Pre Requisites:

- Arrays
- Basic java syntax

List of concepts involved :

- Introduction to queue
- Types of queue
- Queue class in JAVA
- Implementation of various functions of a queue
- Implement queue using stacks
- Implement stack using queues
- Introduction to deque
- Sliding window
- Problem based on the concept of sliding window

What is Queue?

A queue is a linear data structure that is open at both ends and the operations are performed in First In First Out (FIFO) order.
For example : standing in a queue for cash withdrawal, the person who came first will be withdrawing the money first.

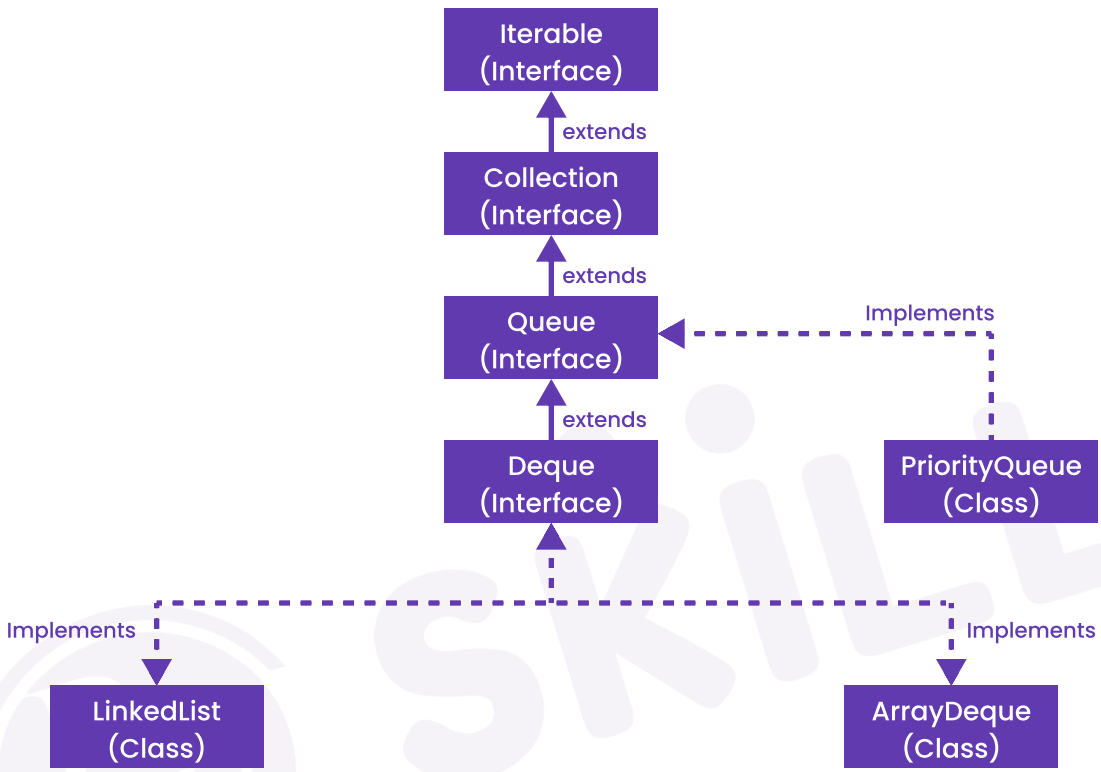
Terminologies associated with a queue :

- Front : this denotes the index from where remove/delete operation will take place.
- Rear : this denotes the index from where add/insert operation will take place.
- Add: adding an element to a queue is known as an add operation. Add operation is not possible if the queue is full.
- Remove : removing an element from a queue is known as remove operation and is not possible if the queue is empty.
- front(): viewing the element present at the front index in a queue is returned by front() function. Its functionality is similar to pop, the only difference is that in pop operation we remove the front indexed element but in front(), we just return the front indexed element's value and we do not remove it. This operation is also not feasible if the queue is empty.

Types of queues :

- **Simple queue** : It is a normal queue that is solely based upon the FIFO principle.

- **Circular Queue :** It is similar to the simple queue. The only difference between a circular queue and a simple queue is the way it is implemented.
- **Double Ended Queue (Deque) :** It is the type of queue where an element can be inserted or deleted from both the front and the rear.
- **Priority Queue :** In this type of queue, the elements are assigned a priority value and depending upon that value, each element is given a position in the queue. The order in which the elements are placed may be in increasing or decreasing order of the priority value depending upon how we want to use it.



Queue class in java :

The Queue interface is present in java.util package and extends the Collection interface is used to hold the elements about to be processed in FIFO(First In First Out) order. It is an ordered list of objects with its use limited to inserting elements at the end of the list and deleting elements from the start of the list, (i.e.), it follows the FIFO or the First-In-First-Out principle.
Being an interface the queue needs a concrete class for the declaration and the most common classes are the PriorityQueue and LinkedList in Java.

Syntax to define a queue :

- Queue<data_type> queue = new PriorityQueue<> ();
- Queue<data_type> queue = new LinkedList<> ();

Q1. Write a program to implement the various functions of a queue.

Solution :