



K. J. Somaiya College of Engineering, Mumbai-77

(A Constituent college of Somaiya Vidyavihar University)

Batch: B2 Roll No.: 16010122151

Experiment / assignment / tutorial No.

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of the Staff In-charge with date

Title: Implementation of Basic operations on queue for the assigned application using Array and Linked List- Create, Insert, Delete, Destroy

Objective: To implement Basic Operations on Queue i.e. Create, Push, Pop, Destroy for the given application

Expected Outcome of Experiment:

CO	Outcome
1	Explain the different data structures used in problem solving

Books/ Journals/ Websites referred:

1. *Fundamentals Of Data Structures In C* – Ellis Horowitz, Satraj Sahni, Susan Anderson-Fred
2. *An Introduction to data structures with applications* – Jean Paul Tremblay, Paul G. Sorenson
3. *Data Structures A Pseudo Approach with C* – Richard F. Gilberg & Behrouz A. Forouzan
- 4.



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Abstract:

(Define Queue, enlist queue operations).

Queue- Queue is a linear data structure that follows the order FIFO. In queues the insertion of an element takes place at the rear end and elimination of an element take place in the front. The queue operations are: -

- Enqueue- Adds an item to the queue at the rear end.
- Dequeue- Removes an item from the queue at the front end.

List 5 Real Life applications of Queue:

- CPU Scheduling
- Queue are used to maintain the play list in media players in order to add and remove the songs from the play-list.
- When data is transferred asynchronously (data not necessarily received at same rate as sent) between two processes. Examples include IO Buffers, pipes, file IO, etc.
- When things don't have to be processed immediately, but have to be processed in First In First Out order like Breadth First Search.
- Disk Scheduling

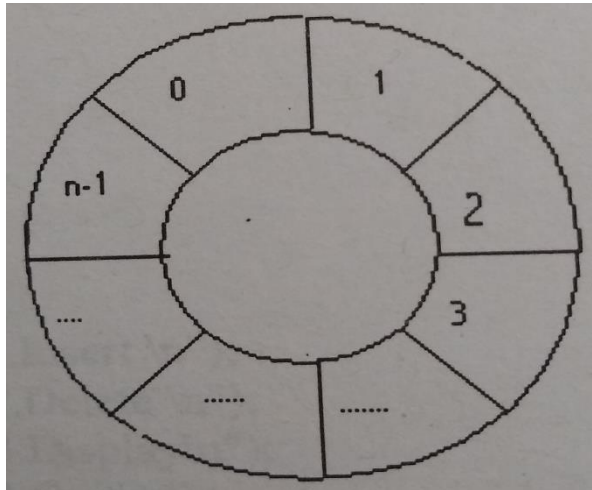
Define and explain various types of queue with suitable diagram and their application(s):

- **Circular Queue-** As in a circle, after last element, first element occurs. Similarly, we assume that after last element of queue, the 1st element will occur. After n-1th element, 0th element occurs.



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- **Double ended Queue**-We can add or delete the element from both sides.

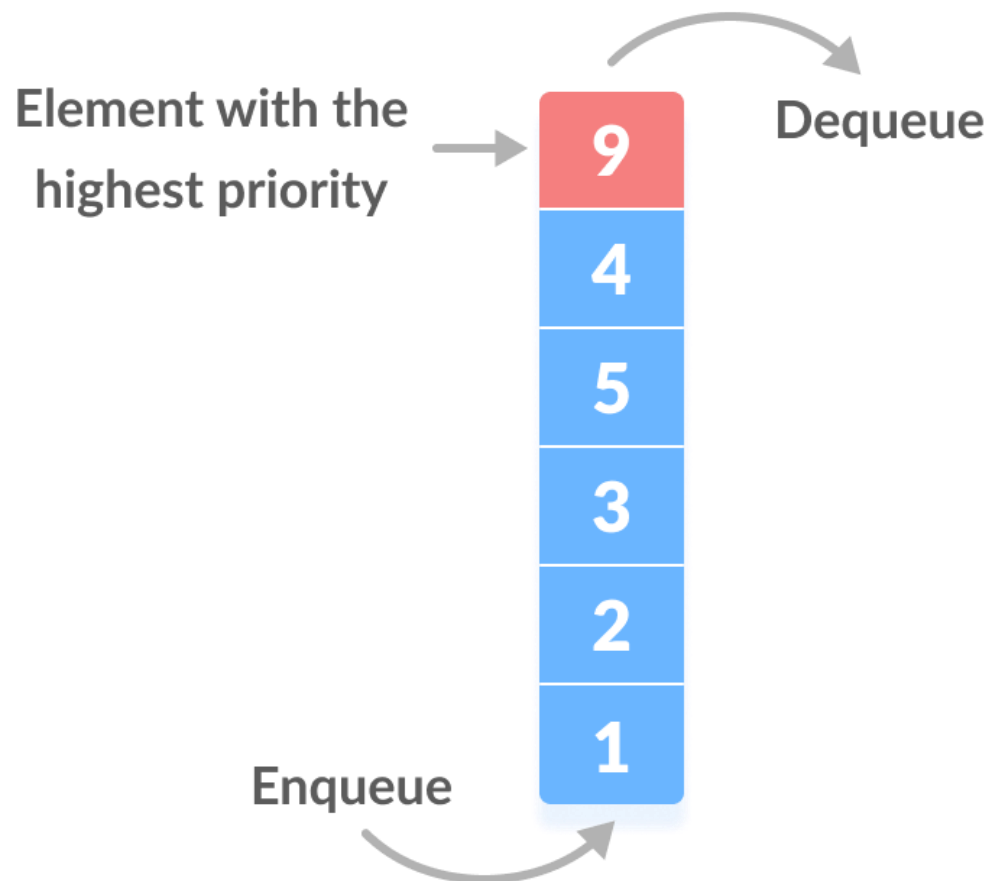


- **Priority Queue**- A priority queue is a data structure used for storing a set S of elements, based on a key value, which denotes the priority of that element. The priority determines the order in which they exit the queue. Every element of queue has some priority and based on that priority it will be processed.
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Queue ADT:

Algorithm for Queue operations using array/Linked list : (Write only the algorithm for assigned type)



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Ans-

// Function to find the position of the last person standing int

josephus(int m) { int index = 0; // Initialize the index to the
beginning of the circle

// Iterate until there is only one person left in the circle

for (int i = n; i > 1; i--) {

// Find the next person to be eliminated by counting M-1 positions

index = (index + m - 1) % i;

// Shift the remaining people to fill the gap

for (int j = index; j < i - 1; j++) {

circle[j] = circle[j + 1];

}

}

// Return the position of the last person standing (0-based index)

return circle[0];

}

Implementation Details:

- 1) Mention the application assigned to you and explain how you implemented the solution using the assigned type of Queue.**



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Ans- Josephus problem using circular queue statically. In the josephus function, we use a while loop to simulate the elimination process until only one person remains. Inside the loop, we calculate the next person to be eliminated, shift the remaining people in the circle, and decrement n accordingly. Finally, we return the position of the last person standing. With these code segments, you can implement the Josephus problem solution in C, following the algorithm outlined in the previous responses.

Program source code:

```
#include <stdio.h>

#define MAX_N 1000 // Maximum number of people

int circle[MAX_N]; // Static array representing the circle
int n; // Number of people in the circle

// Function to find the position of the last person standing
int josephus(int m) {
    int index = 0; // Initialize the index to the beginning of the circle

    // Iterate until there is only one person left in the circle
    for (int i = n; i > 1; i--) {
        // Find the next person to be eliminated by counting M-1 positions

        index = (index + m - 1) % i;
```



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```
// Shift the remaining people to fill the gap
for (int j = index; j < i - 1; j++) {
    circle[j] = circle[j + 1];
}
}

// Return the position of the last person standing (0-based index)
return circle[0];
}

int main() {
    int m;

    printf("Enter the number of people (N): ");
    scanf("%d", &n);    printf("Enter the
counting interval (M): ");    scanf("%d",
&m);

    // Initialize the circle with person numbers
    for (int i = 0; i < n; i++) {        circle[i] = i +
1;
    }
```



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```
// Find and print the position of the last person standing    int
position = josephus(m);    printf("The last person standing is at
position %d\n", position);

return 0;
}
```

Output Screenshots:

```
z:\tmp\n\mkst10t22.0
Enter the number of people (N): 5
Enter the counting interval (M): 2
The last person standing is at position 3
```

Applications of Queue in computer science:

- Operating systems: Queues are used in operating systems for a variety of tasks, such as job scheduling, printer spooling, and interrupt handling. For example, a queue is used to schedule jobs for execution on the CPU. Jobs are added to the queue in the order that they are submitted, and the operating system then executes the jobs in the order that they were added.
- Networking: Queues are used in networking to buffer data packets as they travel between devices. For example, a router may use a queue to buffer packets that are destined for a particular device that is currently busy.
- Data processing: Queues are used in data processing systems to manage the flow of data. For example, a queue may be used to buffer data that is being read from a disk before it is processed by a computer program.
- Algorithms: Queues are used to implement a variety of algorithms, such as breadth-first search and Dijkstra's algorithm. For example, breadth-



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first search is a graph traversal algorithm that uses a queue to explore the nodes of the graph in a level-by-level manner.

Conclusion:- With this experiment I got to know about Queues.



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