

# COMP610: Data Structures and Algorithms

Semester 1, 2018

## Assignment 1

Release Date: 15-Mar-2018

Due Date: 29-Mar-2018 (till 5:00pm)

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### **Things you should know:**

This is the first assessment for this course and it contributes 10% towards overall of your course marks. In this assignment you will be asked to efficiently implement the concepts and skills you have learned in the first three weeks of this course. You may be required to do some research as well but, please be aware of AUT's plagiarism and cheating policies.

This assignment consists of two tasks which are both mandatory.

### **Task1: Car-park System**

(15-marks)

You are required to design a car-park system which will keep track of available and occupied carparks. The system will be recording the following information for an occupied carpark:

1. Car's registration no.
2. Time of occupancy

*Assumption: All carparks are linearly arranged.*

- a. Design an appropriate data structure for the system following all the steps including the interface, abstract base class and implementations.
- b. The system should allow the user to track:
  - i. Available car parks
  - ii. Occupied car parks
  - iii. Car parked at a specific car-park location
  - iv. The parking time for any parked car
  - v. The total parking time of a car when its leaving the carpark
- c. Create a Word/text file with the name "Task1". Discuss what the features of your designed data structure are and how it best suits the given scenario.

## Task2: Sorting Exam Papers

(15-marks)

Suppose you are invigilating an exam of 50 students. You are required to handover the exam papers sorted alphabetically w.r.t. Student Last name.

Consider the following two cases:

1. Case-1: The invigilator will get the exam papers (randomly) from all students and then sort them as per requirements.
2. Case-2: The invigilator will get the exam paper from each student and placed it on the desk in sorted order. i.e., when the invigilator will place the last student's paper on desk, the papers will be already in the required sorted order.

You are required to do the following for each case:

- a. Create a student class with Student ID, First Name, Last Name, Uni-Year and Program. (Uni-Year: refers to the no. year 1, 2 or 3 of student's degree in university).
- b. Select the appropriate sorting algorithm to sort the paper.
  - I. You should create a sorting method to achieve the results
- c. Print the order of student's paper when the no. of papers collected reached 10, 20, 30, 40 and finally 50.
- d. Create a word/text file with the name "Task2" and explicitly mention:
  - I. Which sorting algorithm you have used for each case?
  - II. How you will support your selected algorithm for the given problem?
  - III. What is the complexity of your algorithm?

### **Submission Guidelines:**

- You are required to submit a single zip file containing two folders (one for each task) on Blackboard before the due date and time.
- Please make sure that you have added a “readme.txt” file for both the tasks, mentioning about instructions/other info necessary to run your programs.
- You are required to create two separate project folders (one for each task).
  - Each folder should include all its source-files, discussion files (task1 or task2) and the readme.txt file for the relevant task.

### **Marking Guide:**

Tasks	Criteria	Allocated Marks
<b>Task-1</b>	a. Procedure for creating data structure is followed: Interface Abstract Base Class Implementations	6
	b. User can perform all the five functions	5
	c. Word/Text file “Task1” is submitted with reasonable discussions	4
	<b>Sub-Total (Task-1)</b>	<b>15</b>
<b>Task-2</b>	a. Required student class is created	2
	b. Sorted algorithm implemented	5
	c. Required output is generated	5
	d. Word/Test file “Task2” is submitted with reasonable discussions	3
	<b>Sub-Total (Task-2)</b>	<b>15</b>
<b>TOTAL</b>		<b>30</b>