

Object-Oriented Analysis, Design and Programming

Medialogy, 4th Semester, Aalborg

Tuesday 30 August 2011, 10.00-13.00

Instructions

You have 3 hours to complete this examination.

Neither written material nor electronic equipment may be brought into the examination room.

There are 20 questions and each question is worth 5 marks. The maximum possible score is therefore 100 marks. You must get at least 50 marks to pass.

Question 1

Which **one** of the following was **not** a conclusion of the 1994 Standish CHAOS report?

- a. 31% of software engineering projects are cancelled.
- b. 53% of projects cost over twice their original estimates.
- c. Failures in requirements capture were the biggest cause of software project failure.
- d. Failure to analyse retrospectively why a project failed means that the same mistakes are made over and over again.

Question 2

Which **one** of the following properties is **not** one that is characteristic of a module that is a good abstraction?

- a. low cohesion
- b. low coupling
- c. an appropriate level of information hiding
- d. simulates well the behavior and structure of an identifiable “thing”

Question 3

Write down the output of the following Java program.

```
package dk.aau.create.ooadpreexam2011;
public class Question3 {
    public static void main(String[] args) {
        for(int i = -3; i < 3; i += 2)
            System.out.println(-i);
    }
}
```

Question 4

Write down the output of the following Java program.

```
package dk.aau.create.ooadpreexam2011;
public class Question4 {
    public static void main(String[] args) {
        int[] a = {2,1,0,-1,-2};
        int[] b = new int[10];
        for(int i : a) {
            int k = 2*i;
            if (i < 0)
                b[10+k] = k;
            else
                b[k] = k;
        }
        for(int i : b) System.out.print(i + " ");
        System.out.println();
    }
}
```

Question 5

Suppose there exists an object called myClock of type Clock and this object understands the following two messages:

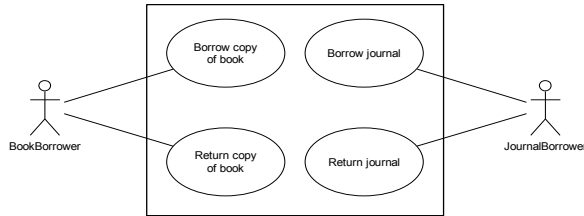
readTime(s : String): Time

readTime(f : File): Time

- Do these two messages have the same signature?
- Do these two messages have the same selector?
- Is this an example of “method overloading” or “method overriding”?
- What is the return type of the first message?
- What is the argument of the second message?

Question 6

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



- What kind of diagram is this?
- What does the oval labeled "Return journal" represent?
- What does the stick figure labelled "JournalBorrower" represent?
- What does the square box surrounding the four ovals represent?
- What does the line connecting JournalBorrower to "Borrow journal" represent?

Question 7

Suppose the MyPoint class is defined as follows:

```
package dk.aau.create.ooadpreexam2011;
public class MyPoint {
    public int x,y;
    public MyPoint(){x = 1; y = 1;}
    public MyPoint(int x, int y) {
        this.x = x;
        this.y = y;
    }
    public String toString() {
        return "("+x+","+y+")";
    }
}
```

Now write down the output of the following program:

```
package dk.aau.create.ooadpreexam2011;
public class Question7 {
    public static void main(String[] args) {
        MyPoint p = new MyPoint();
        MyPoint q = new MyPoint(2,3);
        MyPoint r = q;
        q = p; p = r;
        r.x *= 2; r.y += 2;
        System.out.println(p + " " + q + " " + r);
    }
}
```

Question 8

Suppose the MyPoint class is as defined in Question 7 and suppose the My3DPoint class is defined as follows:

```
package dk.aau.create.ooadpreexam2011;
public class My3DPoint extends MyPoint {
    public int z;
    public My3DPoint () {z = 1;}
    public My3DPoint(int x, int y, int z) {this.z = z;}
    public String toString() {
        return "("+x+","+y+","+z+")";
    }
}
```

Write down the output of the following Java program.

```
package dk.aau.create.ooadpreexam2011;
public class Question8 {
    public static void main(String[] args) {
        My3DPoint p = new My3DPoint();
        My3DPoint q = new My3DPoint(2, 3, 4);
        System.out.println(p+" "+q);
    }
}
```

Question 9

The following Java program contains an error and will not run. The error can be corrected by inserting one word. Write down the corrected version of the *line* in which the error occurs. Then write down the output that is generated by the corrected program.

```
package dk.aau.create.ooadpreexam2011;
public class Question9 {
    private static int[] a = {1,2,3};
    public int[] doubleArray(int[] a) {
        int[] b = new int[a.length];
        for(int i = 0; i < a.length; i++)
            b[i] = 2* a[i];
        return b;
    }
    public static void main(String[] args) {
        int[] b = doubleArray(a);
        for (int i : b) System.out.println(i);
    }
}
```

Question 10

Suppose the BloopException class is defined as follows:

```
package dk.aau.create.ooadpreexam2011;
public class BloopException extends Exception {
    private static final long serialVersionUID = 1L;
    public BloopException(String s) {
        super(s);
        System.out.println("BloopException: "+s);
    }
}
```

Now write down the output of the following program:

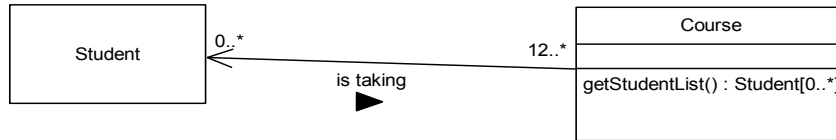
```
package dk.aau.create.ooadpreexam2011;
public class Question10 {
    private static void bloop() throws BloopException {
        throw new BloopException("Hello");
    }
    public static void main(String[] args) {
        try{
            bloop();
        } catch (Exception e) {
            try {
                throw new BloopException("Bonjour");
            } catch (Exception f) {
                System.out.println("Arrivederci");
            }
        }
    }
}
```

Question 11

Define the terms *development process* and *methodology*, when applied to a software project. Illustrate your answer with appropriate examples.

Question 12

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



- How many students can there be on each course?
- How many courses does each student take?
- What is the return type of `getStudentList()`?
- According to the diagram, is it possible within the system to determine the courses that a student is taking? Explain your answer.

Question 13

Suppose we have three files containing Java code. The file `B.java` contains the following:

```
package dk.aau.create.ooadpreexam2011;
public interface B {
    void display();
}
```

The file `C.java` contains the following:

```
package dk.aau.create.ooadpreexam2011;
public class C implements B {
    int x, y, z;
    public C(int x, int y, int z) {
        this.x = x;
        this.y = y;
        this.z = z;
    }
    public void display() {
        System.out.println(x+" "+y+" "+z);
    }
}
```

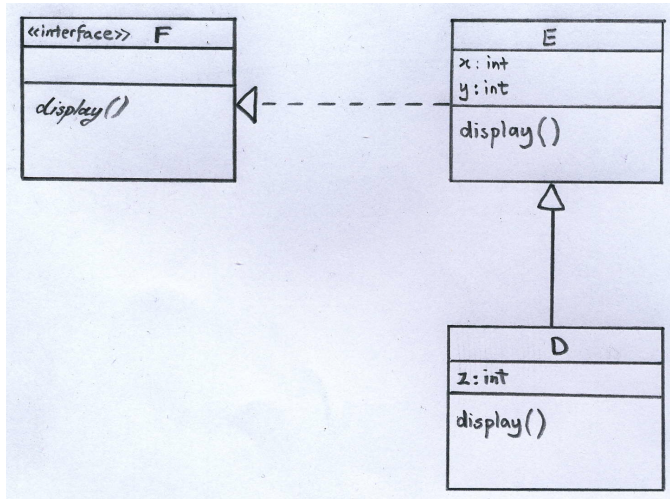
The file, `Question13.java` contains the following:

```
package dk.aau.create.ooadpreexam2011;
public class Question13 {
    public static void main(String[] args) {
        B b = new C(1,2,3);
        b.display();
    }
}
```

Draw a UML class diagram that represents the code in the three files, `B.java`, `C.java` and `Question13.java`.

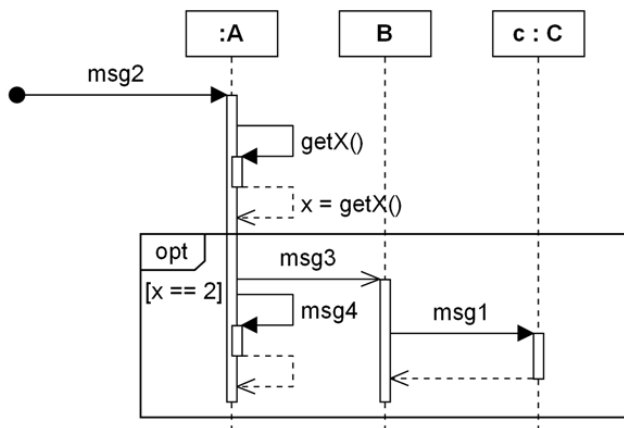
Question 14

Study the following UML class diagram. The `display()` method should print out the values of the attributes of the object. Write Java code that implements this class diagram. Note that the `display` method is written in italics in the box labeled F.



Question 15

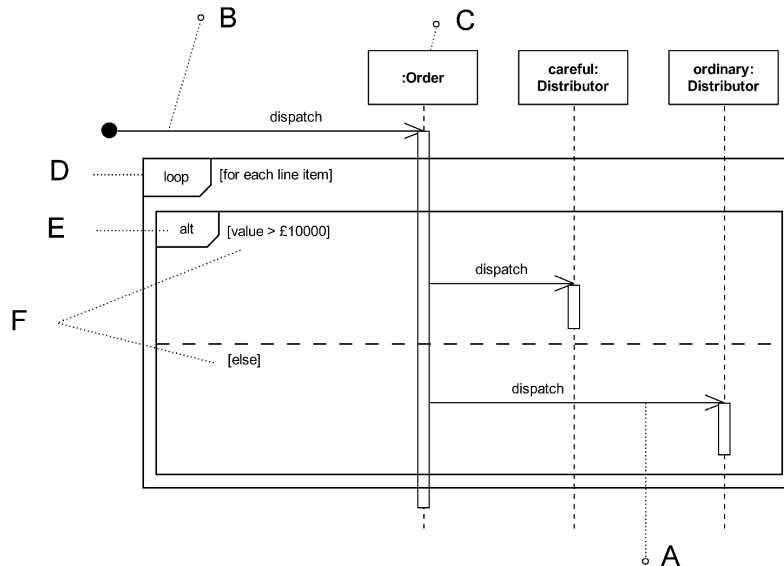
Study the following diagram and answer the questions that follow it.



- What does the box labeled `:A` represent?
- Explain the meaning of the box labeled `opt`.
- Explain the difference in the arrow heads on the arrows labeled `msg3` and `msg4`.
- What does the box labeled `c:C` represent?
- Explain the meaning of the dashed arrows labeled `x = getX()`.

Question 16

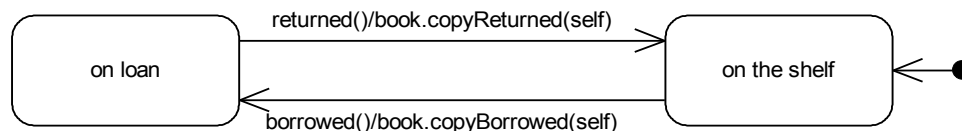
Study the following diagram and answer the questions that follow it.



- What does the arrow labeled A represent?
- What kind of thing is the arrow labeled B?
- What does the box labeled C represent?
- Explain the meaning of the box labeled D.
- Explain the meaning of the expressions labeled F.

Question 17

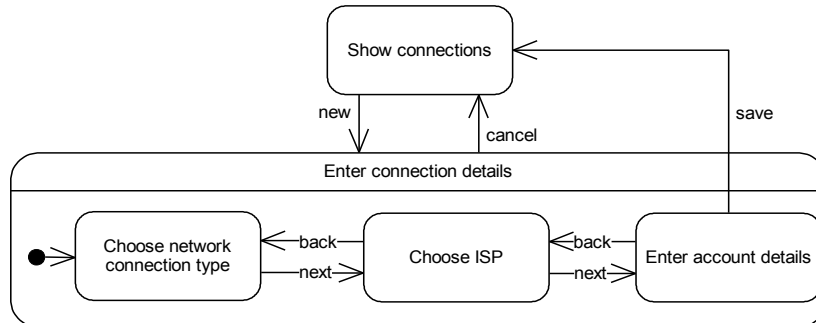
The following diagram represents the various states of a Copy object in a hypothetical library system. Each Copy object can be in only one of two different states: “on loan” or “on the shelf”. Study the diagram and answer the questions that follow it.



- What kind of diagram is this?
- Give an example of an *event* in this diagram.
- Give an example of an *action* in this diagram.
- What does the arrow labeled “borrowed()/book.copyBorrowed(self)” represent?
- What is the meaning of the arrow at the right of the diagram connecting the small black disk to the box labeled “on the shelf”?

Question 18

The following diagram shows the various states in which a New Network Connection wizard can be. Study the diagram and answer the questions that follow it.



- If the current state is "Choose ISP" and the user cancels the operation, what happens?
- What state does the wizard enter if the user chooses "new" when the connections are being shown?
- What kind of thing is the box labeled "Enter connection details"?
- Draw another diagram which is equivalent to the one shown but in which no box is placed inside any other.

Question 19

Write down the output of the following Java program.

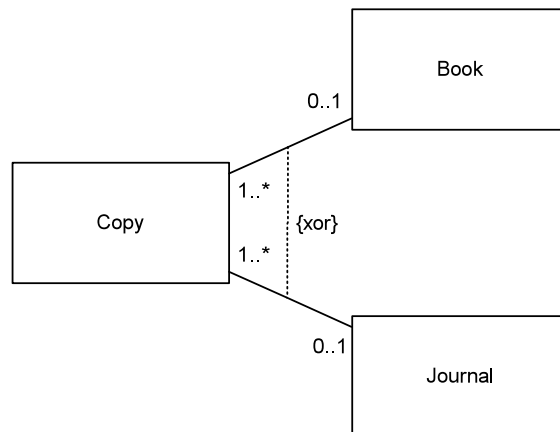
```
package dk.aau.create.ooadpreexam2011;

import java.util.ArrayList;
import java.util.TreeSet;

public class Question19 {
    public static void main(String[] args) {
        TreeSet<Integer> treeSet = new TreeSet<Integer>();
        ArrayList<Integer> arrayList = new ArrayList<Integer>();
        int[] array = {0,1,2,3,2,1,0};
        for(int i : array) {
            treeSet.add(i);
            arrayList.add(i);
        }
        treeSet.remove(1);
        arrayList.remove(1);
        System.out.println(treeSet);
        System.out.println(arrayList);
    }
}
```

Question 20

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



- How many Copies of a book can there be?
- What is the meaning of the dashed line labeled "{xor}"?
- How many Book objects can a single Copy object be linked with?
- Must* a Copy object be linked with another object?
- Can a Journal object have no copies linked to it?

END OF EXAMINATION