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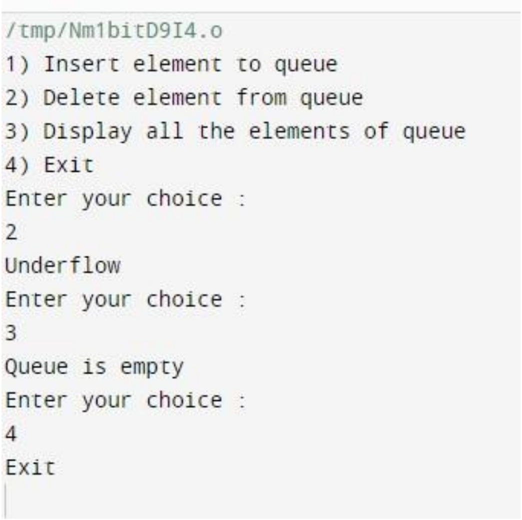
Reg_No – 2021BIT505

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

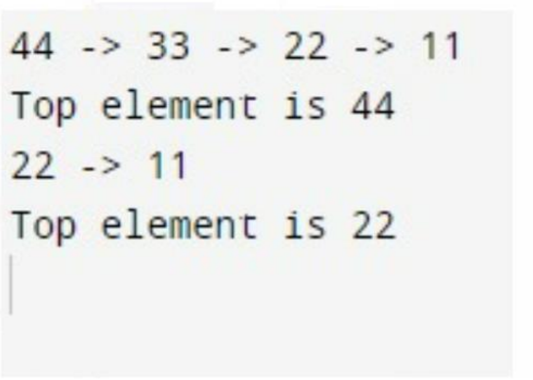
```
// C++ program to Implement a stack
// using singly linked list
#include <bits/stdc++.h> using
namespace std;

// creating a linked list;
class Node { public:
        int data;
        Node* link;
```

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

class Stack {
    Node* top;

public:
    Stack() { top = NULL; }

    void push(int data)
    {

        // Create new node temp and allocate memory in
heap
        Node* temp = new Node(data);

        // Check if stack (heap) is full.
        // Then inserting an element would
        // lead to stack overflow
```

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

                }


                // Initialize data into temp data field

                temp->data = data;


                // Put top pointer reference into temp link

                temp->link = top;


                // Make temp as top of Stack

                top = temp;

        }


        // Utility function to check if

// the stack is empty or not      bool

isEmpty()

        {

                // If top is NULL it means that

// there are no elements are in stack

                return top == NULL;

        }


        // Utility function to return top element in a stack
        int peek()
        {
                // If stack is not empty , return the top element
                if (!isEmpty())
                        return top->data;
                else
                        exit(1);
        }

        // Function to remove    //
a key from given queue q
        void pop()
        {
                Node* temp;

                // Check for stack underflow                    if
(top == NULL) {                         cout << "\nStack Underflow"
<< endl;
                        exit(1);
                }
                else {

                        // Assign top to temp
                        temp = top;
                        // Assign second node to top
                        top = top->link;
                        // This will automatically destroy
                        // the link between first node and second
node

                        // Release memory of top node
                        // i.e delete the node
                        free(temp);
                }
        }

        // Function to print all the
// elements of the stack        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 << " -> ";
                              }
                    }
          }
};

// Driven Program int
main()
{
          // Creating a stack
          Stack s;

          // Push the elements of stack
          s.push(11);
          s.push(22);
```

```
        s.push(33);

        s.push(44);

        // Display stack elements

        s.display();


        // Print top element of stack       cout << "\nTop

element is " << s.peek() << endl;


        // Delete top elements of stack

        s.pop();

        s.pop();


        // Display stack elements

        s.display();


        // Print top element of stack       cout << "\nTop

element is " << s.peek() << endl;


        return 0;

}
```

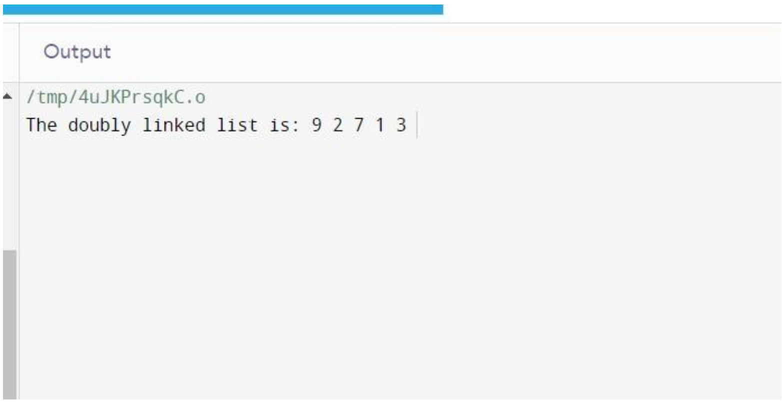


```
44 -> 33 -> 22 -> 11
Top element is 44
22 -> 11
Top element is 22
```

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;
```

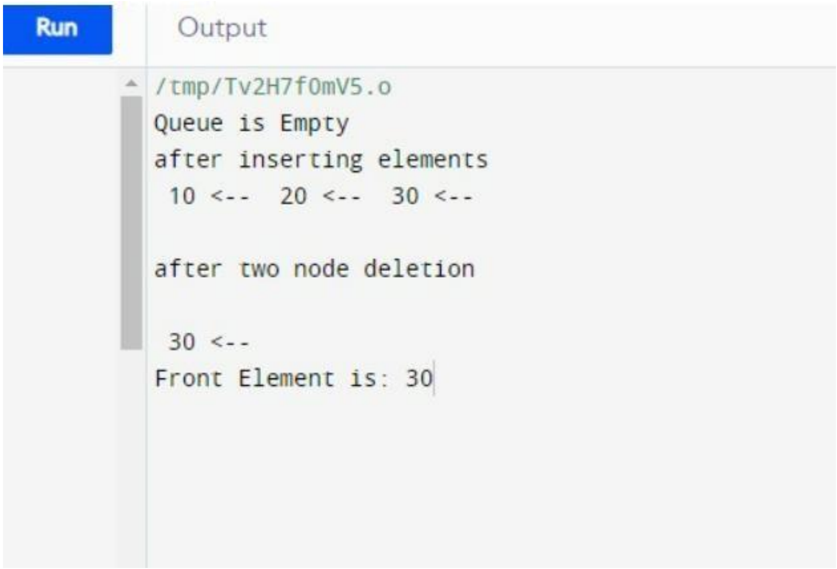
```
  if(head != NULL)    head-
>prev = newnode ;    head =
newnode;
}
void display() {    struct
Node* ptr;    ptr = head;
while(ptr != NULL) {
cout<< ptr->data <<" ";
ptr = ptr->next;
  }
}
int main() {    insert(3);    insert(1);
insert(7);    insert(2);    insert(9);
cout<<"The doubly linked list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



```
/tmp/4uJKPrsqkC.o
The doubly linked list is: 9 2 7 1 3
```

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;
}
```

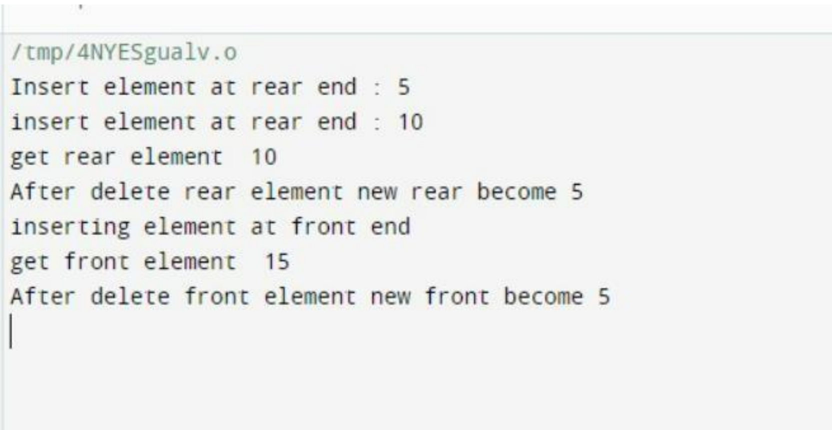


```
/tmp/Tv2H7f0mV5.o
Queue is Empty
after inserting elements
 10 <--  20 <--  30 <--

after two node deletion

 30 <--
Front Element is: 30
```

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
```