Beijing-Dublin International College

SEMESTER 1 FINAL EXAMINATION - (2020/2021)

School of Computer Science

COMP3013J Object-Oriented Design

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Time Allowed: 120 minutes

Instructions for Candidates:

Answer **All** Questions.

BJUT Student ID:_____ **UCD Student ID:**_____

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge:_____ **(Signature)**

Instructions for Invigilators

Non-programmable calculators are permitted.
No rough-work paper is to be provided for candidates.

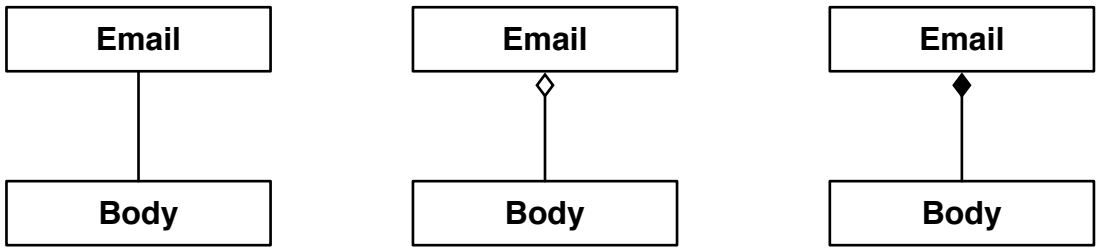
Question 1: Short Questions

a. Describe the primary advantage and disadvantage of using the top-down implementation strategy. What are the consequences of the disadvantage?

(5%)

b. Explain in your own words the Open-Closed Principle. What does it mean for a module to be open? What does it mean for a modeule to be closed? What is the desired result of this principle? **(5%)**

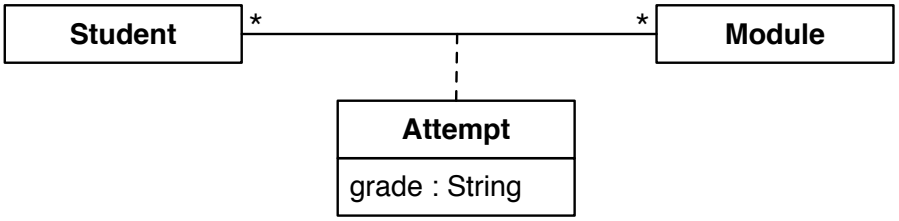
c. For each of the three diagrams below (a, b & c), name the type of connection between the classes. What is the difference between b and c?



(a) (b) (c)

(5%)

d. Given the class diagram below showing an association class (Attempt), give an example in Java code of how these classes could be implemented. Ensure that the implementation allows the record recording of students having multiple attempts on a single module.



(5%)

e. What is typically shown on a deployment diagram? In what situations can this type of diagram be useful?

(5%)

f. Distinguish between Iterative development and Incremental development. **(5%)**

g. What is cohesion? Why is it important that a class be cohesive?

(5%)

h. During the analysis workflow, what is the goal of realising use cases? What models/diagrams are created or updated as a result of this process?

(5%)

(Question Total 40%)

Question 2: Methodology

a. Discuss the importance of testing in large scale software development. In particular, contrast the approaches to testing in the waterfall model and in the unified process. Discuss one risk that the Unified Process minimises in its approach.

(10%)

b. When using modelling in an iterative process it can be difficult to maintain consistency between models and code. What causes this difficulty? Compare and contrast two possible solutions to this problem. **(10%)**

(Question Total 20%)

Question 3: Patterns

a. Explain the motivations behind layered architecture systems. What consequence does this architecture have in terms of change (E.g. implementation of a new GUI)? **(10%)**

b. Draw 2 interaction diagrams showing a client calling the `getInstance` method of a singleton class. One diagram should show what happens the first time the method is called and one should show the second time the method is called. **(10%)**

(Question Total 20%)

Question 4: Modelling

a. Draw a UML domain model that shows the classes that could be used to represent the following facts about Doctors and Patients in a Hospital.

- Many doctors work at a hospital
- For each doctor we record their name and area of speciality
- Patients visit the hospital when they have an appointment (they can have multiple appointments)
- For each patient we record their name and age
- Every appointment is with a particular doctor
- There are two types of appointment visits and stays
- For a visit, we record the time of the appointment
- For a stay, we record the number of nights and which room the patient is staying in
- For each room, we record its number and if it is isolated or not

The diagram should include **attributes** (including types), **associations**, **multiplicities** and **role names** where appropriate. **(10%)**

b. Based on the class diagram you have completed in the previous question, write the basic definitions of the classes in Java. In these classes you only need to implement the associations and attributes, implementing methods or constructors is not required.

(10%)

(Question Total 20%)