**Session: Stacks and Queues - Concepts, Examples, and Interview Questions (Java)**

[1,2,3,4,5,6] = end rule

What is a Stack?

* Follows **LIFO** (Last In First Out)
* Operations:
* push(): insert
* pop(): remove top
* peek(): view top
* isEmpty(): check if empty

**Use Cases:**

* Undo feature
* Syntax parsing
* Backtracking

Java Stack Example

Stack<Integer> stack = **new** Stack<>();  
stack.push(1);  
stack.push(2);  
System.out.println(stack.pop()); *// 2*

How to identify the pattern ?

Ex : find next greater element to the right?  
arr : [4,7,6,8,9]

result : [7, 8, 8, 9, -1]

**Brute force : O(N\*N) time complexity**

for(int i=0;i<arr.length;i++)

for(int j=i+1;j<arr.length;j++)

if(arr[j] > arr[i]){

result[i] = arr[j];

break;

}

**Optimised : O(n) space and O(n) time complexity**

int n = arr.length;  
ArrayList<Integer> res = new ArrayList<>();  
Stack<Integer> stk = new Stack<>();  
  
for (int i = 0; i < n; i++) {  
 res.add(-1);  
}  
  
for (int i = n - 1; i >= 0; i--) {  
   
 while (!stk.isEmpty() && stk.peek() <= arr[i]) {  
 stk.pop();  
 }  
 if (!stk.isEmpty()) {  
 res.set(i, stk.peek());  
 }  
 stk.push(arr[i]);  
}  
  
return res;

**Commonly Asked Interview Questions (Stacks)**

Valid Parentheses (LC 20)

Min Stack (LC 155)

Evaluate Reverse Polish Notation (LC 150)

Daily Temperatures (LC 739)

Next Greater/smaller Element /to left/ to right (LC 496) - 4 questions

Largest Rectangle in Histogram (LC 84)

**Queue**

What is a Queue?

* Follows **FIFO** (First In First Out)
* Operations:
* add() / offer(): insert
* remove() / poll(): remove front
* peek(): view front

**Use Cases:**

* Print queue
* Task scheduling
* BFS traversal

Java Queue Example

Queue<Integer> queue = **new** LinkedList<>();  
queue.add(1);  
queue.add(2);  
System.out.println(queue.remove()); *// 1*

Variants of Queue

* **Deque** (Double-Ended Queue) : Allows insertion and deletion from both ends

Deque<Integer> deque = new ArrayDeque<>();

deque.addFirst(1);

deque.addLast(2);

System.out.println(deque.removeLast()); // 2

**Commonly Asked Interview Questions (Queues)**

Implement Queue using Stacks (LC 232)

Implement Stack using Queues (LC 225)

Sliding Window Maximum (LC 239)

Rotting Oranges (LC 994)

Number of Recent Calls (LC 933)