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Practical No – 2

1) Queue using linked list

```
#include <iostream> using
namespace std; struct
node {
  int data;    struct
node *next;
};
struct node* front = NULL;
struct node* rear = NULL;
struct node* temp; void
Insert() {
  int val;
  cout<<"Insert the element in queue : "<<endl;
```

```
  cin>>val;    if (rear == NULL) {       rear = (struct
node *)malloc(sizeof(struct node)); rear->next =
NULL; rear->data = val; front = rear;
  } else {
     temp=(struct node *)malloc(sizeof(struct node));
rear->next = temp;       temp->data = val;       temp-
>next = NULL;       rear = temp;
  }
}
void Delete() {
temp = front;    if
(front == NULL) {
     cout<<"Underflow"<<endl;
     return;
  }
  else    if (temp->next != NULL) {       temp = temp->next;
cout<<"Element deleted from queue is : "<<front->data<<endl;
     free(front);
front = temp;
  } else {
     cout<<"Element  deleted  from  queue  is  :  "<<front->data<<endl;
free(front); front = NULL; rear = NULL;
  }
}
```

```
void Display() {    temp = front;    if
((front == NULL) && (rear == NULL)) {
cout<<"Queue is empty"<<endl;
    return;
  }
  cout<<"Queue elements are: ";
while (temp != NULL) {
cout<<temp->data<<" ";      temp
= temp->next;
  }
  cout<<endl;
}
int main() {
  int ch;
  cout<<"1) Insert element to queue"<<endl;
cout<<"2) Delete element from queue"<<endl;
cout<<"3) Display all the elements of queue"<<endl;
cout<<"4) Exit"<<endl;
  do {
    cout<<"Enter your choice : "<<endl;
cin>>ch; switch (ch) {         case 1:
Insert();         break;         case 2:
Delete();         break;         case 3:
Display();         break;
       case 4: cout<<"Exit"<<endl;
```

```
        break;          default: cout<<"Invalid
choice"<<endl;
     }
  } while(ch!=4);
return 0;
}
```

```
/tmp/Nm1bitD9I4.o
1) Insert element to queue
2) Delete element from queue
3) Display all the elements of queue
4) Exit
Enter your choice :
2
Underflow
Enter your choice :
3
Queue is empty
Enter your choice :
4
Exit
```

2) Stack using linked list

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

class Node { public:
            int data;
```

```
        Node* link;

        Node(int n)
        {
                this->data = n;   this-
        >link = NULL;
        }
};

class Stack {
        Node* top;

public:
        Stack() { top = NULL; }

        void push(int data)
        {
                Node* temp = new Node(data);

         if (!temp) {                                cout
<< "\nStack Overflow";
exit(1);
                }
```

```
        temp->data = data;


        temp->link = top;


        top = temp;
}
bool isEmpty()
{
        return top == NULL;
}
int peek()
{
                if (!isEmpty())
                return top->data;
        else
                exit(1);
}


void pop()
{
        Node* temp;
      if (top == NULL) {
                cout << "\nStack Underflow" << endl;
                exit(1);
```

```
                }
                else {
                        temp = top;

                        top = top->link;
                        free(temp);
                }
        }

        void display()
        {
                Node* temp;

                // Check for stack underflow
if (top == NULL) {                              cout <<
"\nStack Underflow";
                        exit(1);
                }
                else {
temp = top;
                        while (temp != NULL) {
                                // Print node data
                                cout << temp->data;
```

```
                                        // Assign temp link to temp
                                        temp = temp->link;
                                if (temp != NULL)
                                                cout << " -> ";
                                }
                        }
                }
};

int main()
{

        Stack s;

        s.push(11);
        s.push(22);
        s.push(33);
        s.push(44);

cout << "\nTop element is " << s.peek() << endl;

        s.pop();
        s.pop();

        s.display();
```

```
        cout << "\nTop element is " << s.peek() << endl;


        return 0;
}
```

```
44 -> 33 -> 22 -> 11
Top element is 44
22 -> 11
Top element is 22
```

3) Doubly linked list

```
#include <iostream> using
namespace std; struct
Node {
  int data;    struct
Node *prev;    struct
Node *next;
};
```

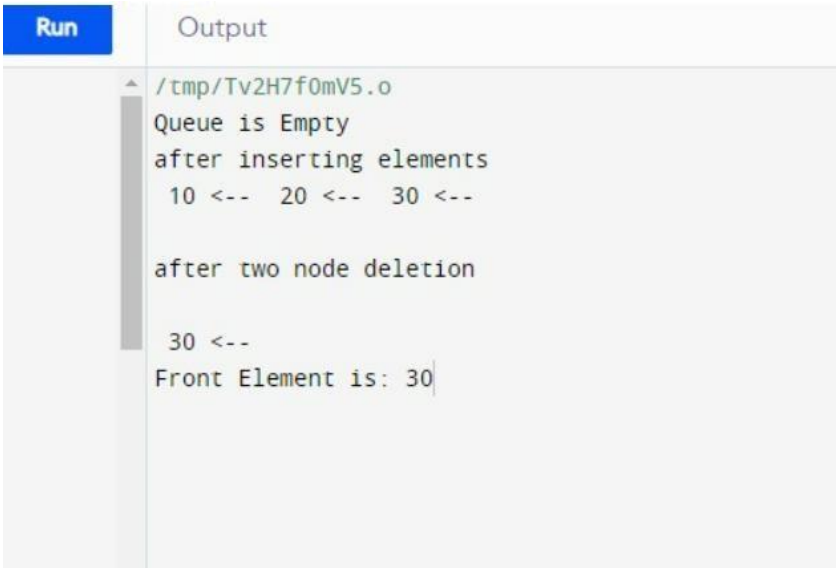
```
struct Node* head = NULL; void
insert(int newdata) {
  struct Node* newnode = (struct Node*) malloc(sizeof(struct
Node));    newnode->data = newdata;    newnode->prev =
NULL;    newnode->next = head;
  if(head != NULL)    head-
>prev = newnode ;    head =
newnode;
}
void display() {    struct
Node* ptr;    ptr = head;
while(ptr != NULL) {
cout<< ptr->data <<" ";
ptr = ptr->next;
  }
}
int main() {    insert(3);    insert(1);
insert(7);    insert(2);    insert(9);
cout<<"The doubly linked list is: ";
display();    return 0;
}
```

4) Enqueue

```
#include <bits/stdc++.h> using
namespace std;
struct Q {
  int f, r, capacity;
int* q;    Q(int c) {
f = r= 0;
capacity = c;       q
= new int;
  }
  ~Q() { delete[] q; }
void Enqueue(int d) {
     if (capacity == r) {
```

```
        printf("\nQueue is full\n");
return;       } else {          q[r] = d;
r++;
     }
     return;
  }
  void Dequeue() {
     if (f == r) {
        printf("\nQueue is empty\n");
        return;       } else {          for
(int i = 0; i < r - 1; i++) {
q[i] = q[i + 1];
        }
        r--; //update rear
     }
     return;
  }
  void Display()  {
     int i;       if
(f == r) {
        printf("\nQueue is Empty\n");
        return;
     }       for (i = f; i < r; i++)
{         printf(" %d <-- ",
q[i]);
```

```
    }
    return;
  }
  void Front() {
    if (f == r) {
      printf("\nQueue is Empty\n");
      return;
    }
    printf("\nFront Element is: %d", q[f]);
    return;
  }
};
int main(void) {    Q qu(3);    qu.Display();
cout<<"after inserting elements"<<endl;
qu.Enqueue(10);    qu.Enqueue(20);
qu.Enqueue(30);    qu.Display();
qu.Dequeue();    qu.Dequeue();
  printf("\n\nafter two node deletion\n\n");
qu.Display();    qu.Front();    return 0;
}
```



5) Dequeue

```
#include <iostream>
using namespace std;
#define MAX 100
class Deque { int
arr[MAX]; int front;
        int rear; int
size; public:
        Deque(int size)
        {
```

```
                front = -1;
        rear = 0;
                this->size = size;
        }
        void insertfront(int key);
void insertrear(int key);
void deletefront();     void
deleterear();   bool isFull();
bool isEmpty();         int
getFront();     int getRear();
};
bool Deque::isFull()
{
        return ((front == 0 && rear == size - 1)
                        || front == rear + 1);
}
bool Deque::isEmpty() { return (front == -1); } void
Deque::insertfront(int key)
{
        if (isFull()) {
                cout << "Overflow\n" << endl;
                return;
        }
        if (front == -1) {
```

```
                front = 0;
        rear = 0;
        }
        else if (front == 0)
                front = size - 1;
else
                front = front - 1;
        arr[front] = key;
}
void Deque ::insertrear(int key)
{
        if (isFull()) {                 cout << "
Overflow\n " << endl;
                return;
        }
        if (front == -1) {
                front = 0;
                rear = 0;
        }
        else if (rear == size - 1)
                rear = 0;
        else
                rear = rear + 1;
arr[rear] = key;
```

```
}
void Deque ::deletefront()
{
        if (isEmpty()) {            cout << "Queue
Underflow\n" << endl;
                return;
        }
        if (front == rear) {
                front = -1;
        rear = -1;
        }
        else
                if (front == size - 1)
                front = 0;

        else
                front = front + 1;
}
void Deque::deleterear()
{
        if (isEmpty()) {
                cout << " Underflow\n" << endl;
                return;
        }
```

```
        if (front == rear) {
                front = -1;
        rear = -1;
        }
        else if (rear == 0)
                rear = size - 1;
        else
                rear = rear - 1;
}
int Deque::getFront()
{
        if (isEmpty()) {        cout << "
Underflow\n" << endl;
                return -1;
        }
        return arr[front];
}
int Deque::getRear()
{
        if (isEmpty() || rear < 0) {
                cout << " Underflow\n" << endl;
                return -1;
        }
        return arr[rear];
```

```
}
int main()
{
        Deque dq(5);
        cout << "Insert element at rear end : 5 \n";
dq.insertrear(5);

        cout << "insert element at rear end : 10 \n";
dq.insertrear(10);

        cout << "get rear element "
                << " " << dq.getRear() << endl;

        dq.deleterear();
        cout << "After delete rear element new rear"
                << " become " << dq.getRear() << endl;

        cout << "inserting element at front end \n";
        dq.insertfront(15);

        cout << "get front element "
                << " " << dq.getFront() << endl;
            dq.deletefront();
```

```
        cout << "After delete front element new "
<< "front become " << dq.getFront() << endl;
        return 0;
}
```

```
/tmp/4NYESgualv.o
Insert element at rear end : 5
insert element at rear end : 10
get rear element  10
After delete rear element new rear become 5
inserting element at front end
get front element  15
After delete front element new front become 5
```