# NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

**B.Tech. (5th Semester)**

**Assignment No :- 4**

**Department of Computer Science & Engineering**

**Subject: Advance data Structure**

**Lab Code- CS105201CS**

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**Lab Batch No :- 1**

**Q.1) Write a program that builds two way linked lists of 5 nodes. The data field of the linked list shall contain the string value:-**

```
#include <iostream>
#include <bits/stdc++.h>
using namespace std;

struct DNode {
    string info;
    DNode* left;
    DNode* right;
};

DNode* createList(int n) {
    DNode* first = nullptr;
    DNode* last = nullptr;

    cout << "Enter n string values:\n";
    for (int i=1;i<=n; i++){
        DNode* fresh = new DNode;
        cin >> fresh->info;
        fresh->left = last;
        fresh->right = nullptr;

        if (first == nullptr) {
            first = fresh;
        } else {
            last->right = fresh;
        }
        last = fresh;
    }
    return first;
}

int main() {
    DNode* start = createList(5);
    cout << "Doubly linked list with 5 nodes created.\n";
    return 0;
}
```

**Q.2) Write a program to print all the data values of the above two-way linked list:-**

```
#include<bits/stdc++.h>
#include<iostream>
using namespace std;

struct DNode {
    string info;
    DNode* left;
    DNode* right;
};

void showForward(DNode* start) {
    cout << "List elements are:\n";
    while (start != nullptr) {
        cout << start->info << " ";
        start = start->right;
    }
    cout << endl;
}

int main() {
    DNode* head = nullptr;
    DNode* tail = nullptr;

    cout << "Enter 5 strings:\n";
    for(short i=0;i<5;i++){
        DNode* temp=new DNode;
        cin >> temp->info;
        temp->left = tail;
        temp->right = nullptr;

        if (head == nullptr) head = temp;
        else tail->right = temp;

        tail = temp;
    }
    showForward(head);
    return 0;
}
```

**Q.3) Write a program to add new node in the above two way linked list at the end of the linked list:-**

```
#include<bits/stdc++.h>
#include<iostream>
using namespace std;

struct DNode {
    string info;
    DNode* left;
    DNode* right;
};

void displayList(DNode* start) {
    cout << "Current List:\n";
    while (start != nullptr) {
        cout << start->info << " ";
        start = start->right;
    }
    cout << endl;
}

void pushBack(DNode*& head, DNode*& tail, string value) {
    DNode* fresh = new DNode;
    fresh->info = value;
    fresh->left = tail;
    fresh->right = nullptr;

    if (head == nullptr) {
        head = tail = fresh;
    } else {
        tail->right = fresh;
        tail = fresh;
    }
}

int main() {
    DNode* head = nullptr;
    DNode* tail = nullptr;

    cout << "Enter 5 strings:\n";
    for(int i=1;i<=5;i++){
        string s;
        cin >> s;
        pushBack(head, tail, s);
```

```
    }

    displayList(head);

    cout <<"Enter a string to append: ";
    string extra;
    cin >> extra;
    pushBack(head, tail, extra);

    displayList(head);
    return 0;
}
```

**Q.4) Write a program that builds circular linked lists of 3 nodes. The data field of the linked list shall contain the integer value:-**

```
#include<bits/stdc++.h>
#include<iostream>
using namespace std;

struct CNode {
    int data;
    CNode* next;
};

CNode* makeCircular(int n) {
    CNode* head = nullptr;
    CNode* last = nullptr;

    cout << "Enter " << n << " integers:\n";
    for (int i=0; i <n; i++){
        CNode* fresh = new CNode;
        cin >> fresh->data;
        fresh->next = nullptr;

        if (head==nullptr) head = fresh;
        else {
            last->next = fresh;
        }
        last = fresh;
    }
    last->next = head;
    return head;
}
```

```
void traverseCircular(CNode* head, int n) {
    cout << "Circular list values:\n";
    CNode* temp = head;
    while(n--){
        cout << temp->data << " ";
        temp = temp->next;
    }
    cout << endl;
}

int main() {
    CNode* start = makeCircular(3);
    traverseCircular(start, 3);
    return 0;
}
```