

Stack Queue Part 2

PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Queue

- A queue is a useful data structure in programming. It is similar to the ticket queue outside a cinema hall, where the first person entering the queue is the first person who gets the ticket.
- Queue follows the First In First Out (FIFO) rule - the item that goes in first is the item that comes out first.

empty queue enqueue enqueue dequeue

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 54 of 71

Windows taskbar: Slides, Mail, Photos, Task View, File Explorer, Edge, Settings, Taskbar settings, Start button, Volume, Battery, ENG, 6:07 PM, Taskbar icons.

PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Basic Operations of Queue

A queue is an object (an abstract data structure - ADT) that allows the following operations:

- Enqueue:** Add an element to the end of the queue
- Dequeue:** Remove an element from the front of the queue
- IsEmpty:** Check if the queue is empty
- IsFull:** Check if the queue is full
- Peek:** Get the value of the front of the queue without removing it.

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 55 of 71

Windows taskbar: Slides, Mail, Photos, Task View, File Explorer, Edge, Settings, Taskbar settings, Start button, Volume, Battery, ENG, 6:10 PM, Taskbar icons.

PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Working of Queue

Queue operations work as follows:

- two pointers FRONT and REAR
- FRONT track the first element of the queue
- REAR track the last element of the queue
- initially, set value of FRONT and REAR to -1

Enqueue Operation

- check if the queue is full
- for the first element, set the value of FRONT to 0
- increase the REAR index by 1
- add the new element in the position pointed to by REAR

Dequeue Operation

- check if the queue is empty
- return the value pointed by FRONT
- increase the FRONT index by 1
- for the last element, reset the values of FRONT and REAR to -1

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 56 of 71

146:30 1x

PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Working of Queue

Queue operations work as follows:

- two pointers FRONT and REAR
- FRONT track the first element of the queue
- REAR track the last element of the queue
- initially, set value of FRONT and REAR to -1

Enqueue Operation

- check if the queue is full
- for the first element, set the value of FRONT to 0
- increase the REAR index by 1
- add the new element in the position pointed to by REAR

Dequeue Operation

- check if the queue is empty $\rightarrow -1$
- return the value pointed by FRONT $\rightarrow -1$
- increase the FRONT index by 1
- for the last element, reset the values of FRONT and REAR to -1

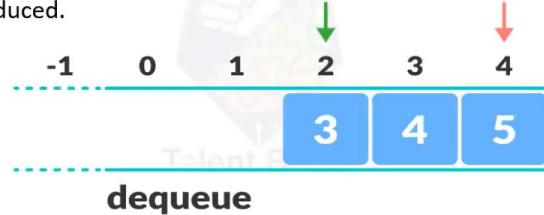
This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 56 of 71

142:02 1x

Limitations of Queue

As you can see in the image below, after a bit of enqueueing and dequeuing, the size of the queue has been reduced.



And we can only add indexes 0 and 1 only when the queue is reset (when all the elements have been dequeued).

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 58 of 71



1:10:16 1x

Complexity Analysis & Applications of Queue

The complexity of enqueue and dequeue operations in a queue using an array is $O(1)$.

Applications of Queue

- CPU scheduling, Disk Scheduling
- When data is transferred asynchronously between two processes. The queue is used for synchronization. For example: IO Buffers, pipes, file IO, etc.
- Handling of interrupts in real-time systems.
- Call Center phone systems use Queues to hold people calling them in order.

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 59 of 71



1:08:57 1x

Types of Queue

There are four different types of queues:

- Simple Queue
- Circular Queue
- Priority Queue
- Double Ended Queue

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

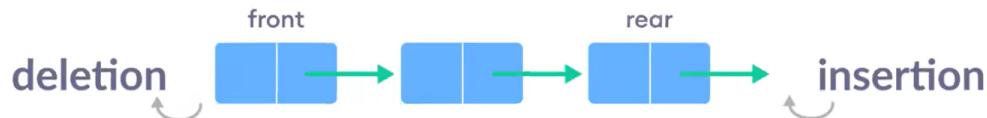
Slide 60 of 71



1:04:55 1x

Simple Queue

In a simple queue, insertion takes place at the rear and removal occurs at the front. It strictly follows the FIFO (First in First out) rule.



This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

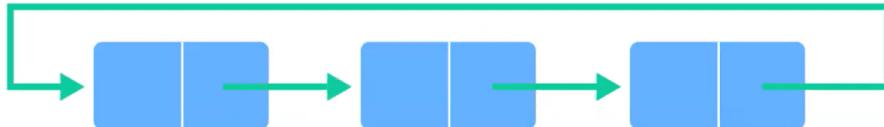
Slide 61 of 71



1:03:48 1x

Circular Queue

In a circular queue, the last element points to the first element making a circular link.



The main advantage of a circular queue over a simple queue is better memory utilization.

If the last position is full and the first position is empty, we can insert an element in the first position.

This action is not possible in a simple queue.

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

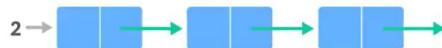
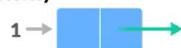


Priority Queue

A priority queue is a special type of queue in which each element is associated with a priority and is served according to its priority.

If elements with the same priority occur, they are served according to their order in the queue.

Priority



Insertion occurs based on the arrival of the values and removal occurs based on priority.

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video



Deque (Double Ended Queue)

In a double ended queue, insertion and removal of elements can be performed from either from the front or rear. Thus, it does not follow the FIFO (First In First Out) rule.



This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 64 of 71

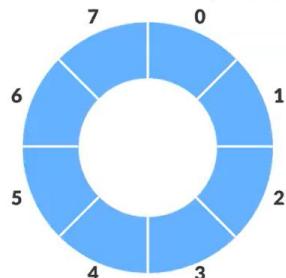


1:00:18 1x

Circular Queue

Circular Queue works by the process of circular increment i.e. when we try to increment the pointer and we reach the end of the queue, we start from the beginning of the queue. Here, the circular increment is performed by modulo division with the queue size. That is,

if REAR + 1 == 5 (overflow!), REAR = (REAR + 1)%5 = 0 (start of queue)



This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 65 of 71



58:53 1x

PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Circular Queue Operations

The circular queue work as follows:

- two pointers FRONT and REAR
- FRONT track the first element of the queue
- REAR track the last elements of the queue
- initially, set value of FRONT and REAR to -1

1. Enqueue Operation

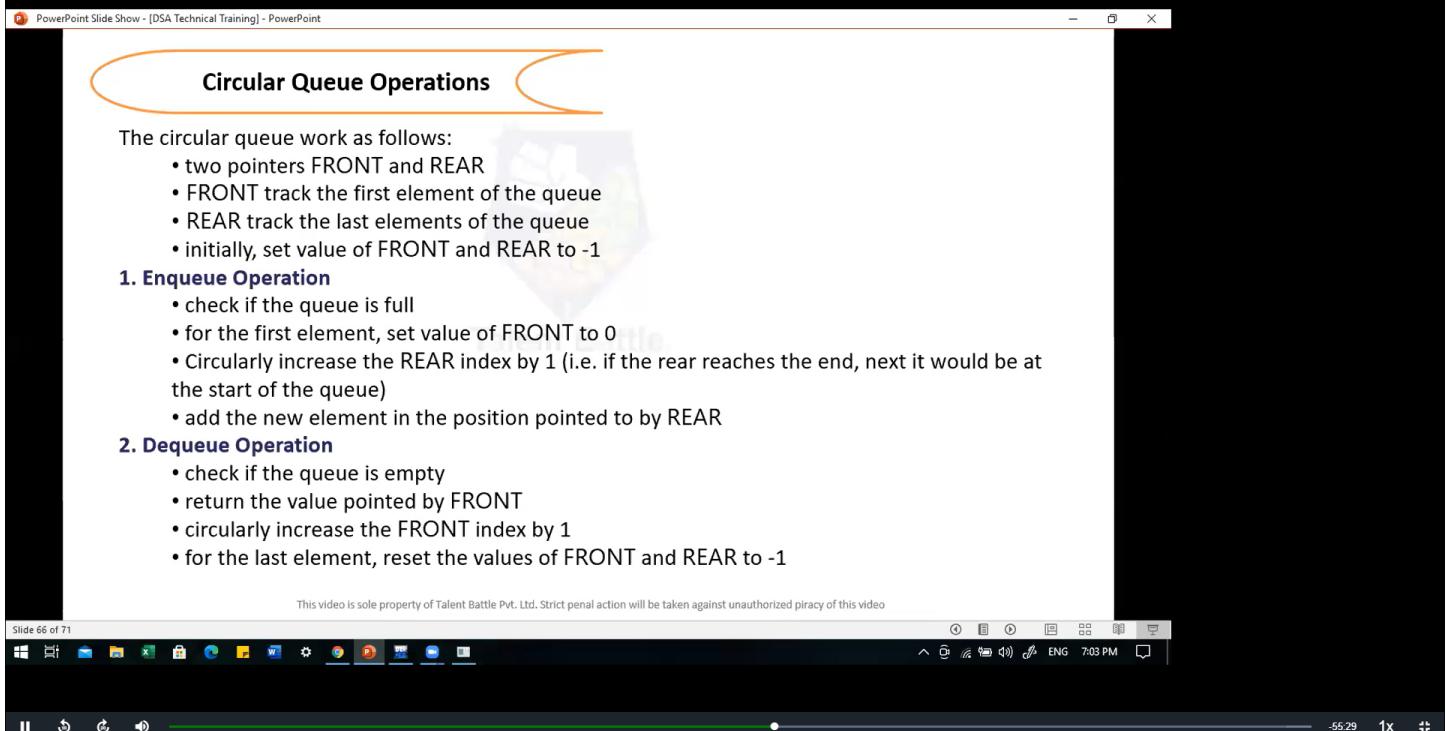
- check if the queue is full
- for the first element, set value of FRONT to 0
- Circularly increase the REAR index by 1 (i.e. if the rear reaches the end, next it would be at the start of the queue)
- add the new element in the position pointed to by REAR

2. Dequeue Operation

- check if the queue is empty
- return the value pointed by FRONT
- circularly increase the FRONT index by 1
- for the last element, reset the values of FRONT and REAR to -1

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 66 of 71



PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Circular Queue Operations

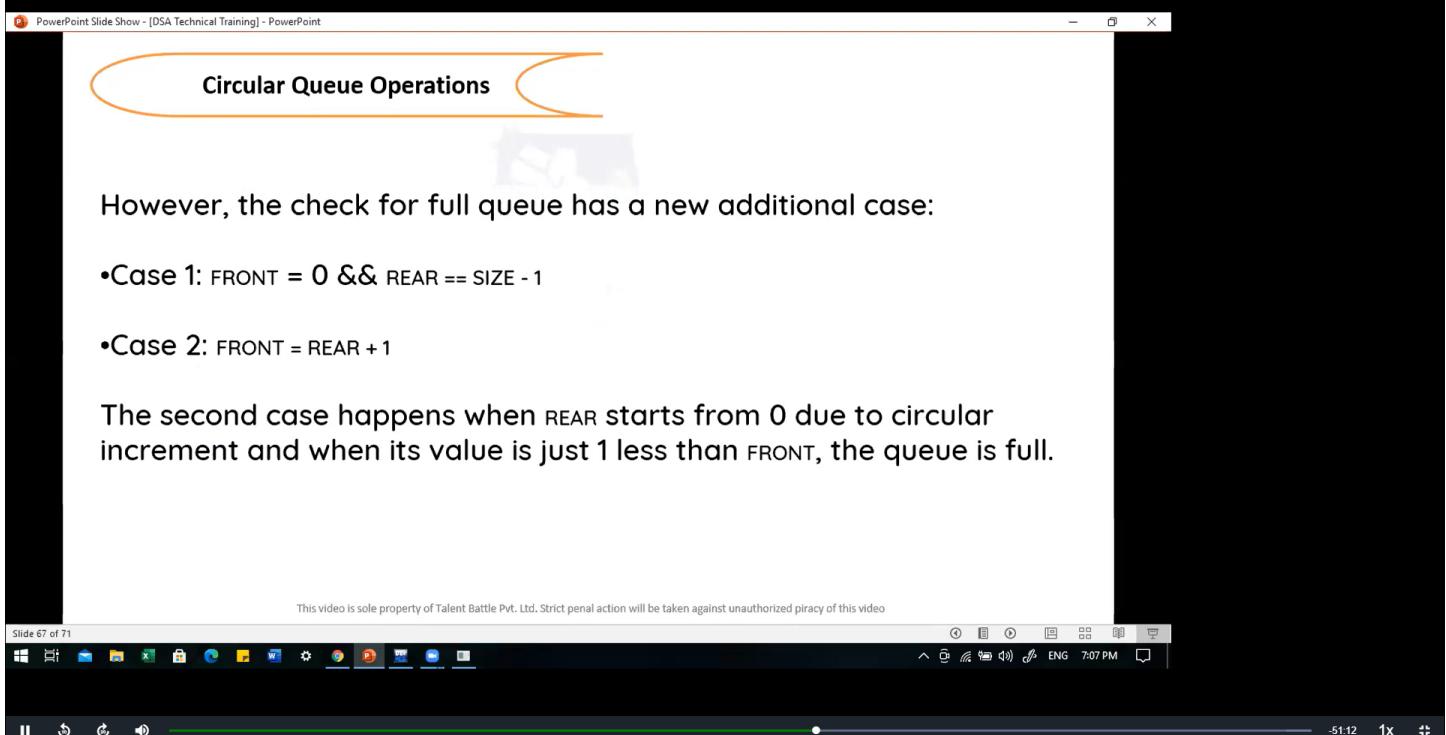
However, the check for full queue has a new additional case:

- Case 1: $\text{FRONT} = 0 \ \&\& \ \text{REAR} == \text{SIZE} - 1$
- Case 2: $\text{FRONT} = \text{REAR} + 1$

The second case happens when REAR starts from 0 due to circular increment and when its value is just 1 less than FRONT, the queue is full.

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 67 of 71



PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Application of Circular Queue



- CPU scheduling
- Memory management
- Traffic Management

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 70 of 71

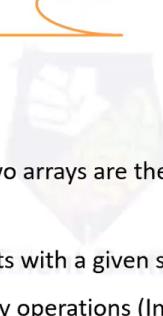


8:00 AM ENG 7:29 PM

29.21 1x

PowerPoint Slide Show - [DSA Technical Training] - PowerPoint

Practice Examples



1. Program to find array size.
2. Write Program to check if two arrays are the same or not.**[Asked in: Amazon, Goldman Sachs]**
3. Write Program to find Triplets with a given sum.
4. Write Program for basic array operations (Insert, delete and search an element)
5. Write Program to find smallest and largest element in an array

This video is sole property of Talent Battle Pvt. Ltd. Strict penal action will be taken against unauthorized piracy of this video

Slide 71 of 71



8:00 AM ENG 7:29 PM

29.17 1x

