



Department of Computer Science
Bahria University

CSC-221: Data structures & Algorithms
Semester03Fall 2021)

ASSIGNMENT 03

Marks: 05

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CLASS: BSCS-3A

REG #: 02-134202-018

Marks Obtained: _____

Instructions.

1. Dead line: Submit your assignment by **08-01-2022**
2. Follow same format for assignment submission.
3. Copied/Plagiarized answers will be marked zero.
4. Write code and also attach output.

The Josephus problem is the following game:

N people, numbered 1 to N are sitting in a circle. Starting at person 1, a hot potato is passed. After M passes the person holding the hot potato is eliminated, the circle closes ranks and the game continues with the person who was sitting after the eliminated person picking up the hot potato. The last remaining person wins. Thus if $M=0$ and $N=5$, players are eliminated in order and player 5 wins. If $M=1$ and $N=5$ the order of elimination is 2,4,1,5

Write a program to solve Josephus problem for general values of M and N .Try to make your program as efficient as possible

CLO-4, PLO-4

CODE:

```
#include<iostream>
using namespace std;
struct node {
    int data;
    node* next;
};
struct node* head = NULL;
struct node* tail = NULL;
void create(int val) {
    node* ptr = new node;
    head = ptr;
    ptr->data = val;
    tail = ptr;
    tail->next = head;
}
void insertEnd(int val) {
    if (head == NULL) {
        create(val);
    }
    else {
        node* ptr = new node;
        tail->next = ptr;
        ptr->data = val;
        tail = ptr;
        tail->next = head;
    }
}
void deleteFront() {
    if (head == NULL) {
        cout << "\nList is Empty!";
    }
    else if (head == tail) {
        node* temp = head;
        head = NULL;
        tail = NULL;
        free(temp);
        cout << "\nList Emptied!";
    }
    else {
        node* temp = head;
        head = temp->next;
        tail->next = head;
        free(temp);
    }
}
void display() {
    node* ptr = head;
    if (head == NULL) {
```

```

        cout << "\nList is Empty!";
    }
    else {
        while (ptr->next != head) {
            cout << ptr->data << " ";
            ptr = ptr->next;
        }
        cout << ptr->data;
    }
}

void josephus(int m) {
    node* prev, * current, * temp;
    prev = head;
    current = head;
    while (current->next != current) {
        int count = 0;
        if (m == 0) {
            cout << current->data << " ";
            deleteFront();
            current = head;
        }
        else {
            while (count != m) {
                prev = current;
                current = current->next;
                count++;
            }
            temp = current;
            cout << current->data << " ";
            if (temp == head) {
                head = head->next;
                tail->next = head;
            }
            prev->next = current->next;
            current = prev->next;
            free(temp);
        }
    }

    cout << "\nWinner is " << head->data;
}

int main() {
    int choice = 0;
    int val, n, pos;
    cout << "\n##### CIRCULAR LINKED LIST
#####";
    cout << "\n1.Insert elements ";
    cout << "\n2.Display Linked List ";
    cout << "\n3.Josephus Problem ";
    cout << "\n4.Exit";
}

```

```

while (choice != 4)
{
    cout << "\nEnter your choice ";
    cin >> choice;
    switch (choice) {
    case 1:
        cout << "\nEnter no of elements ";
        cin >> n;
        cout << "\nEnter data \n";
        for (int i = 1; i <= n; i++) {
            cin >> val;
            insertEnd(val);
        }
        break;
    case 2:
        cout << "\n-----DISPLAY-----\n";
        display();
        break;
    case 3:
        cout << "\nJosephus Problem ";
        cout << "\nEnter value of M : ";
        cin >> val;
        cout << endl;
        josephus(val);
        break;
    case 4:
        exit(0);
    }
}
}

```

Output:

```

##### CIRCULAR LINKED LIST #####
1.Insert elements
2.Display Linked List
3.Josephus Problem
4.Exit
Enter your choice 1
Enter no of elements 10

```

```
Enter no of elements 10
```

```
Enter data
```

```
1  
2  
3  
4  
5  
6  
7  
8  
9  
10
```

```
Enter your choice 2
```

```
-----DISPLAY-----
```

```
1 2 3 4 5 6 7 8 9 10
```

```
Enter your choice 3
```

```
Josephus Problem
```

```
Enter value of M : 3
```

```
3 6 9 2 7 1 8 5 10
```

```
Winner is 4
```