AUTUMN TRIMESTER FINAL EXAMINATION - (2022/2023)

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. UML diagrams can be described as either dynamic or static. Explain the difference between these two types of diagrams. Name one example of each type. **(5%)**

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

c. What is the includes relationship? Explain how an includes relationship defined in the use case diagram has an effect on the development of the system.
(5%)

d. 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%)

e. What is cohesion? Why is it important that a class be cohesive?
(5%)

f. What is typically shown on a deployment diagram? In what situations can this type of diagram be useful? **(5%)**

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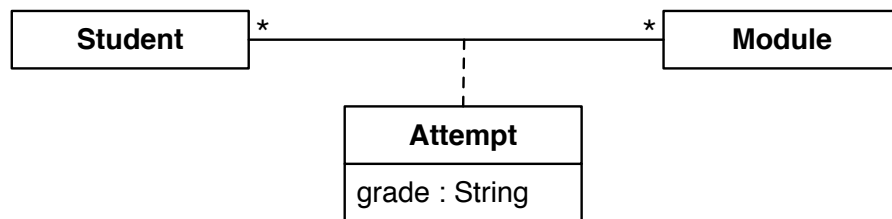
h. Explain in your own words the Open-Closed Principle. What does it mean for a module to be open? What does it mean for a modeule to be closed? What is the desired result of this principle? **(5%)**

(Question Total 40%)

Question 2: Analysis

a. Given the following use case description and domain model, complete a sequence diagram realising the basic course of events.

Display Appointments

Description

This use case describes the display of appointments of a specific doctor in a calendar view.

Actors

Secretary

Basic course of events

1 The secretary starts the display appointments functionality.
2 The system presents a form to select a date and a doctor.
3 The secretary selects a date and a doctor.
4 The system displays the appointments for the doctor on the selected day. The time, location and the name of the patient are displayed.

Domain Model
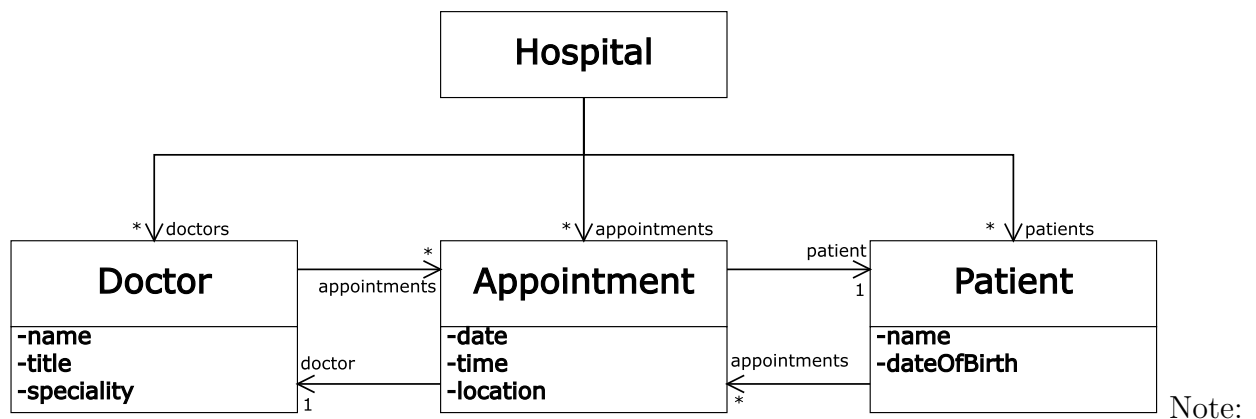
Note: The sequence diagram only need to include application layer classes. No UI or database parts of the system should be included.

(15%)

b. Create a class diagram showing the updates made as a result of completing this use case realisation.

(5%)

(Question Total 20%)

Question 3: 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. List and describe briefly the 4 quadrants of the spiral model. How does the spiral model compare to the waterfall model in terms of the risk of the project and management overhead. **(10%)**

(Question Total 20%)

Question 4: Modelling

a. Draw a UML class diagram to represent the following information about a flight reservation system.

- Tickets are assigned to travellers, who are identified by name, passport number and date of birth
- A ticket can be for a single flight or for multiple connected flights
- For a single flight, we record the origin and destination airports (represented by airport code and the name of the city and country) as well as planned departure and arrival dates and times, we also record the flight number and seat number
- Individual flights are associated with an airline about which we record the name and country
- Tickets can have a baggage allowance, this can be either by weight or by the number of pieces
- Tickets can be either economy, business or first class

The diagram should include **attributes** (including types), **associations**, **multiplicities**, **visibilities** and **role names** where appropriate.   (15%)

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.

(5%)

(Question Total 20%)

(Exam Total 100%)