Lab 02

Topic

Train Station Simulation

Objective

• To practice the use of **queue (FIFO)** and **stack (LIFO)** data structures by simulating the rearrangement of trains at a station.

You may do all these tasks with array or lists

Problem Description

At a train station, trains arrive in a certain order and must be rearranged before departure:

- **Incoming trains** arrive in a queue (FIFO).
- The station has a **sidetrack** (a stack, LIFO) where trains can be held temporarily.
- Trains must **depart in increasing order** of their IDs (1, 2, 3, …).

Requirements

1. Represent the **arrival order** using a list. i.e. the input maybe [3,1,2,5,4].
2. The trains will have to leave in correct order. i.e. 1,2,3,4,5
3. Use a **queue** as the main track.
4. Use a **stack** as the sidetrack for temporary storage.
5. Rearrange trains so that they depart in increasing order.
6. Print each operation performed:
    - Enqueue → Train arrives at the station.
    - Push → Train moved to the stack.
    - Pop → Train leaves the stack.
    - Dequeue → Train departs directly from the queue.
7. Display the **final departure order** of trains.

8. If the trains cannot be rearranged perfectly (not all orders are sortable with this method), still output the result obtained.

Example

Input (arrival order):

```
3, 1, 2, 5, 4
```

Possible sequence of operations:

```
Train 3 arrives at the station.
Train 3 is moved to the sidetrack.
Train 1 arrives at the station.
Train 1 is moved on the main track.
Train 2 arrives at the station.
Train 2 is moved on the main track.
Train 3 is moved on the main track.
Train 5 arrives at the station.
Train 5 is moved to the sidetrack.
Train 4 arrives at the station.
Train 4 is moved on the main track.
Train 5 is moved on the main track.
```

Output (departure order):

```
1, 2, 3, 4, 5
```