

UNIVERSITY OF BOLTON – RAK CAMPUS

**SCHOOL OF GAMES COMPUTING AND
CREATIVE TECHNOLOGIES**

COMPUTING PATHWAY

SEMESTER 2 EXAMINATION 2008/2009

OBJECT ORIENTATED METHODS

MODULE NO: CST3006DL

Date: Tuesday 26th May 2009

Time (RAK): 1.00 pm – 3.00pm

INSTRUCTIONS TO CANDIDATES:

There are five questions.

Answer any FOUR Questions

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Computing Pathway
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QUESTION 1

- a) State two differences between an abstract class and an interface class in Java.
(2 marks)
- b) Explain the circumstances in which you would choose to use an abstract class, and when you would prefer to use an interface class.
(3 marks)
- c) What are the advantages of implementing multiple interfaces in Java, as opposed to multiple class inheritance in C++?
(2 marks)
- d) Explain the problem of the 'Fragile Base Class' when using inheritance. Use a simple class diagram to illustrate this problem.
(6 marks)
- e) Explain how the fragile base class can be overcome using composition. Illustrate your answer with a simple example using a class diagram and code fragments.
(6 marks)
- f) Discuss the relative merits of inheritance versus composition, and when you would prefer one over the other.
(6 marks)

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QUESTION 2

- a) Explain the procedure to catch and deal with an exception in Java. (3 marks)
- b) State two benefits of using exception handling over using `if` statements. (2 marks)
- c) Write the statements necessary to handle a divide-by-zero exception for the code below. Explain the code you add. (5 marks)

```
public void method1(){
    double result;
    result=method2(3.1, 0.0);
}

public double method2(double x, double y){
    double z;
    // divide-by-zero exception to be handled here
    z=x/y;
    return z;
}
```

- d) Sometimes it is not appropriate to handle the exception in the method/function where it occurs. Re-write `method1()` and `method2()` so that the exception will be handled in the calling method (`method1`). (8 marks)
- e) Explain under what circumstances it would be appropriate to use the technique in (d) rather than handling the exception immediately. (3 marks)
- f) Discuss with reasons which technique, either (c) or (d), is appropriate for use in constructors. (4 marks)

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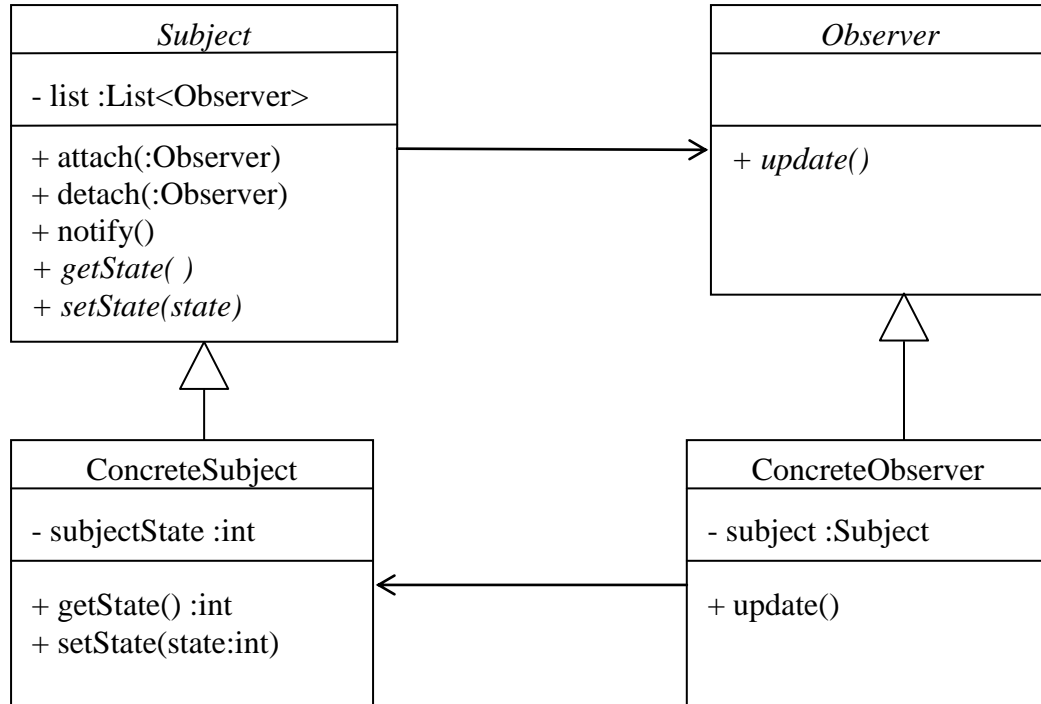
QUESTION 3

- a) What is an inner class and an anonymous class? (4 marks)
- b) What purposes do inner classes serve in Java? (2 marks)
- c) Draw a fully detailed class diagram for a **Book** class that has **Chapter** as an inner class. The **Book** should also have a 'Preface' and a 'Contents' page. (6 marks)
- d) State one clear advantage of the inner class structure of (c) over two separate classes for **Book** and **Chapter**. (2 marks)
- e) Suppose we introduce a method in the `Book` class to perform spellchecking called `spellcheck()`. Describe with the aid of code fragments two ways you could modify the `Book` class so that the spellchecking is done in a separate thread. Do not write code for `spellcheck()`. (7 marks)
- f) Discuss an advantage and a disadvantage of the two techniques used in (e) above. (4 marks)

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QUESTION 4

- a) Explain the responsibilities of each of the four classes shown below in the Observer design pattern, when the pattern works in the 'pull' mode. (8 marks)



- b) Explain the role of 'loose coupling' in this pattern. (2 marks)
- c) When the pattern is used in the 'pull' mode, write suitable code for:
`Subject::notify()`
`ConcreteObserver::update()` (6 marks)
- d) Write code for function main to instantiate a `ConcreteSubject` object with two `ConcreteObserver` objects attached. Then to change the state of the subject and notify the observers. (3 marks)
- e) Show how the code of 6(c) should be modified for the pattern to work in the 'push' mode. How will the class diagram differ in the push mode? (6 marks)

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QUESTION 5

- a) Explain Model-View-Controller (MVC) pattern with the help of a diagram.
(6 marks)
- b) Show using a class diagram how the Observer, Composite, and Strategy design patterns can be used in implementing the MVC.
(11 marks)
- c) Select two design patterns from the list below.

Composite pattern.
Strategy pattern
Singleton pattern

For each pattern that you have chosen:

- (i) Draw the class diagram for the pattern
(2 marks for each pattern)
- (ii) Explain why the pattern is useful and how it can be used
(2 marks for each pattern)

END OF QUESTIONS