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DSA Assignment 6

Circular Linked list template

```
#include <iostream>
using namespace std;
class node_cll{
public:
    int data;
    node_cll* next;
node_cll(int d){
    data = d;
    next = this; // makes next point to current obj
    }
};

void insert(node_cll* head, int data){
    node_cll* temp = new node_cll(data); temp->next = head->next;
    head->next = temp;
}
void display(node_cll* head){
    if(head->next == head){
        cout<<head->data;
        return;
    }
    node_cll* temp = head;
    cout<<temp->data<<' ';
    temp = temp->next;
    while(temp!=head){
        cout<<temp->data<<' ';
        temp = temp->next;
    }
}
```

Doubly Linked List Template

// here we will make a double linked list class for code reusability

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

class node{
public:
    int data;
    node* left;
    node* right;
    node(int d){
        data = d;
        left = right = NULL; }
};
void display(node* head){
    while(head!=NULL){
        cout<<head->data<<' ';
        head = head->right;
    }
}
```

Doubly Linked list Q1

(A)

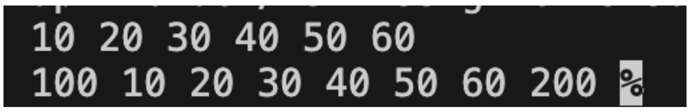
// insertion cases

```
#include "dll.cpp"

void insertTail(node* &tail, int data){ node* temp = new node(data);
temp->left = tail;
tail->right = temp;
tail = temp; }
void insertHead(node* &head, int data){
node* temp = new node(data);
temp->right = head; head->left = temp;
head = temp; }
void insertPosition(node* &head, int data, int pos){ int count = 1;
node* temp_head = head;
if(pos == 1){
insertHead(head,data);
return; }
while(count!=(pos-1)){
temp_head = temp_head->right;
count++; }
if(temp_head->right == NULL){ // if last position insertion
insertTail(temp_head,data);
return; }
node* temp = new node(data); temp->left = temp_head;
temp->right = temp_head->right;
temp_head->right->left = temp;
temp_head->right = temp; }

int main(){
node* head = new node(10); // making first node with value 10 node* tail =
head;
insertTail(tail,20);
insertTail(tail,30);
insertTail(tail,40);
insertTail(tail,50);
insertTail(tail,60);
display(head);
cout<<endl;
insertPosition(head,100,1);
insertPosition(head,200,8);
display(head); }
```

Output:



```
10 20 30 40 50 60
100 10 20 30 40 50 60 200 %
```

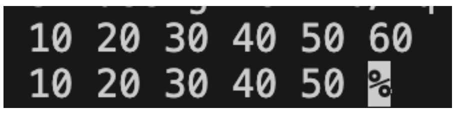
(B)

// deletion cases for doubly linked list

```
#include "dll.cpp"

void insertTail(node* &tail, int data){ node* temp = new node(data);
temp->left = tail;
tail->right = temp;
tail = temp; }
void del_first(node* &head){ // deletion of first node
if(head->right == NULL){ // if only one node exists delete head;
head = NULL;
return; }
node* temp = head;
head = temp->right;
head->left = NULL;
delete temp; }
void del(node* &head, node* &tail, int index){ if(head == NULL){
cout<<"list is already empty";
return;
}
if(index==1){
del_first(head);
return;
}
int count = 1;
node* temp = head;
while(count!=index-1){ temp = temp->right;
count++; }
node* temp2 = temp->right;
if(temp2->right == NULL){
temp2->left = NULL;
temp->right = NULL;
tail = temp;
delete temp2;
return;
}
temp->right = temp2->right;
temp->right->left = temp2->left;
temp2->right = NULL;
temp2->left = NULL;
delete temp2; }
int main(){
node* head = new node(10); // making first node with value 10 node* tail =
head;
insertTail(tail,20);
insertTail(tail,30);
insertTail(tail,40);
insertTail(tail,50);
insertTail(tail,60);
display(head);
cout<<endl;
del(head,tail,6);
display(head); }
```

Output:

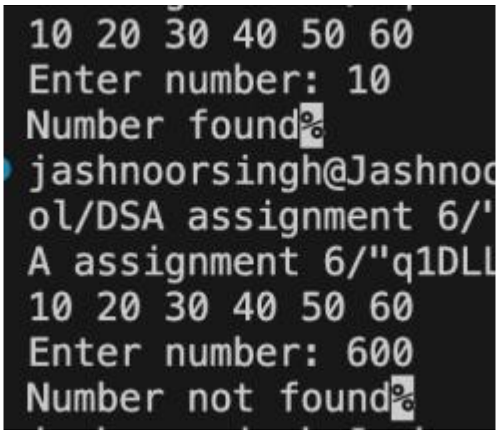


```
10 20 30 40 50 60
10 20 30 40 50 %
```

(C)

```
// searching in DLL
#include "dll.cpp"
void insertTail(node* &tail, int data){ node* temp = new node(data);
temp->left = tail;
tail->right = temp;
tail = temp; }
bool search(node* head, int key){ while(head!=NULL){
if(head->data == key)return true;
head=head->right; }
return false; }
int main(){
node* head = new node(10); // making first node with value 10 node* tail =
head;
insertTail(tail,20);
insertTail(tail,30);
insertTail(tail,40);
insertTail(tail,50);
insertTail(tail,60);
display(head);
cout<<endl;
if(search(head,60)){
cout<<"Number found"; }
else cout<<"Number not found"; }
```

Output:



```
10 20 30 40 50 60
Enter number: 10
Number found%
jashnoorsingh@Jashnoc
ol/DSA assignment 6/'
A assignment 6/"q1DLL
10 20 30 40 50 60
Enter number: 600
Number not found%
```

Circular Linked list Q1

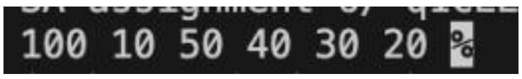
(A)

```
#include "cll.cpp"

void insert_anywh(node_cll* &head, int data, int pos, int size){
if(pos == 1 || pos == size){
node_cll* temp = head->next;
while(temp->next != head){
temp = temp->next; }
node_cll* temp2 = new node_cll(data);
temp->next = temp2;
temp2->next = head;
if(pos==1)head = temp2; // if we make this new head then we insert at front or
else we insert at back
}
else{
int count = 1;
node_cll* temp = head;
while(count != pos-1){
temp = temp->next;
count++;
}
node_cll* temp2 = new node_cll(data);
temp2->next = temp->next;
temp->next = temp2; }
}

int main(){
node_cll* head = new node_cll(10);
insert(head,20);
insert(head,30);
insert(head,40);
insert(head,50);
node_cll* temp = head->next;
int size = 1;
while(temp!=head){ // calculating size of linked list size++;
temp = temp->next; }
insert_anywh(head,100,1,5);
display(head); }
```

Output:



```
100 10 50 40 30 20 %
```

(B)

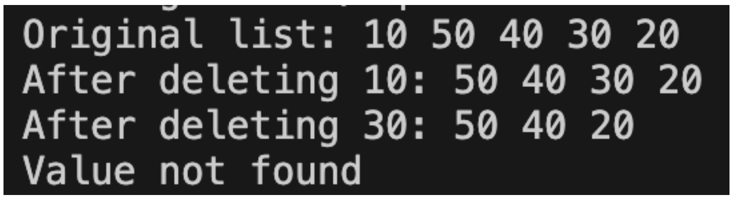
// delete a node by value

```
#include "cll.cpp"

void deleteNode(node_cll*& head, int value){ if (head == nullptr){
cout << "List is empty\n";
return; }
node_cll* curr = head;
node_cll* prev = nullptr;
if (head->next == head && head->data == value) { delete head;
head = nullptr;
return; }
do{
if (curr->data == value) break;
prev = curr;
curr = curr->next;
}while(curr != head);
if(curr->data != value){
cout<<"Value not found\n";
return; }
if (curr == head){
node_cll* last = head;
while(last->next != head)
last = last->next;
last->next = head->next;
head = head->next;
delete curr; }
else {
prev->next = curr->next;
delete curr; }
}

int main(){
node_cll* head = new node_cll(10);
insert(head,20);
insert(head,30);
insert(head,40);
insert(head,50);
cout << "Original list: ";
display(head);
cout<<endl;
deleteNode(head,10); // deleting head
cout << "After deleting 10: ";
display(head);
cout<<endl;
deleteNode(head,30); // deleting middle node cout << "After deleting 30: ";
display(head);
cout<<endl;
deleteNode(head, 99); // deleting non-existent value }
```

Output:



```
Original list: 10 50 40 30 20
After deleting 10: 50 40 30 20
After deleting 30: 50 40 20
Value not found
```

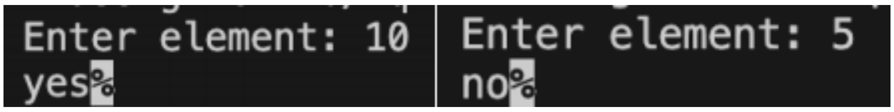
(C)

// searching in cll

```
#include "cll.cpp"

bool search(node_cll* head,int key){ if(head->data == key)return true;
node_cll* temp = head->next;
while(temp!=head){
if(temp->data == key)return true; temp = temp->next;
}
return false; }
int main(){
node_cll* head = new node_cll(10); insert(head,20);
insert(head,30);
insert(head,40);
insert(head,50);
insert(head,60);
if(search(head,10))cout<<"yes";
else cout<<"no"; }
```

Output:



```
Enter element: 10
yes%
```

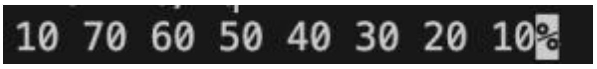
```
Enter element: 5
no%
```

Q2

```
#include <iostream>
using namespace std;
class node_cll{
public:
int data;
node_cll* next;
node_cll(int d){
data = d;
next = this; // makes next point to current obj }
};

void insert(node_cll* head, int data){
node_cll* temp = new node_cll(data); temp->next = head->next;
head->next = temp; }
void display(node_cll* head){
if(head->next == head){
cout<<head->data;
return; }
node_cll* temp = head; while(1){
cout<<temp->data<<' ';
temp = temp->next;
if(temp == head){
cout<<temp->data;
break;
}
}
}int main(){
node_cll* head = new node_cll(10);
insert(head,20);
insert(head,30);
insert(head,40);
insert(head,50);
insert(head,60);
insert(head,70);
display(head); }
```

Output



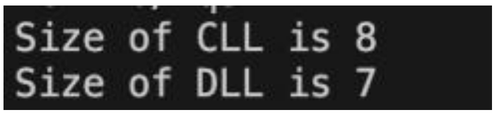
```
10 70 60 50 40 30 20 10%
```

Q3

```
#include "dll.cpp"
#include "cll.cpp"

void insertTail(node* &tail, int data){ node* temp = new
node(data);
temp->left = tail;
tail->right = temp;
tail = temp; }
int size_cll(node_cll* head){ int n=1;
node_cll* temp = head->next; while(temp!=head){
n++;
temp=temp->next; }
return n; }
int size_dll(node* head){ int n=1;
node* temp = head->right; while(temp!=NULL){
n++;
temp=temp->right; }
return n; }
int main(){
node_cll* head = new node_cll(10); // making cll
insert(head,20);
insert(head,30);
insert(head,40);
insert(head,50);
insert(head,60);
insert(head,70);
insert(head,80);
node* head2 = new node(10);
node* tail = head2;
insertTail(tail,20);
insertTail(tail,30);
insertTail(tail,40);
insertTail(tail,50);
insertTail(tail,60);
insertTail(tail,70);
cout<<"Size of CLL is "<<size_cll(head)<<endl;
cout<<"Size of DLL is "<<size_dll(head2)<<endl; }
```

Output



```
Size of CLL is 8
Size of DLL is 7
```

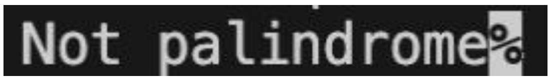
Q4

```
#include <iostream>
using namespace std;
class node{
```

```
public:
char data;
node* left;
node* right;
node(char d){
data = d;
left = right = NULL; }
};

void insertTail(node* &tail, char data){ node* temp = new node(data);
temp->left = tail;
tail->right = temp;
tail = temp; }
bool isPalindrome(node* head, node* tail){ while(head!=tail){
if(head->data!=tail->data)return false;
head = head->right;
tail = tail->left; }
return true; }
int main(){
node* head = new node('a'); // making first node with value 10 node* tail =
head;
insertTail(tail,'b');
insertTail(tail,'c');
insertTail(tail,'b');
insertTail(tail,'d');
if(isPalindrome(head,tail)){ cout<<"Is palindrome";
}
else cout<<"Not palindrome"; }
```

Output:



```
Not palindrome%
```

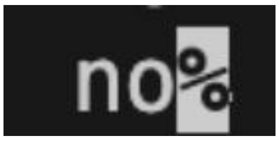
Q5

// Wap to check if list is circular linked list or not

```
#include "cll.cpp"

bool check_cll(node_cll* head){
if(head->next == head)return true; // for single element list node_cll* temp =
head->next;
if(temp == NULL)return false; while(temp!=head){
if(temp->next == NULL)return false;
temp=temp->next; }
return true; }
int main(){
node_cll* head = new node_cll(10); // making a node insert(head,20);
insert(head,30);
insert(head,40);
insert(head,50);
insert(head,60);
insert(head,70);
insert(head,80);
head->next = NULL; // making this list singly linked list
if(check_cll(head))cout<<"yes";
else cout<<"no"; }
```

Output:



```
no%
```