Informatics and Computer Science	**19CSCI01I** **take-home assignment** **2019/2020**
Module Title **Introduction to Programming**	
Module Leader **Dr. Mostafa Salama**	Semester **Two**
Assessment Weight **50% of the total course mark**	Due Date **Announced on E-Learning**

Student Name						
Student ID						
Marks Breakdown	**Q1**		**Q2**		**Q3**	
Total Mark						
Marker 1 Signature		**Marker 2 Signature**				

Instructions to students:

1. This is an individual assignment that replaces the final exam. This assignment is 2 pages long and includes three questions. Write your answers in a word document, and use only the following text style “font type: Arial (Body), font size: 12, justified text and 1.5 spacing”. Do not include any images or figures in your answer.

2. The total mark of this assignment is 100 marks. The allocation of the mark of each question is shown in box brackets. The time allowed to answer this research report is two days only. Late submission is not allowed and will not be considered.

3. Submission: Submit a pdf to the submission link in the E-Learning, the name of the document is your first name followed by his id, Ahmed123123.pdf. Late submissions and submissions using email will not be accepted. Your submission will be checked against plagiarism by the Turnitin system. The submission must be accompanied by the Turnitin report. If the similarity is more than 25%, it will be considered plagiarism.

Assignment Questions and Requirements:

Q1. One-dimensional array and linked list (LL) are two different data structures that holds multiple values. Discuss the difference between these structures according to the following criteria. Your discussion must include coding examples.

a. The allocation of the elements of each data structure in the computer memory. [**10 marks**; 5 marks for the array and 5 marks for the LL: 3 marks for explaining how the elements are allocated in the memory and 2 marks for the example (for each)]

b. The extension of the number of elements in each data structure. [**10 marks**; 5 marks for each data structure: 3 marks for explaining how the size of the data structure can be increased or decreases and 2 marks for the example]

c. The accessibility of the elements in each data structure. [**10 marks**; 5 marks for each data structure: 3 marks for explaining how the elements can be added, modified or deleted and 2 marks for the example]

[Total: 30 marks]

Q2. A list of objects, in C++, can be an array or a linked list. Consider any object in the list is an instance of a class “Data”, this class has two member variables {id(integer) and name(string)}

a. Write a function sortArray() that sorts the objects of type “Data” in an array “dataArray”. This function receives two parameters, the array “dataArray” and the size of the array. Your answer will include only the sortArray() function, considering that the dataArray is already full of the “Data” objects. (**10 marks**)

b. Clarify how the function sortArray() sorts the objects in the array. Your answer will include a complete description for each line in the function. (**10 marks**)

c. Write a function sortLinked() that sorts the objects of type “Data” in a linked list “dataLL”. This function receives two parameters, the linked list “dataLinked” and the size of the linked list. Your answer will include only the sortLinked() function, considering that the “dataLinked” is already full of “Data” objects. (**10 marks**)

d. Clarify how the function sortLinked() sorts the objects in the linked list. Your answer will include a complete description for each line in the function. (**10 marks**)

[Total: 40 marks]

Q3. Write a C++ program that save a list of 10 students {“number”(integer), “name”(string) and “grade”(float of range from 0 to 100)} in a file. The first line in the file contains the information of student’s “number” 1. While the student’s “number” in the second line is 2, and so on until the tenth “student”. (**10 marks**)

Then write a function getStudent(int num) that returns the “student” whose “number” is the input parameter “num”. This function must retrieve the information of any “student” by his number using the seekg() function. The “student” objects are either structure or a class. (**20 marks**)

[Total: 30 marks]

Good Luck