**COMP-254 001:** Data Structures and Algorithms

**Hands-On TEST 1 – [date, time]**

Student: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Be sure to read the following general instructions carefully:**

* This lab test **must be completed individually** by all the students.
* Read the project **naming and submission guidelines** on page 2.
* You should demonstrate the solution and then **submit the project through the assignment link on eCentennial**.

**Exercise 1**

**Write and test** a Java/Python **recursive** method for **finding the maximum element in an array, A, of n elements**. What is your running time? **Hint**: an array of size 1 would be the stop condition. The implementation is similar to *linearSum* method in lecture 5 examples. You can use the **Math.max** method for finding the maximum of two numbers.

(3 marks)

**Exercise 2**

**Write and test** an efficient Java/Python method for **reversing a singly linked list L** using only a constant amount of additional space. **Hint:** Add the method to SinglyLinkedList class. Change the orientation of links while making a single pass through the list from *head* to *tail*. (4 marks)

**Exercise 3**

**Write and test** an efficient Java/Python method for **finding the ten largest elements in an array of size n**. What is the running time of your algorithm? **Hint**: Use an auxiliary array to store indices of largest elements and ignore previous found elements. Note that 10 is a constant.

(3 marks)

**Evaluation:**

|  |  |
| --- | --- |
| **Correct implementation of requirements:**   * Correct data structure algorithm * Correct Java or Python implementation of methods * Correct running time if required | 85% |
| **Friendly and Correct test method** | 15% |
| **Total** | 100% |

You must name your Eclipse project according to the following rule:

**YourFullname\_COMP254LabTest1**.

Example: **JohnSmith\_COMP254\_001LabTest1**

**Create a package for each exercise (ex1, ex2, ex3).**

**Submission rules:**

Submit your modules as **zip files** that are named according to the following rule:

**YourFullname\_ COMP254\_001LabTest1.zip**

Example: **JohnSmith\_ COMP254\_001LabTest1.zip**

Use 7-zip to compress files (<https://www.7-zip.org/download.html>). DO NOT USE RAR, or other software.