

**UNIVERSITY OF LONDON**

**GOLDSMITHS COLLEGE**

**B.Sc. Examination 2008**

**CIS224 – IS52018A**

**Software Projects: Software Engineering and Research Methods**

**Duration: 1½ hours**

**Date and time**

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*Full marks will be awarded for complete answers to a total of TWO questions.*

*Each question carries 25 marks. The marks for each part of a question are indicated at the end of the part in [.] brackets.*

*There are 50 marks available on this paper.*

*No calculators should be used.*

**THIS PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM**

## Question 1

- (a) Give a short account of why requirements engineering is a difficult process. [4 marks]
- (b) What is the relationship between use cases A and B if:
- (i) use case A *includes* use case B [2 marks]
  - (ii) use case E *extends* use case B [2 marks]
- (c) Answer the following questions regarding classes, interfaces and abstract classes.
- (i) How are *interfaces* different from *classes*? [2 marks]
  - (ii) How are *abstract classes* different from *interfaces*? [2 marks]
  - (iii) What is the relationship between an interface and a class that *realises* or *implements* it. [2 marks]
  - (iv) Define the term *instantiation*. Can a class be *instantiated*? Can an interface be *instantiated*? Can an abstract class be *instantiated*? [4 marks]
- (d) Dependency is a relationship between class definitions.
- (i) With reference to source code modifications, explain what it means that *class A depends on class B*. [2 marks]
  - (ii) How is dependency between two classes, say A and B, represented diagrammatically in UML? [2 marks]
  - (iii) With reference to messages, attributes and operations (methods), state in which circumstances *class A depends on class B*. [3 marks]

## Question 2

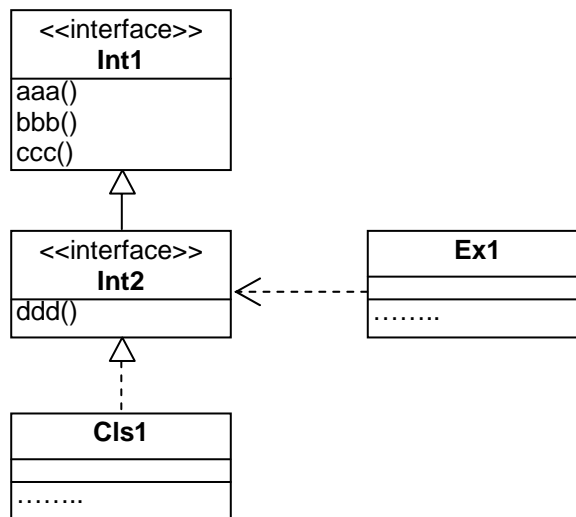
- (a) Draw a use case diagram for the following specification for an internet banking system. *Users should be able to make payments and view statements on line. In each case, i.e. before viewing statements or making a payment, a user will have to undertake an identification procedure. If a payment would cause the account to become overdrawn, the payment is rejected.*

[5 marks]

- (b) Represent the following specification for a banking application as a UML class diagram. *There are two types of accounts, Current and Savings. Each customer can have at most one account of each kind. Current accounts can be shared, but by not more than two customers. Savings accounts cannot be shared.*

[6 marks]

- (c) Consider the following class diagram.



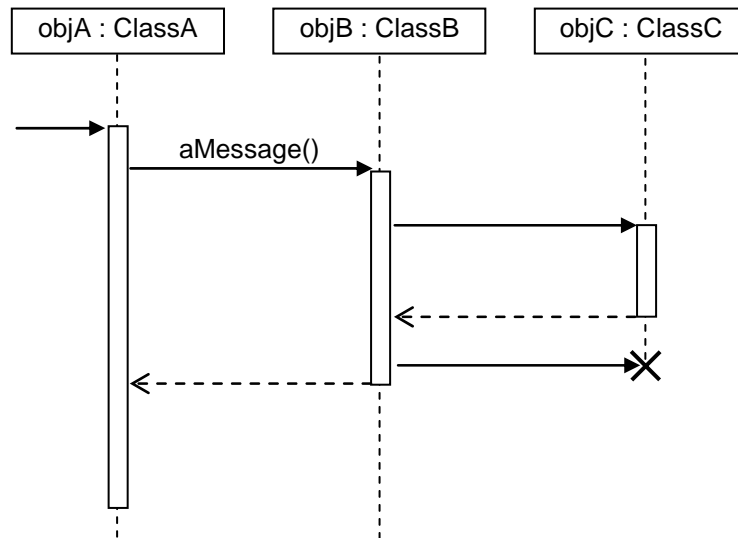
- (i) What should *Cls1* necessarily include as code components when it is implemented in an OO programming language? [2 marks]
- (ii) Which parts of code (i.e. corresponding to which diagram components) should or might be required to be modified, if a modification is made to the code representing interface *Int1*, and which are safe to remain unchanged? Explain your answer. [4 marks]

- (d) Represent the following specification for a computer racing game as a UML class diagram. *A car is modelled with two essential components: an engine system and a control system. One car has one engine system and one control system. A car is no longer a car if any of these two components is missing. A car may also have (but this is not necessary) driver settings, which affect its behaviour – i.e. the way the engine system responds to the control system. One car can have more than one driver setting.*

[8 marks]

### Question 3

(a) Consider the following sequence diagram.



Answer the following questions.

- (i) What do the rectangles at the top of the diagram represent? [1 mark]
- (ii) What do the vertical dotted lines represent? [1 mark]
- (iii) What do the vertical rectangles represent? [1 mark]
- (iv) What does it mean that an object has a *live activation*? [1 mark]
- (v) Is time represented in this diagram? How? [2 marks]
- (vi) What do the cross (X) and the arrow that meets it represent? [2 marks]
- (vii) Which class should implement the method (operation) *aMessage()*? [1 mark]

(b) Consider the following specification.

*A simple drawing application consists of a tool bar and a canvas. The canvas can contain basic shapes, such as circles and rectangles. Among other tools, the toolbar includes a shape selection, a colour selection, and a paint tool. A shape is filled with a colour by: selecting the shape, selecting a colour and then clicking on the paint tool.*

Consider that the canvas contains only two shapes, one circle and one rectangle, and the rectangle has already been selected (with the selection tool). Consider also that a colour has also been selected. Draw a sequence diagram which describes the process of colouring the rectangle. **Hint.** There are four objects in this scenario: a paint tool, a canvas, a circle and a rectangle. The paint tool is live activated with a *click()* message from the user. The first message sent by the paint tool is to the canvas, to enquire which shape is selected. The canvas asks first the circle and then the rectangle. [16 marks]