COMP 203 Data Structures and Algorithms, Fall 2024

Lab Assignment 3

Deadline: 21.10.2024 11:00 am

Read the questions and rules carefully. They are clear and well defined.

Rules:

1. **No Cheating:** You are not allowed to collaborate with your friends and use any kind of websites or AI. If your homework gives a sign of any of them, **directly it will be graded as zero**.
2. **Goal:** Please do your homework alone. Our main aim is to **learn**.
3. **Submission:** Submit your work in **a single java file. DON'T USE ZIP/RAR etc. In these cases, your points will be deducted by 30%.**
4. **Coding policy:** Explain your code in comments. **This is a must!**
5. **Latency policy:** A 30% deduction will be applied for each day of late submission.
6. Do not use built-in functions of java.

Files to submit: DoublyLinkedList.java

1. Doubly linked List

a. Create a generic Node<T> Class that has a constructor with parameter T data for singly linked list. (10pt)

b. Create a generic DoublyLinkedList <T> Class that has an empty constructor. In this DLL, you have access to header and trailer nodes. (10pt)

c. Write a function with the name "public void append(T data)" to insert a node having value *data* at the end of the DLL. (15pt)

d. Write a function with the name "public void delete(T data)" to delete the node that has the value *data*. (15pt)

e. Write a function with the name "public void display()" to print the node values in the DLL. (15pt) It should print in the following format:

```
header <->X <-> Y <->Z <-> trailer
```

f. Write a main function that has an String type DLL from DoublyLinkedList class (with name StrDLL) and do the following operations on it in the order of: (10pt)

StrDLL.append("hello");

StrDLL.append("from");

StrDLL.append("the earth");

StrDLL.display();

StrDLL.delete("from");

StrDLL.display();

Output should be in the following form:

```
header <->"hello" <-> "from" <->"the earth" <-> trailer

header <->"hello" <-> "the earth" <-> trailer
```

g. In the same main function, create an Integer type DLL from DoublyLinkedList class (with name IntDLL) and do the following operations on it in the order of: (10pt)

IntDLL.append(4);

IntDLL.append(8);

IntDLL.append(15);

IntDLL.append(16);

IntDLL.display();

IntDLL.delete(8);

IntDLL.display();

Output should be in the following form:

```
header <-> 4 <->  8 <->  15 <-> 16 <-> trailer
header <-> 4 <->  15 <-> 16 <-> trailer
```

h. What is the Big-O worst case time complexity of append function where the size of DLL is n? Explain why. (5pt)

What is the Big-O worst case time complexity of delete function where the size of DLL is n? Explain why. (5pt)

What is the Big-O worst case time complexity of display function where the size of DLL is n? Explain why. (5pt)

Write the answers of these questions as comment lines in your code at the end of your code.