Tasks

Question 1

Implement a queue data structure using templates and perform basic operations on it.

Requirements:

1. Create a class called **Node using templates** to represent a node for a queue. Each node should have an integer data field and a pointer to the next node.

2. Create a class called **Queue using templates** to represent the queue data structure.

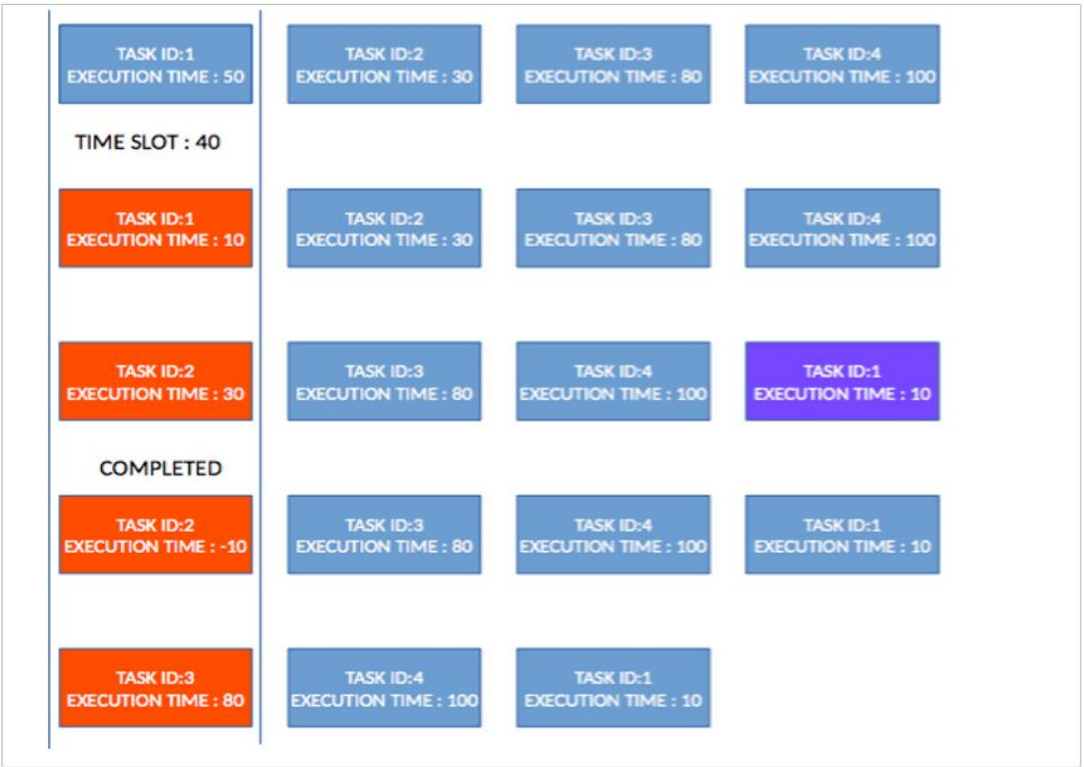
3. Queue will have a **front** pointer that will point towards the node in the front of the queue and a **rear** pointer that will point towards the end of the queue.

4. Implement the following methods in the **Queue** class:

    - **enqueue(item)**: Add an item to the back of the queue.
    - **dequeue()**: Remove and return the item from the front of the queue.
    - **peek()**: Return the item at the front of the queue without removing it.
    - **is_empty()**: Return **True** if the queue is empty, **False** otherwise.
    - **size()**: Return the number of elements in the queue.
    - **clear()**: Clear all elements from a node-based queue, effectively making it an empty queue.
    - **isPalindrome(string str):** to check palindrome using recursion

Question 2

Round robin is a scheduling algorithm that an operating system uses to time share computational resources of a processor between tasks. Each task is given a specific time slot (**Quantum**) to execute on a processor (CPU Time), once this time slot expires and the task is not yet completed, it is preempted (**dequeue**) and added to the back of the queue (**enqueue**) with its **Remaining Execution Time**. Then the next task (**front**) in the queue is selected and this processes continues until all tasks have finished execution.



Your task is to simulate this process using a queue. Implement a function **roundRobin()** that takes input a **Queue of execution time and a time quantum.** Then it simulates the process of task execution until the queue gets empty. Example of output is displayed below.

```
Execution Time: 50
Remaining Time: 20
Task is not completed, it is being re-scheduled

Execution Time: 30
Remaining Time: 0
Task is completed, it is removed from queue

Execution Time: 80
Remaining Time: 50
Task is not completed, it is being re-scheduled

Execution Time: 100
Remaining Time: 70
Task is not completed, it is being re-scheduled

Execution Time: 20
Remaining Time: -10
Task is completed, it is removed from queue

Execution Time: 50
Remaining Time: 20
Task is not completed, it is being re-scheduled

Execution Time: 70
Remaining Time: 40
Task is not completed, it is being re-scheduled

Execution Time: 20
Remaining Time: -10
Task is completed, it is removed from queue

Execution Time: 40
Remaining Time: 10
Task is not completed, it is being re-scheduled

Execution Time: 10
Remaining Time: -20
Task is completed, it is removed from queue
```