# FINAL EXAMINATION

| | |
|---|---|
| Course: **OBJECT-ORIENTED PROGRAMMING** | |
| Time: **100** minutes | Term: **3** – Academic year: **2017-2018** |
| Lecturer(s): **Dr. Dinh Ba Tien** | |
| Student name: | Student ID: |

***(Notes: Closed book exam)***

**Question 1.** Give a short answer for each of the following questions in object-oriented programming:

a. In C++, does the **friend** keyword violate the rule of **data hiding** in OOP?
b. Describe the differences between the **IS-A** and **HAS-A** relationship. Give an example to illustrate
c. What is a **pure virtual function**? Give an example to illustrate.
d. What happens to a class if it has a pure virtual function?
e. Describe the **diamond problem** in **multiple inheritance**.
f. How can we avoid the diamond problem?

**Question 2.** Have a look at the source code as below:

```
1   void doSth(int n, int x, int y) {
2       int* pArr;
3       pArr = new int[n];
4       //do something here
5
6       if (x==y) throw "Division by zero";
7       double t = pArr[0]/(x-y);
8       //do something else here
9
10      delete [] pArr;
11  }
```

a. What happens if the **line 6** satisfies and the exception is thrown?
b. How can you avoid the problem in the question (a) if the exception is thrown? Please explain your solution.

**Question 3.** In order to protect the Earth from being attacked by aliens, a group of scientists sit together to build an intelligent squad of robot soldiers. They have designed and built a very intelligent robot, named **IntelliBot**. Each IntelliBot can be a soldier. It can fire against any enemy with a destruction power of X. Especially, 2 or more IntelliBots can combine together to build up a **CombiBot**. The new CombiBot has the fire power of the **multiplication of all the powers** of the IntelliBots combined (e.g. CombiBot has 3 IntelliBot X, Y and Z. Thus, the CombiBot has the power of destruction as X*Y*Z).

You are asked to:

a. Draw a **class diagram** to design an object-oriented solution for the above problem.
b. Implement the IntelliBot with a **fire function** that returns the power of destruction value of that IntelliBot.
c. Implement the CombiBot with has the following functionalities:
    - The **fire function** which returns the current power of destruction of this CombiBot.
    - The **add function** which allows to add another Bot (either an IntelliBot or a CombiBot) into this CombiBot
d. Implement a function to allow an end user to input robots into a squad one by one, including IntelliBots and CombiBots (e.g. option 1 to input a IntelliBot and option 2 to input a CombiBot).
e. Implement a function to show the **total power** of **all the robots** in the squad.

******* GOOD LUCK !!! *******