ASSIGNMENT 2
SCSJ/SECJ1023 – Programming Technique II

- This assignment can be done individually or in pairs.
- Your programs must follow the input and output as required in the text and shown in the examples. You must test the programs with (but not limited to) all the input given in the examples.
- Any form of plagiarisms is **NOT ALLOWED**. Students who copied other student's program/ assignment will get **ZERO** mark (both parties, student who copied and student that share their work).
- Please insert your name, matrices number, section of your class and date as a comment in your program.
- Only one submission per pairs (partners) is required for the submission which is the source code (the file with the extension .cpp). Submit the assignment via the UTM's e-learning system.

Question 1 ***(Question 4, pg 113, Exercise 3, Lab 8)***

Faculty of Computing will be organizing a competition that is open to all UTM students. The competition is meant to provide a platform to the students to exhibit their idea. Some important notes regarding the competition:

a) It is an individual participation.

b) Each student must have a project beforehand.

c) Each student must find an advisor which can be any UTM staff regardless of their position. That means, besides lecturers, technicians, research officers, etc, also can be appointed as advisers. However, only one advisor is allowed for each student.

d) Also, each staff can only advise a student.

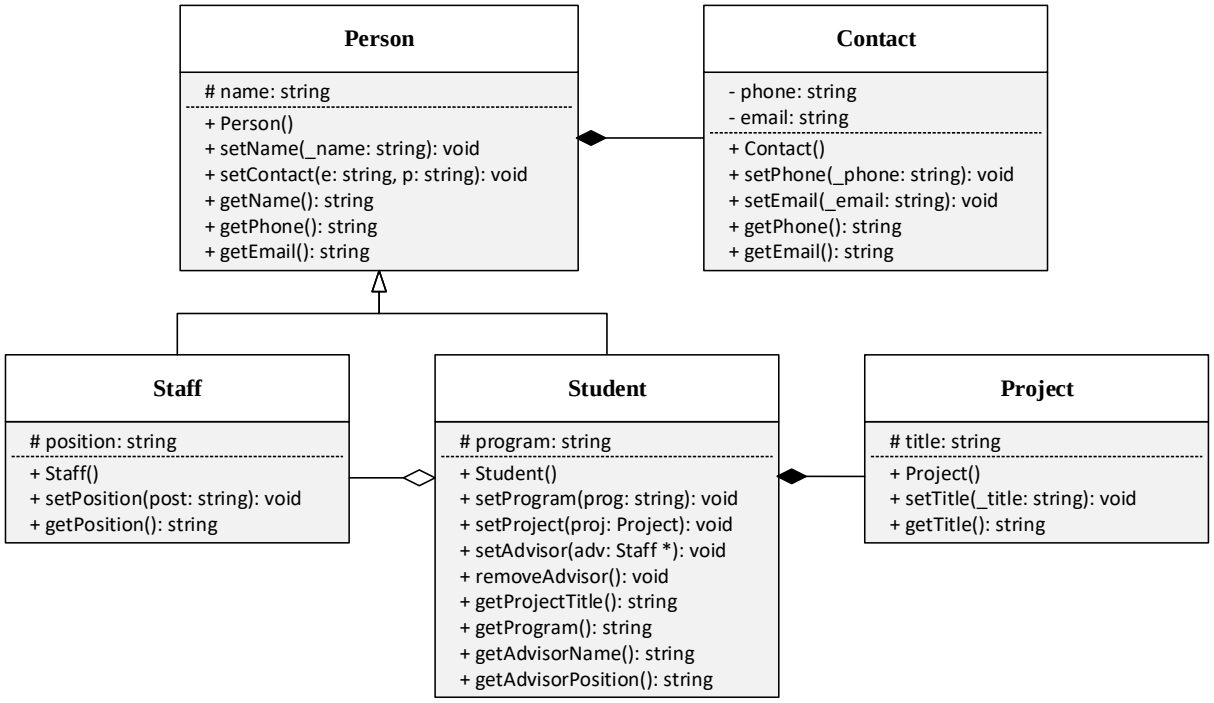

Figure 1: UML class diagram

Suppose the class design has been done by other parties as shown in Figure 1. Based on the class diagram in Figure 1 and the requirements above, write a C++ program that does the following tasks:

a. Implement all the classes and their relationships. You need to define all the methods listed in the diagram, and you can add other methods whenever possible.

b. Create a list of **`Advisor`** objects and another list of **`Students`** objects. Use array of objects and the sample data given in an input files.

c. Assign each student with an advisor.

d. Print the information of all the students along with their projects and advisers.

e. Suppose the first and second students want to change their advisor each other, while the advisor for the third student wants to withdraw from being appointed as an advisor. Write the code to implement these situations.

f. Print again the final list.

g. The output of the program is shown in **Figure 2**.

Table 1: Sample data of advisors

No	Advisor's Name	Phone	Email	Position
1	Prof. Dr. Muhammad Roslan	0199875678	mroslana29@gmail.com	Lecturer
2	Mr. Qamarool Zaman	01156781234	qam23@gmail.com	Senior Technician
3	Dr. Siti Zubaidah Rosli	0101117456	ctzr983@gmail.com	Research Officer
4	AP. Dr. Karim Hisham	0123451222	kh123@gmail.com	Lecturer

Table 2: Sample data of students

No	Student's Name	Phone	Email	Program	Project
1	Lim Sew Ying	010897634045	lsying12@live.utm.my	Electrical Engineering	Smart Dustbin
2	Abu Bakar Razali	0111210000	abraz78@live.utm.my	Computer Science	Money Recognition for Blind People
3	Nur Amalina Muhammad	0129000123	nam978@live.utm.my	Biomedical Engineering	Dengue Testing Kit
4	Abas Amirullah	0121236782	abasa12@live.utm.my	Science	Sports in Education

Sample data of advisors and students are provided in the input files named **"inpAdvisor.txt"** and **"inpStudent.txt"**.

```
NO  NAME                 PHONE          EMAIL                 PROGRAM                 PROJECT                          ADVISOR
1   Lim Sew Ying         010897634045   lsying12@live.utm.my  Electrical Engineering  Smart Dustbin                    Prof. Dr. Muhammad Roslan
2   Abu Bakar Razali     0111210000     abraz78@live.utm.my   Computer Science        Money Recognition for Blind People  Mr. Qamarool Zaman
3   Nur Amalina Muhammad 0129000123     nam978@live.utm.my    Biomedical Engineering  Dengue Testing Kit               Dr. Siti Zubaidah Rosli
4   Abas Amirullah       0121236782     abasa12@live.utm.my   Science                 Sports in Education              AP. Dr. Karim Hisham


NO  NAME                 PHONE          EMAIL                 PROGRAM                 PROJECT                          ADVISOR
1   Lim Sew Ying         010897634045   lsying12@live.utm.my  Electrical Engineering  Smart Dustbin                    Mr. Qamarool Zaman
2   Abu Bakar Razali     0111210000     abraz78@live.utm.my   Computer Science        Money Recognition for Blind People  Prof. Dr. Muhammad Roslan
3   Nur Amalina Muhammad 0129000123     nam978@live.utm.my    Biomedical Engineering  Dengue Testing Kit
4   Abas Amirullah       0121236782     abasa12@live.utm.my   Science                 Sports in Education              AP. Dr. Karim Hisham

--------------------------------
Process exited with return value 0
Press any key to continue . . .
```

Figure 2: Output of the program

Question 2

A faculty in a private university wishes to computerize its student records system. The record of each student includes his or her name and the program he or she enrolls. The faculty offers several programs at undergraduate and postgraduate levels such as "Bachelor of Computer Science", "Bachelor of Social Study", "Master of Business Administration", "PhD of Social Science", and many more. Regardless of the program or degree, each student is appointed with a lecturer as his or her academic advisor. The role of the advisor is to guide the student on academic matters such as the rules and regulations of the academic system.

There are two types of students, undergraduate and postgraduate students, respectively. The computer system has to record the current CGPA for each of the undergraduate students. As for the postgraduate programs either master or PhD degrees, they are conducted in fully research-based. Each postgraduate student has to have a research project and a lecturer to supervise his or her project.

Based on the given problem, answer the following questions:

(a) Draw the UML class diagram for the above problem. Your design has to include the classes and their attributes and methods accordingly, as well as relationships between the classes. Each class has to provide a constructor, mutators, and assessors. (8 marks)

(b) Then, write the C++ code to implement the design. Your implementation should apply object-oriented programming concepts including data hiding, composition or aggregation, and inheritance. (12 marks)

(c) Next, utilize the classes to store a list of undergraduate students and a list of postgraduate students. You need to use dynamic arrays for the lists and fill them in with data read from two input files accordingly. Figure 1 and Figure 2 show the examples of input files containing the list of undergraduate and postgraduate students, respectively. The first line in each file indicates the number of students the file contains. Following that is the record of a student in which each attribute is arranged in a line. The student records are separated by blank lines. Finally, print all the students from the arrays into another text file. Figure 3 shows an example of the output file. (10 marks)

```
100                                  } The number of students

Ali Bin Bakar                        } Student's name and program
Bachelor of Science                  } Academic advisor
Prof. Dr. Kamil Ahmad                } Student's current CGPA
3.85

Aminah Binti Ahmad
Bachelor of Business
Dr. Rohaya Qamarool
3.99

(due to limited spaces, the remaining student records are not shown in this figure)
```

Figure 1: An example of input file named "ugstudents.txt", for the list of undergraduate student records. Note that, the texts in *italic* are given to describe the fields accordingly. Also, only two records from the input file out of 100 are shown here due to limited spaces.

```
50                                          The number of students

Bakar Bin Malik                             Student's name and program
Master of Social Science
Dr. Rohaya Qamarool                         Academic advisor
Prof. Dr. Kamil Ahmad                       Project supervisor
The Effects of Social Media                 Research project

Ruby Gabriella
PhD of Business
Prof. Dr. Kamil Ahmad
Prof. Dr. Saidi Abdullah
Adaptive Human Capital Management

(due to limited spaces, the remaining student records are not shown in this figure)
```

Figure 2: An example of input file named "pgstudents.txt", for the list of postgraduate student records. Note that, the texts in *italic* are given to describe the fields accordingly. Also, only two records from the input file out of 50 are shown here due to limited spaces.

```
THE LIST OF UNDEGRADUATE STUDENTS
No   Name                    Program                 Advisor                    CGPA

  1  Ali Bin Bakar           Bachelor of Science     Prof. Dr. Kamil Ahmad      3.85
  2  Aminah Binti Ahmad      Bachelor of Business    Dr. Rohaya Qamarool        3.99
...  ..............          ......................  ........................   ....
                             (students no 3 to 98 go here)
...  ..............          ......................  ........................   ....

99  Nuraini Binti Zulkifli   Bachelor of Science     Dr. Rohaya Qamarool        3.70
100 Iskandar Binti Muhammad  Bachelor of Electrical  Prof. Dr. Sharom Mat       3.88



THE LIST OF POSTGRADUATE STUDENTS
No Name                   Supervisor              Project

 1  Bakar Bin Malik       Prof. Dr. Kamil Ahmad   The Effects of Social Media
 2  Ruby Gabriella        Dr. Saidi Abdullah      An Adaptive Human Capital Management
..  ..............        ......................  ..................................
                           (students no 3 to 49 go here)
..  ..............        ......................  ..................................
50  Zulkarnain Bin Hashim Prof. Dr. Kamil Ahmad   Artificial intelligence for robots
```

Figure 3: An example of the output file containing both the lists of undergraduate and postgraduate students. Note that only some students are shown here due to limited spaces.