CS272 Lab Assignment #7: Generic Programming, Implement and Use Stacks

Learning objectives: Objective 1 (stack), Objective 5 (generic programming), Objective 6, Objective 7

Note:

- **Specifications** for all your classes and methods:
  Please properly explain (1) the functionality of the methods, (2) the parameters, (3) the return values, (4) the pre-conditions if there is any;
  Please use inline comments, meaningful variable names, indentation, formatting, and whitespace throughout your program to improve its readability.
- You can (but are not required to) design and implement other facilitating methods (E.g., other get and set methods, toString method) to finish the implementation of the required methods.

Requirements

- (10 pts) Write a generic interface for stack and put the code in **StackInterface.java**. This interface should include five functions: push, pop, top, size, and isEmpty.

- (10 pts) Write a generic class for the node in singly linked lists and put the code in **SNode.java**.

- (40 pts) Implement **LinkStack.java** with the following detailed requirements.
  1. (5 pts) It has ONLY one instance variable, which is a generic node of type `SNode`.
  2. (35 pts) `LinkStack` should implement the `StackInterface` interface and implement all the methods declared in ths interface. (Each method carries 7pts)

- (40 pts) Implement **ArraylistStack.java** with the following detailed requirements.
  1. (5 pts) It has one instance variable: an *arraylist* with a generic data type.
  2. (35 pts) `ArrayListStack` should implement `StackInterface` interface and implement all the methods declared in this interface. (Each method carries 7pts)

- You need to design test cases to test your functios in `ArraylistStack.java` and `LinkStack.java` *thoroughly*. If your test cases cannot cover some important conditions, points may be deducted.
  Please put your test case files to **StackTest.java**.

- (10pt BONUS) **NQueen.java**: Use either **stack that you implemented** to solve the N-queen problem. Your design needs to follow the logic in the lecture notes. You can also use the program project 10 at page 358 as reference. The parameter should be N (in the range of [1, 16]). The result should print queens at proper positions. For example the solution at page 358 should be printed as

```
Q - - - -
- - Q - -
- - - - Q
- Q - - -
- - - Q -
```

Submission

A zipped file *your-bannerid-lab7.zip* containing your java file(s).

Grading Criteria

- The score allocation has already been put beside the questions.
- Please make sure that you test your code *thoroughly* by considering all possible test cases.
  Your code may be testd using more test cases.