The University of Nottingham, Ningbo China

SCHOOL OF COMPUTER SCIENCE

A LEVEL 2 MODULE, AUTUMN SEMESTER 2018-2019

Software Maintenance

Time allowed: **ONE HOUR**

Candidates may complete the front cover of their answer book and sign their desk card but must NOT write anything else until the start of the examination period is announced

Answer ALL 7 questions

No calculators are permitted in this examination.

Dictionaries are not allowed with one exception. Those whose first language is not English may use a standard translation dictionary to translate between that language and English provided that neither language is the subject of this examination. Subject specific translation dictionaries are not permitted.

No electronic devices capable of storing and retrieving text, including electronic dictionaries, may be used.

DO NOT turn examination paper over until instructed to do so

ADDITIONAL MATERIAL: None.

INFORMATION FOR INVIGILATORS: Collect examination question papers at the end of the examination.

SECTION A: Object Oriented Concepts and Principles

(Section A carries a total of 24 marks)

Question 1: Methods overloading and overriding represent two polymorphism types.

(i) How do you differentiate between both types?

[4 marks]

(ii) Provide two examples, one on methods overriding and one on methods overloading (provide only methods signatures).

[4 marks]

Question 2: We discussed five main Object Oriented Design Principles (SOLID)

(i) Define the Interface Segregation Principle.

[4 marks]

(ii) Discuss a situation for the use of Inversion Dependency Principle.

[4 marks]

Question 3: A state machine diagram and a sequence diagram are UML diagrams that represent dynamic behaviors of objects.

(i) In which situation can we use the state machine diagram?

[4 marks]

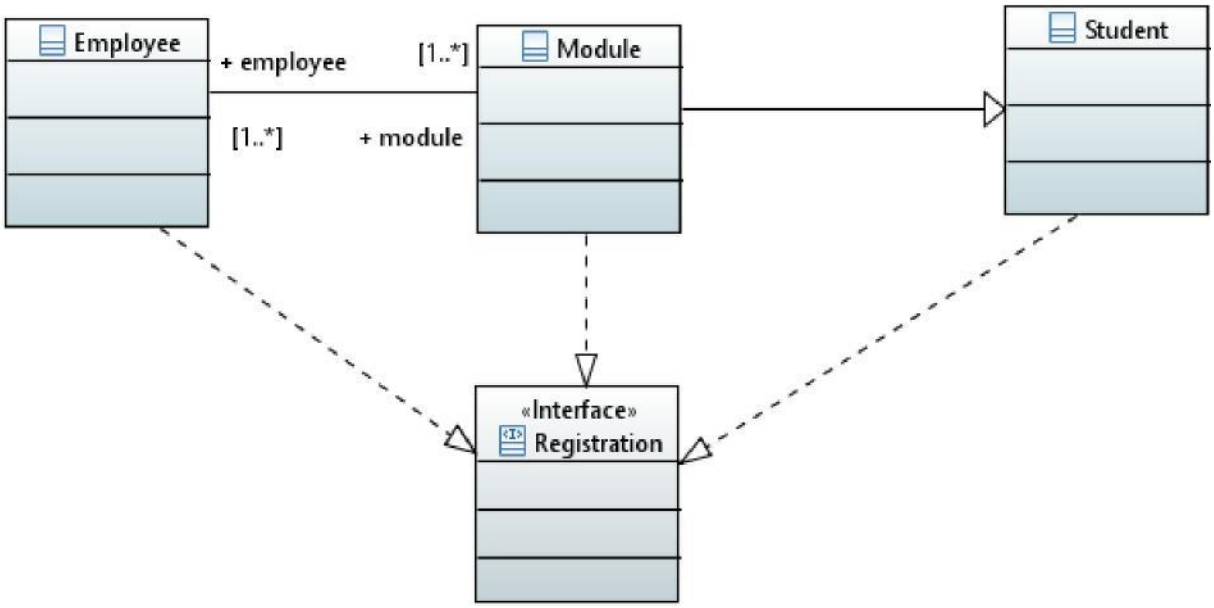
(ii) What is the main difference between the state machine diagram and a sequence diagram?

[4 marks]

SECTION B: Maintenance and Design Patterns

(Section B carries a total of 26 marks)

Question 4: NYC IT Solutions is a software company that developed a university registration application. The application shall be accessed by Students, Teachers, Accountants, and Registrars. A system designer created a class diagram for this application. The class diagram has the classes: Student, Module, and Employee. All the classes implement an Interface called Registration. You are assigned to maintain the code related to this registration application however, you are asked to check first whether the class diagram is designed properly. Use the provided class diagram to answer the following questions:



(i) Identify three problems in this design.

[4 marks]

(ii) Draw a new class diagram that reflect the changes based on your answer for part (i).

[4 marks]

(iii) Justify your new design.

[4 marks]

(iv) Write the constructors for the revised classes (**Teacher** and **Employee**) showing how their attributes can be initialized.

[4 marks]

Question 5: Information hiding from a client is an important objective in object oriented design. What is the design pattern that can satisfy this objective?

[3 marks]

Question 6: Maintaining a third party code can be challenging for many reasons. Provide two challenges and explain how you can overcome these challenges.

[4 marks]

Question 7: Explain the importance of MVC for code maintainability.

[3 marks]

<<End of the Exam Questions>>