Beijing-Dublin International College

SEMESTER 2 FINAL EXAMINATION - (2015/2016)

School of Computer Science

COMP3013J Object Oriented Design

Prof. Pádraig Cunningham
Dr. Seán Russell*

Time Allowed: 120 minutes

Instructions for Candidates:

Question 1 carries 40 marks and all other questions carry 20. Answer Question 1 and any other 3 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.

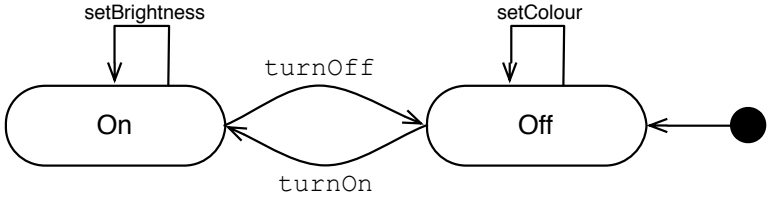
No rough-work paper is to be provided for candidates.

Question 1: Short Questions

a. Explain what is meant by object identity. Describe how object identity is implemented in most object-oriented programming languages. Describe how can this identity be realised in persistent storage. Explain the difference between the two implementations. **(5%)**

b. Which workflows are more used in the **Inception** phase of the Unified Process? **(5%)**

c. Explain in words the meaning of the following statechart.



(5%)

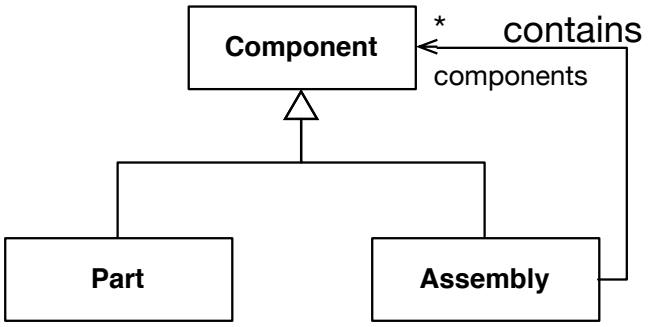
d. In modelling with UML, what is the key goal in building interaction diagrams? What models may change as a result of this process? **(5%)**

e. Explain the 'Liskov substitution principle'. **(5%)**

f. A company provides some service through an interface `Inf`. Two other companies use this interface by implementing it in the classes `A` and `B`. The company that created `A` has requested a new method be added to the interface, but the company that created `B` does not want the interface to be changed. Explain briefly the possible solutions and the advantages and disadvantages of each solution.

(10%)

g. What type of object structure is denoted by the following class diagram? Why might aggregation be more appropriate?



(5%)

(Total 40%)

Question 2: Methodology

a. Describe the spiral model of software development. **(6%)**

b. List and describe briefly the 4 quadrants of the spiral model. **(7%)**

c. How does the spiral model compare to the waterfall model. Describe this comparison in terms of the risk of the project. **(7%)**

(Total 20%)

Question 3: Patterns

a. Explain the idea behind the Singleton pattern. Give example code showing how the singleton pattern is implemented. **(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%)**

(Total 20%)

Question 4: Modelling

a. List the five views of UML. Describe the purpose of each view and who the view is of interest to. **(10%)**

b. Describe the concept of data storage in an OOP program when compared to data in traditional procedural programs. Illustrate your example with an object diagram. **(10%)**

(Total 20%)

Question 5: Code Metrics

a. Explain the Depth of Inheritance Tree (DIT) metric in your own words. Is a high or low value for DIT considered better and why? **(10%)**

b. Explain the Weighted Methods per Class (WMC) metric in your own words. Is a high or low value for WMC considered better and why? **(10%)**

(Total 20%)