**COMP 203 Data Structures and Algorithms, Fall 2024**

**Lab Assignment 8**

**Deadline: 02.12.2024 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 **one java files.** **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.

**Files to submit:** DLLPositionalList.java

1. Implement Positional List abstract data structure from doubly linked list. **(100pt)**

**Hint: Position is equivalent to Node.**

a. Implement a Node<E> class, DLL<E> class and DLLPositionalList class including their constructors in java. (5x3=15pt)

b. Position addFirst(E element) to insert an element at the first position of the Positional List and returns its position. (10pt)

c. Position addLast(E element) to insert an element at the last position of the Positional List and returns its position. (10pt)

d. Position addAfter(Position p, E element) to insert an element after the position p in the Positional List and returns the newly added element’s position. (10pt)

e. Position addBefore(Position p, E element) to insert an element before the position p in the Positional List and returns the newly added element’s position. (10pt)

f. Position First() to returns the position of the first element of the Positional List. (5pt)

g. Position Last() to returns the position of the last element of the Positional List. (5pt)

h. E remove(Position p) to remove the element at the position p from the Positional List and returns the removed element. (10pt)

i. E set(Position p, E newValue) to set the element at the position p with the newValue. (5pt)

j. printPositionalList() to print the elements in the Positional List. (10pt)

k. Test all your functions in the main. (10pt)

**Example:**

addFirst(10) //10

addFirst(20) //20,10

addFirst(30) //30,20,10

addLast(40) //30,20,10,40

printPositionalList()

30,20,10,40 //prints the result

remove(last()) //30,20,10 returns 40

remove(first()) //20,10 returns 30

printPositionalList()

20 10 //prints the result

First() //returns header’s next node

Last() //returns trailer’s previous node