

# Object-Oriented Analysis, Design and Programming

## Re-examination

Medialogy Semester 4

Wednesday 12 August 2009

09:00 – 11:00

## Instructions

- *You have 2 hours to complete this examination.*
- *Neither written material nor electronic equipment may be brought into the examination room.*
- *There are 20 questions. The maximum score on this examination is 100 marks. Each question is worth 5 marks.*
- *You must get at least 50 marks in order to pass.*
- *Answers must be in English or Danish.*

## Question 1

With reference to the Ariane 5 disaster, which **one** of the following statements is true?

- A. They used an expensive new system instead of modifying an existing one.
- B. The software was insufficiently flexible and not designed to be future-proof.
- C. Software was reused without properly testing it in its new context.
- D. The failure was caused by software trying to convert a 16-bit integer value for a vertical velocity component into a 64-bit floating-point value.

## Question 2

According to the Standish Group CHAOS report (1994) which **one** of the following was the biggest cause of software project failure?

- A. The use of programming languages that do not properly support object-oriented design.
- B. Failures in requirements capture.
- C. Failure to reuse existing software (“re-inventing the wheel”).
- D. Insufficient testing.

*continued*

**Question 3**

Which **three** of the following adjectives describe the modules in a good software system?

- A. reusable
- B. cohesive
- C. replaceable
- D. abstract

**Question 4**

Study the following UML operation declaration and answer the questions that follow it.

```
+ computeSum(x : int, y: int) : int
```

- a. What is the selector of this operation?
- b. What are the names of the arguments of this operation?
- c. What is the return type of this operation?
- d. What is the visibility of this operation?

**Question 5**

Write down the output of the following program.

```
package dk.aau.imi.med4.ooadp2009.reexam;
public class ReExam5 {
    public static void main(String[] args) {
        int d = -5;
        System.out.println(d + d);
        System.out.println("a" + d + d);
        System.out.println("a" + (d + d));
    }
}
```

**Question 6**

Write down the output of the following program.

```
package dk.aau.imi.med4.ooadp2009.reexam;
public class ReExam6 {
    public static void main(String[] args) {
        int[] intArray = {1,2,3,4,5};
        for(int i = intArray.length - 1; i >= 0; i--)
            System.out.println(intArray[i]);
    }
}
```

*continued*

**Question 7**

In the context of a diagrammatic modelling language, explain the meanings of the following terms. Use examples where appropriate.

- a. model elements
- b. syntax
- c. semantics

**Question 8**

Explain the difference between using UML in *sketch mode* and *blueprint mode*.

**Question 9**

The following shows the contents of a file called SimplePoint.java.

```
package dk.aau.imi.med4.ooadp2009.reexam;
public class SimplePoint {
    int x = 1, y = 2;
}
```

The following shows the contents of a file called ReExam9.java.

```
package dk.aau.imi.med4.ooadp2009.reexam;
public class ReExam9 {
    public static void main(String[] args) {
        System.out.println(new SimplePoint().x);
    }
}
```

What is the output when the ReExam9 class is run as a programme?

*continued*

**Question 10**

The following shows the contents of a file called SimplePoint.java.

```
package dk.aau.imi.med4.ooadp2009.reexam;
public class SimplePoint {
    int x = 1, y = 2;
}
```

The following shows the contents of a file called ReExam10.java.

```
package dk.aau.imi.med4.ooadp2009.reexam;
public class ReExam10 {
    public static void main(String[] args) {
        SimplePoint p = new SimplePoint();
        SimplePoint q = p;
        q.y *= 2;
        System.out.println(p.y);
    }
}
```

What is the output when the ReExam10 class is run as a programme?

*continued*

**Question 11**

The following shows the contents of a file called Point.java. (The numbers at the beginnings of the lines are just labels – they are not part of the code.)

```
1 package dk.aau.imi.med4.ooadp2009.reexam;
2 public class Point {
3     int x, y;
4     public Point(int x, int y) {
5         this.x = x;
6         this.y = y;
7     }
8 }
```

The following shows the contents of a file called ReExam11.java.

```
package dk.aau.imi.med4.ooadp2009.reexam;
public class ReExam11 {
    public static void main(String[] args) {
        Point p = new Point();
        System.out.println("x = "+p.x+", y = "+p.y);
    }
}
```

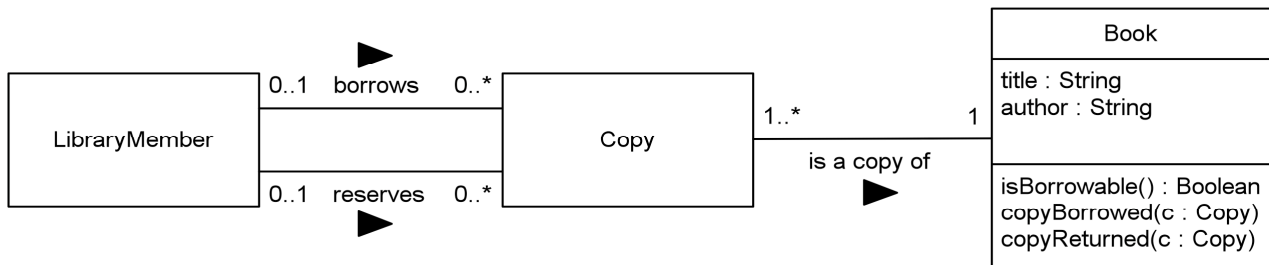
Write down the code that needs to be inserted between lines 3 and 4 in Point.java in order to make ReExam11 output the following when it is run:

x = 1, y = 2

*continued*

**Question 12**

Study the following UML diagram and answer the questions that follow it.



- What kind of UML diagram is this?
- List the attributes of the Book class.
- List the operations of the Book class.
- How many Copy objects are associated with each LibraryMember object?
- Does the diagram tell us that each Copy object has no attributes? Explain your answer.

**Question 13**

Study the two UML diagrams below and answer the questions that follow.



Diagram 0

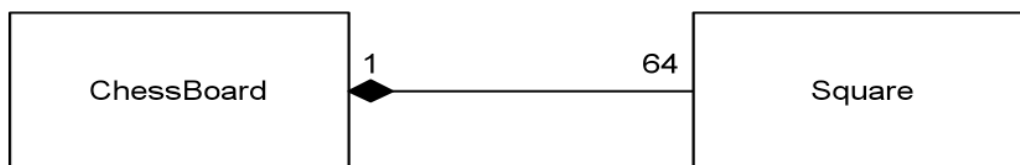


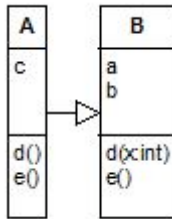
Diagram 0

- Which of the two diagrams, Diagram 1 or Diagram 2, represents a *composition*?
- How many Degree programmes can each Course be a part of?
- If a Square object, *s*, is associated with a ChessBoard object, *C*, what happens to *s* if *C* is deleted?
- If a Course object, *c*, is associated with a Degree programme object, *D*, what happens to *c* if *D* is deleted?
- Is the type of relationship that exists between football players and the teams they play for an example of an aggregation or a composition? Explain your answer.

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**Question 14**

Study the following UML diagram.



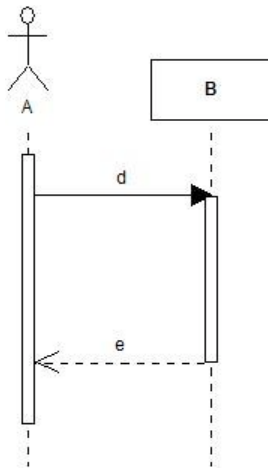
Which of the following statements are true? (There may be more than one true statement.)

- A is a superclass of B
- A is a specialization of B
- A contains only one attribute which is c.
- B contains three attributes: a, b and c.
- The operation e() in B is overridden in class A.
- The operation d(x:int) in B is overloaded in class A.
- Class A contains at least three attributes: a, b and c.
- The operation d(x:int) in B is overridden in class A.
- The operation e() in B is overloaded in class A.
- Attributes a and b are inherited by class A.

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**Question 15**

Study the following diagram and answer the question that follows it.



Which of the following statements are true? (One or more statements may be true.)

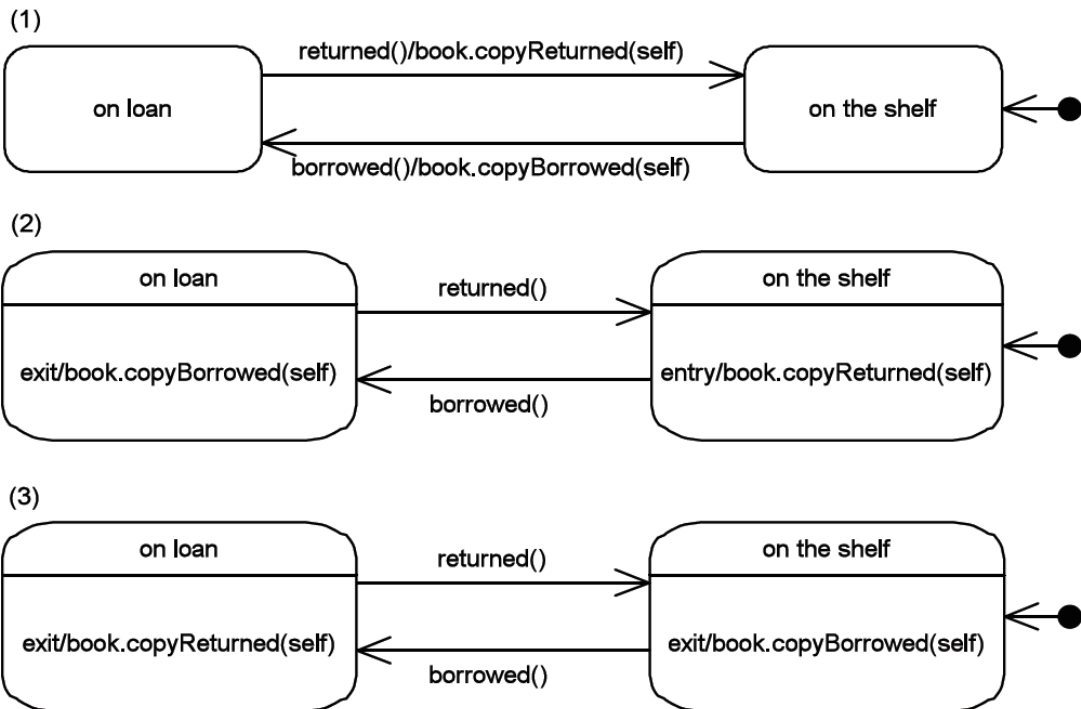
- A is an actor.
- d is an asynchronous message.
- A is a participant.
- The live activation of B starts at the point at which the arrow d touches B's lifeline.
- e is a value returned by the method called by the message d.
- B is a class.
- The diagram is an example of a UML activity diagram.
- Time increases as one moves from left to right in the diagram.
- d is a synchronous message.
- B is an object.

*continued*



**Question 16**

Study the following three diagrams which describe the state of a Copy object in a library software system. Then answer the questions below the diagrams.

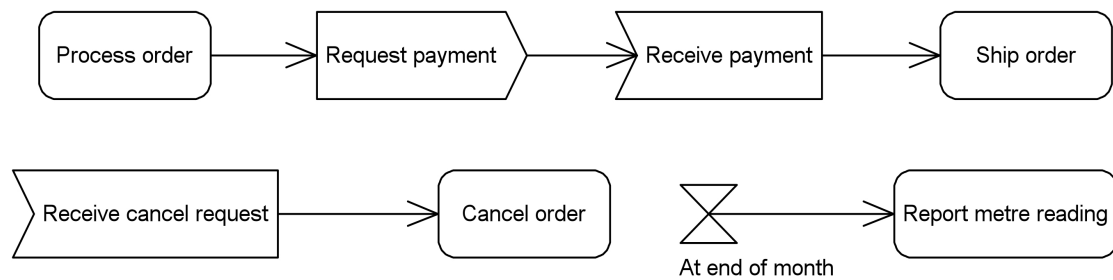


- What sort of diagrams are these?
- Which two of the three diagrams are equivalent?
- To what does “self” refer in “book.copyReturned(self)”?
- In diagram (3), what happens when a Copy object that is on loan receives a “returned()” message?
- In the text “entry/book.copyReturned(self)”, what is the action and what is the event?

*continued*

**Question 17**

Study the following diagrams and answer the questions that follow them.



- What type of diagrams are these?
- There is one *time signal* in these diagrams. What is its label?
- There is one *send signal* in these diagrams. What is its label?
- Under what conditions is an order cancelled?
- Under what conditions does the system start listening for a payment to be received?
- How often is the metre reading read?

**Question 18**

Study the following three class definitions and write down the output generated when ReExam18 is run, assuming that the three classes are defined in separate files in the same package.

```

public class SimplePoint {
    int x = 1, y = 2;
}

public class Simple3DPoint extends SimplePoint {
    int z = 3;
}

public class ReExam18 {
    public static void main(String[] args) {
        Simple3DPoint p = new Simple3DPoint();
        p.x += 2;
        System.out.println("x = "+p.x+", y = "+p.y+", z =
            "+ p.z);
    }
}
  
```

*continued*

**Question 19**

Write down the output of the following program.

```
public class Boop {
    private static int nextId = 0;
    private int id = 0;
    public Boop() { id = ++nextId; }
    public int getId() { return id; }
    public static void main(String[] args) {
        for(int i = 5; i >= 0; i--)
            System.out.println(new Boop().getId());
    }
}
```

*continued*

**Question 20**

Write down the output of the following program.

```
package dk.aau.imi.med4.ooadp2009.reexam;

public class Exceptions {

    static class JumpException extends Exception {
        private static final long serialVersionUID = 1L;
        public String getMessage() {
            return "JumpException thrown!";
        }
    }

    private static void countDown() throws JumpException {
        for(int i = 5; true; i--) {
            if (i > 0)
                System.out.println(i);
            else
                throw new JumpException();
        }
    }

    public static void main(String[] args) {
        try {
            try {
                countDown();
            } catch (JumpException e) {
                System.out.println(e.getMessage());
                countDown();
            }
        } catch (JumpException e) {
            System.out.println(e.getMessage());
        }
    }
}
```

*END OF EXAMINATION*