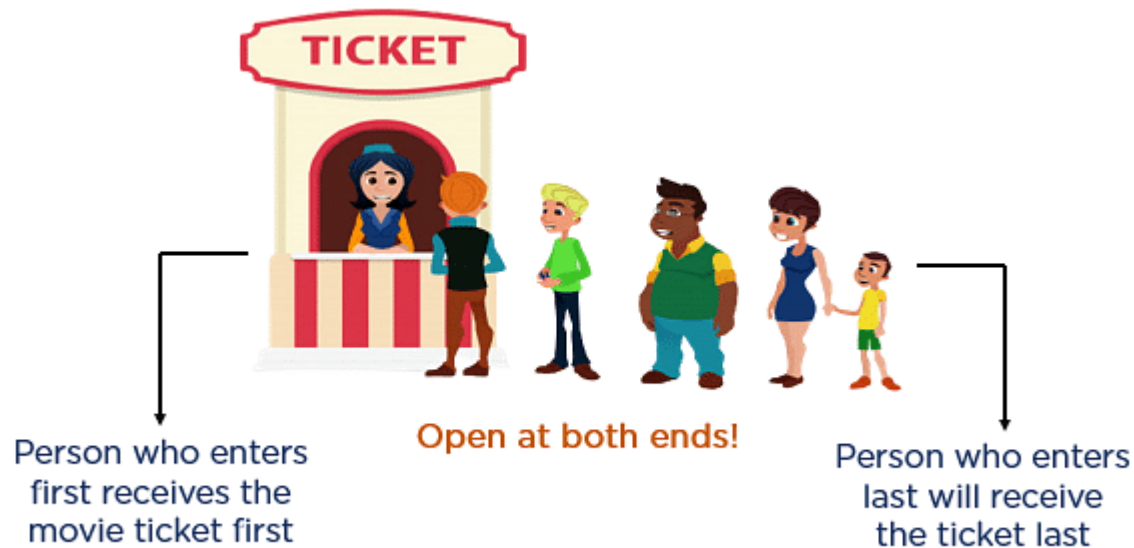


Data Structures and Algorithms

Lecture 17: Queue

Queue

A Queue is defined as a linear data structure that is open at both ends and the operations are performed in First In First Out (FIFO) order.



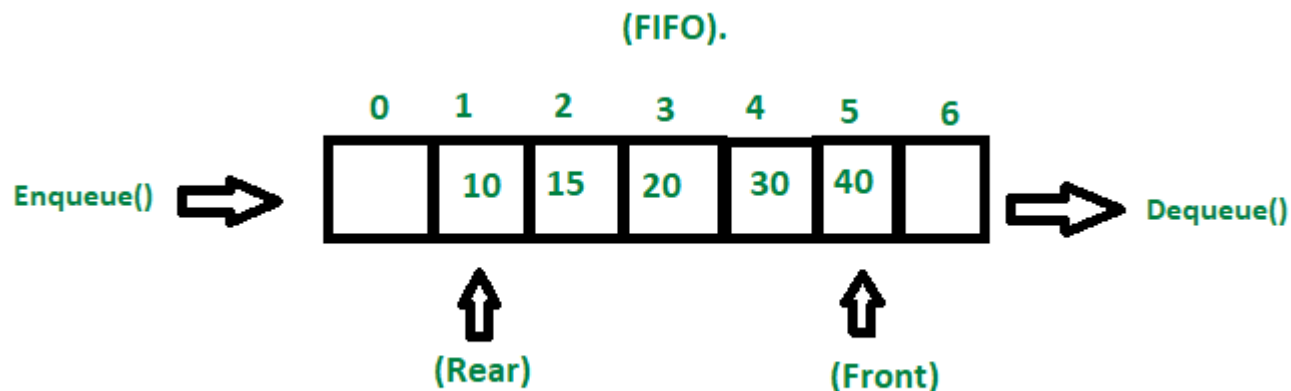
Queue

A Queue is defined as a linear data structure that is open at both ends and the operations are performed in First In First Out (FIFO) order.



FIFO Principle of Queue:

- A Queue is like a line waiting to purchase tickets, where the first person in line is the first person served. (i.e. First come first serve).
- Position of the entry in a queue ready to be served, that is, the first entry that will be removed from the queue, is called the front of the queue (sometimes, head of the queue), similarly, the position of the last entry in the queue, that is, the one most recently added, is called the rear (or the tail) of the queue.



Characteristics of Queue:

- Queue can handle multiple data.
- We can access both ends.
- They are fast and flexible.

Queue Representation - Array

Like stacks, Queues can also be represented in an array: In this representation, the Queue is implemented using the array. Variables used in this case are:

- Queue: the name of the array storing queue elements.
- Front: the index where the first element is stored in the array representing the queue.
- Rear: the index where the last element is stored in an array representing the queue

Queue Representation – Linked List

A queue can also be represented using following entities:

- Linked-lists,
- Pointers, and
- Structures.

Types of Queue:

There are different types of queues:

- **Input Restricted Queue:** This is a simple queue. In this type of queue, the input can be taken from only one end but deletion can be done from any of the ends.
- **Output Restricted Queue:** This is also a simple queue. In this type of queue, the input can be taken from both ends but deletion can be done from only one end.
- **Circular Queue:** This is a special type of queue where the last position is connected back to the first position. Here also the operations are performed in FIFO order.
- **Double-Ended Queue (Deque):** In a double-ended queue the insertion and deletion operations, both can be performed from both ends.
- **Priority Queue:** A priority queue is a special queue where the elements are accessed based on the priority assigned to them.

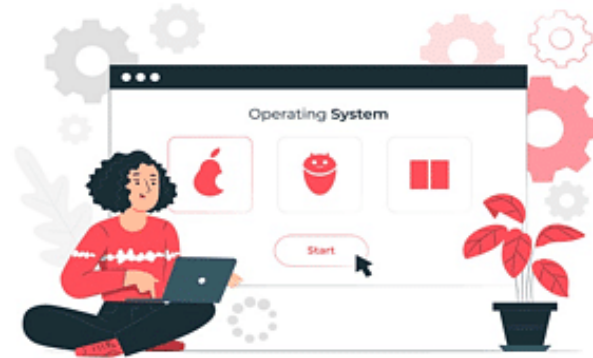
Applications of Queue:

- In a computer system, there may be queues of tasks waiting for the printer, for access to disk storage, or even in a time-sharing system, for use of the CPU.
- Within a single program, there may be multiple requests to be kept in a queue, or one task may create other tasks, which must be done in turn by keeping them in a queue.
- It has a single resource and multiple consumers.
- It synchronizes between slow and fast devices.
- In a network, a queue is used in devices such as a router/switch and mail queue.
- Variations: dequeue, priority queue and double-ended priority queue.

Applications of Queue:



Printers and single shared resources



Operating Systems for task scheduling



Switches and Routers



Call Center phone systems

Recall:

- Queue and its types
- Queue Representation
- Applications of Queue

