete Head\n";
list.print();
list.del_tail();
cout<<"Delete tail\n";
list.print();

return 0;
}
```

Output

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```
ed_List % cd "/Users/saurabhmaiti/Desktop/Data_Structures_prep/Linked_List/" && g++ circular.cpp -o circular && "/Users/saurabhmaiti/Desktop/Data_Structures_prep/Linked_List/"circular
1
1 2
3 1 2
3 1 2 4
Circular Doubly Linked List: 3 1 2 4
Delete Head
1 2 4
Delete tail
1 2
saurabhmaiti@Saurabhs-MacBook-Air Linked_List %
```