

# Stacks and Queues Exercises

**Question 1.** Write a Java program to implement a stack of integer values using Linked Lists with the following operations:

1. `boolean isEmpty()` - return true if the stack is empty and false otherwise.
2. `void clear()` - clear the stack.
3. `void push(int x)` - insert a node with value `x` at the top of the stack.
4. `int pop()` - remove the top element on the stack and return its value; throw `EmptyStackException` for empty stack.
5. `int top()` - return value of a node at the top of the stack; throw `EmptyStackException` for empty stack.
6. `void traverse()` - display all values in the stack from the top to the bottom.
7. Use a stack to convert an integer number in decimal system to binary system and display on the screen.

Note: Write your own Linked Lists, don't use Java libraries. You can write some constructors and other methods as you see they are necessary.

**Question 2.** Write a Java program to implement a queue of integer values using Linked Lists with the following operations:

1. `boolean isEmpty()` - return true if the queue is empty and false otherwise.
2. `void clear()` - clear the queue.
3. `void enqueue(int x)` - insert a node with value `x` at the end of the queue.
4. `int dequeue()` - remove the first element on the queue and return its value; throw `Exception` for empty queue.

5. `int first()` - return value of the first node of the queue; throw Exception for empty queue.
4. `void traverse()` - display all values in the queue from the front to the rear.

Note: Write your own Linked Lists, don't use Java libraries. You can write some constructors and other methods as you see they are necessary.

**Question 3.** Extend your queue to a priority queue by implementing the following operation:

1. `int priority_dequeue()` - remove the maximum element from the queue and return its value. If there are multiple maximum elements, remove and return the first.

**Question 4.** Copy and modify your programs in questions 1 and 2 so that elements in the stack and queue are String types. Write the Main class to test them.

**Question 5.** Copy and modify your programs in questions 1 and 2 so that elements in the stack and queue are Object types. Write the Main class to test them.