THE UNIVERSITY OF ZAMBIA

SCHOOL OF NATURAL SCIENCES

DEPARTMENT OF COMPUTER STUDIES

CST2012

PROGRAMMING II USING JAVA

SEMESTER TWO

2006/2007

EXAMINATION

DATE: 22nd **FEBRUARY, 2007**

DURATION: THREE (3) HOURS

INSTRUCTIONS:

SECTION A

There are **20 multiple** choose questions in this section.
Answer **ALL**. Wrong choices will cost you
-0.5 marks. **[Total 20 Marks]**

SECTION B

There are **nine (9)** open ended questions in this section.Answer **ALL** questions. **[Total 30 Marks].**

SECTION C

There are three programming questions in this section.
Answer any **TWO** questions. **[Total 50 Marks]**

SECTION A: ANSWER ALL QUESTIONS: (Wrong answers cost (-0.5))

1. True of false, JFrame is a lightweight component.
2. True or false. A JPanel cannot be added to another JPanel.
3. What's wrong with the following code?

```
class Test3 {
   public static void main(String args[]) {
     MouseListener listener = new MouseAdapter() {
       static int count;
       public void mouseEntered(MouseEvent e) {
         processIt(e);
       }
       private void processIt(MouseEvent f) {
         System.out.println("Got: " + f);
         System.out.println("Count: " + ++count);
       }
     };
   }
}
```

a.) Anonymous inner classes can only implement interfaces.
b.) Inner classes can't have support methods.
c.) All the methods of MouseListener aren't implemented.
d.) Inner classes can't have static declarations.
e.) Nothing is wrong. The code compiles fine.

4. In the following class definition, which variables are inaccessible within the method of the inner class?

```
class Testing {
   public static int a = 1;
   private static int b = 2;
   public int c = 3;
   private int d = 4;
   public void aMethod(int e) {
     int f = 5;
     class Inner {
       int g = 6;
       public void anotherMethod(int h) {
       // What can?t be accessed here?
       }
     }
   }
}
```

a.) c, d
b.) e, f
c.) c, d, e, f
d.) e, f, g
e.) None of them.

5. You have been given a design document for a veterinary registration system for implementation in Java Technology. It states: "A pet has an owner, registration date, and a vaccination-due date. A cat is a pet that has a flag indicating if it has been neutered and a textual description for its markings".

Given that the Pet class already been defined, which of the following fields would be appropriate for inclusion in the Cat class as members?

a.) Pet thePet;
b.) Date registered;
c.) Date vaccinationDue;
d.) Cat theCat;
e.) Boolean neutered;
f.) String markings;

6. What will happen when you attempt to compile and run the following code

```
import java.io.*;
class Base{
    public void amethod()throws FileNotFoundException{}
}
public class ExcepDemo extends Base{
    public static void main(String argv[]){
       ExcepDemo e = new ExcepDemo();
    }
    public void amethod() throws IOException{}
    protected ExcepDemo(){
       try{
           DataInputStream din = new
DataInputStream(System.in);
           System.out.println("Pausing");
           din.readByte();
           System.out.println("Continuing");
           this.amethod();
       }catch(IOException ioe) {}
    }
}
```

a.) Compile time error caused by protected constructor
b.) Compile time error caused by amethod declaring new Exception
c.) Runtime error caused by amethod declaring new Exception
d.) Compile and run with output of "Pausing" and "Continuing" after a key is hit

7. Consider the following source file:

```
1. interface Animal {
2. void saySomething();
3. }
4. class farm {
5. void setName(String name){};
6. }
7. // insert code here
8. public class Cow implements Pasture {
9. public void graze() { }
10. void saySomething(){}
11.}
```

Which of the following code lines inserted independently at line 7 will make this source file compile?

a.) interface Pasture {void graze();}
b.) interface Pasture {void graze(){}}
c.) interface Pasture extends Animal{void graze();}
d.) interface Pasture extends Animal{void saySomething(){}}
e.) interface Pasture implements Animal{void graze();}

8. Consider the following code:

```
1. class AllMyExceptions {
2.      public static void main(String [] args) {
3.             try {
4.                  System.out.println(Double.valueOf("420.00"));
5.             } catch (Throwable e) {
6.                    System.out.println("Some exception!");
7.              }catch (Exception ne) {
8.                    System.out.println("Number format exception!");
9.              }
10.            System.out.println("All My Exceptions!");
11.    }
12. }
```

What is the result?

a. 420.0
   All My Exceptions!
b. Some exception!
   All my exceptions
c. Number format exception!
   All my exceptions
d. Compilation fails.
e. An exception is thrown at runtime.

9. Consider the following code:

```
1. public class MyThread {
2.     public static void main(String[] args) {
3.             Counter ct = new Counter();
4.             ct.run();
5.             ct.start();
6.             ct.start();
7.     }
8. }
9. class Counter extends Thread {
10.    public void run() {
11.            System.out.print("Running");
12.    }
13. }
```

What is the output? (choose two);

a. Running
b. Running Running
c. Running Running Running
d. Compilation fails.
e. An exception is thrown at runtime.

10. Which of the following statements are true? (Choose all that apply.)
    a. Readers and writers are used for I/O on 16-bit Unicode characters.

b. FileInputStream and FileOutputStream can be used to handle I/O on 16-bit Unicode characters.
c. FileInputStream and FileOutputStream can be used to read image files.
d. FileInputStream and FileOutputStream can be used to read text files.

11. Consider the following code:

```
1. import java.io.*;
2. class Animal implements Serializable {}
3. class Cow extends Animal{
4. Milk m = new Milk();
5. }
6. class Milk implements Serializable {
7. SaturatedFat sf1 = new SaturatedFat();
8. SaturatedFat sf2 = new SaturatedFat();
9. SaturatedFat sf3 = new SaturatedFat();
10.}
11. class SaturatedFat implements Serializable { }
```

When you serialize an instance of Cow, how many objects will be serialized?

a. 0
b. 2
c. 3
d. 4
e. 5
f. 6

12. Consider the following code:

```
1. public class MyThreads {
2. public static void main(String[] args) {
3. Thread t1 = new Counter();
4. Thread t2 = new Thread(t1);
5. t1.start();
6. t2.start();
7. }
8. }
9. class Counter extends Thread implements Runnable {
10. public void run() {
11. System.out.println("Running");
12. }
13. }
```

What is the output?

a. Running
b. Running
c. Running
d. No output.
e. Compilation fails.
f. An exception is thrown at runtime.

13. Consider the following code:

```
int i = aReader.read();
```

What is true of the type of variable aReader?

a. It has to be a BufferedReader.
b. It has to be a FileReader.
c. It can either be a FileReader or a BufferedReader.
d. It can be neither a FileReader nor a BufferedReader.

14. Which one of the following class definitions is a valid definition of a class that cannot be instantiated?

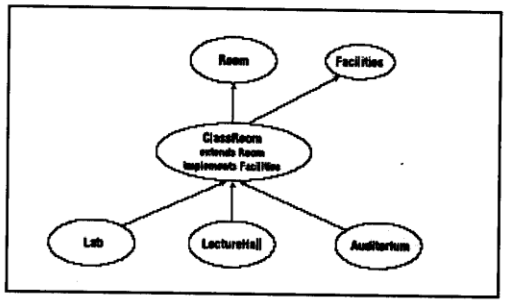
    Select the one correct answer.

    a. class Ghost {
    ```
    abstract void haunt();  }
    ```
    b. abstract class Ghost {
    ```
    void haunt();
    }
    ```
    c. abstract class Ghost {
    ```
    void haunt() {};
    }
    ```
    d. abstract Ghost {
    ```
     abstract void haunt();
    }
    ```
    e. static class Ghost {
    ```
      abstract haunt();
    }
    ```

15. Without time slicing, each thread in a set of equal-priority threads runs to completion before other threads of equal priority get a chance to execute.

    a. false
    b. true

For questions 16 and 17, consider the class hierarchy shown in the Figure:



16. Consider the following code fragment:

```
1. LectureHall lh = new LectureHall();
2. Auditorium a1;
3. Facilities f1;
4.
5. f1 = lh;
6. a1 = f1;
```

What of the following is the true statement about this code?

   a. The code will compile and execute without any error.
   b. Line 5 will generate a compiler error because an explicit conversion (cast) is required.
   c. Line 6 will generate a compiler error because an explicit conversion (cast) is required to convert Facilities to Auditorium.

17. Consider the following code fragment:

```
1. LectureHall lh = new LectureHall();
2. Auditorium a1;
3. Facilities f1;
5. f1 = lh;
6. a1 = (Auditorium) f1;
```

What of the following is the true statement about this code?

   a. The code will compile and execute without any error.
   b. Line 5 will generate a compiler error because an explicit conversion (cast) is required.
   c. Line 6 will generate a compiler error because an interface cannot be converted to the class that implements the interface.
   d. Line 6 will compile fine, but an exception will be thrown during the execution time.

18. Which of these field declarations are legal within the body of an interface?
Select the three correct answers.

   a. `public static int answer = 42;`
   b. `int answer;`
   c. `final static int answer = 42;`
   d. `public int answer = 42;`
   e. `private final static int answer = 42;`

19. Which of the following has FlowLayout has it's default layout manager

   a. JFrame
   b. JDialog
   c. JPanel
   d. JApplet
   e. Applet

20. When the following program is run, it will print all the letters I, J, C, and D. Is this statement true or false?

```
public class MyClass {
    public static void main(String[] args) {
        I x = new D();
        if (x instanceof I) System.out.println("I");
        if (x instanceof J) System.out.println("J");
        if (x instanceof C) System.out.println("C");
        if (x instanceof D) System.out.println("D");
    }
}
interface I{}
interface J{}
class C implements I {}
class D extends C implements J {}
```

Select the one correct answer.

a. True.

b. False.

Section B :Answer ALL questions (30 Marks)

1. What exception types can be caught by the following handler?

```
1. catch (Exception e) {
2.     ...
3. }
```

What is wrong with using this type of exception handler? **[2 Marks]**

2. What exceptions can be caught by the following handler?

```
1. ...
2. } catch (Exception e) {
3.     ...
4. } catch (RuntimeException a) {
5.     ...
6. }
```

Is there anything wrong with this exception handler as written? Will this code compile? **[3]**

3. Match each situation in the first column with an item in the second column

`a. int[] A;` `A[0] = 0;`	1. error
b. The Java VM starts running your program, but the VM can't find the Java platform classes. (The Java platform classes reside in `classes.zip` or `rt.jar`.)	2. checked exception
c. A program is reading a stream and reaches the end of stream marker.	3 runtime exception
`d.` Before closing the stream and after reaching the end of stream marker, a program tries to read the stream again.	4. No exception

[4 Marks]

4. How would you append data to the end of a file? Show the constructor for the class you would use and explain your answer. **[3 Marks]**

5. What is wrong with the following interface?

```
public interface MyInterface  {
    public void aMethod(int aValue){
        System.out.println("Hi Mom");}
 }
```

Fix problem in the interface . **[3 Marks]**

6. The program below doesn't compile. What do you need to do to make it compile? Why?

```
import java.util.*;
public class MyClass {
    public static void main(String[] args) {
        Timer timer = new Timer();
        timer.schedule(new TimerTask() {
                public void run() {
                    System.out.println("Exiting.");
                    timer.cancel();}
            },
            5000);
System.out.println("In 5 seconds this application will exit.
");
    }}
```

[4 Marks]

Section B Questions continue on the next page

7. What is the point of the following statement?

```
out = new PrintWriter( new FileWriter("data.dat") );
```

Why would you need a statement that involves two different stream classes, `PrintWriter` and `FileWriter`?

[4 Marks].

8. In Java, input/output is done using streams. Streams are an abstraction. Explain what this means and why it is important. **[4 Marks]**

9. What does it mean to use a `null` layout manager, and why would you want to do so? **[3]**

Section C: Any Two Questions (50 Marks)

Question One

(a) The following code is supplied for you to analyze.

```
public class MyClass1 {
    protected MyInnerClass1 ic;
    public MyClass1() {
     ic = new MyInnerClass1();
    }
    public void displayStrings() {
     System.out.println(ic.getString() + ".");
     System.out.println(ic.getAnotherString() + ".");
    }
    static public void main(String[] args) {
       MyClass1 c1 = new MyClass1();
     c1.displayStrings();
    }
    protected class MyInnerClass1 {
     public String getString() {
         return "MyInnerClass1: getString invoked";
     }
    public String getAnotherString() {
         return "MyInnerClass1: getAnotherString invoked";
     }
    }
}
```

(i) What is the output of the program when it's compiled and executed?
[2 Marks]

(ii) Create a Java class called `MyClass2.java` that defines subclasses of both `MyClass1` and its inner class, `MyInnerClass1`. (Call the subclasses `MyClass2` and `MyInnerClass2`, respectively.) `MyInnerClass2` should override the `getAnotherString` method to return `"MyInnerClass2 version of getAnotherString invoked"`. `MyClass2` should define one constructor and one method:

- A no-argument constructor that initializes the inherited `ic` instance variable to be an instance of `MYInnerClass2`
- A main method that creates an instance of `MyClass2` and invokes `displayStrings` on that instance

[6 Marks]

(iii) What is the output when you run `MyClass2`? **[2 Marks]**

(b) Create a class **Rectangle**. The class has attributes length and width, each of which defaults to 1. It has methods that calculate the perimeter and the area of the rectangle. It has set and get methods for both length and width. The set methods should verify that length and width are each floating-point numbers larger than 0.0 and less than 20.0; otherwise they should throw your **own defined exception** with appropriate messages. Write a program to test class Rectangle. **[10 Marks]**

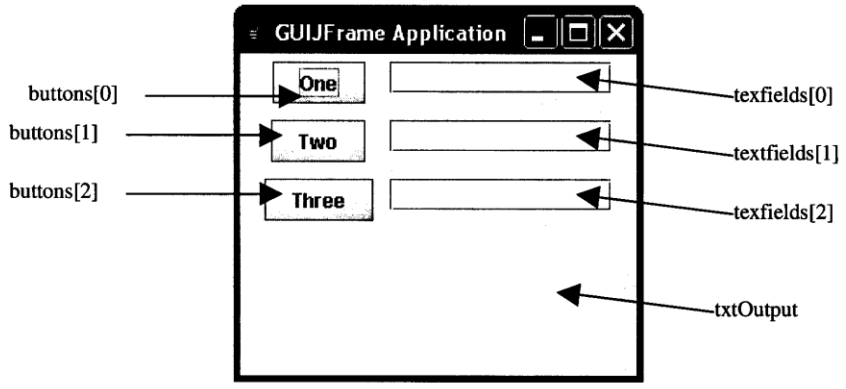
(c) Question Two

(a) Study the Java JFrame Application given below. Line numbers have been included so that you can refer to them in your answer if you wish.

```
1.  import javax.swing.*;
2.  import java.awt.*;
3.  public class GUIJFrame extends JFrame {
4.          JButton [] buttons;
5.          JTextField [] textfields;
6.          JPanel [] pans;
7.          JTextArea txtOutput;
8.          public GUIJFrame(){
9.           super("GUIJFrame Application");
10.          Container cp =getContentPane();
11.          buttons=new JButton[]{new JButton("One"),new JButton("Two"), new
    JButton("Three")};
12.         textfields=new JTextField(new JTextField("",12),new
    JTextField("",12),JTextField("",12) };
13.       pans=new JPanel[6];
14.       txtOutput=new JTextArea(5,20);
15. // your code to create the GUI goes here.
16. }//end constructor
17. }//end class
```

(i) The JFrame Application given above is a skeleton which creates a number of GUI components (three Buttons, three JTextField, six JPanels and one JTextArea) but doesn't use them to set up a GUI. When the JFrame Application is executed it will show a blank screen.

What needs to be added to the create the following GUI?



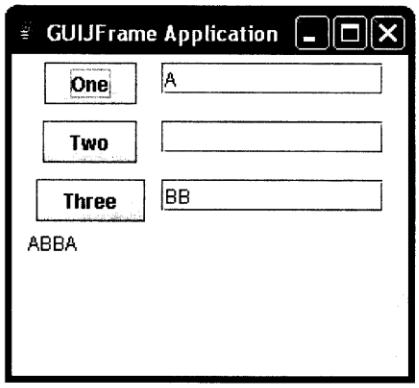
You may need to create additional panels and use appropriate layout managers to archive the desired effect. Please state any assumptions that you make.(Write the full Java code)

[10 Marks]

Question continues on the next page

(ii) Give the code that needs to be added to your JFrame Application above to make the program behave as follows:
When the user clicks on any of the three buttons any text they have entered into the corresponding textfield is output in the JTextArea. The text is appended to any other text that is already displayed.

For instances if the user entered "A" into textfields[0] and "BB" into textfields[2] and then clicked buttons[0], then buttons[2] and then buttons[0] again; the resulting display would be as shown below.



[5 Marks]

(b) Write a temperature conversion application that converts from Fahrenheit to Celsius. The Fahrenheit temperature should be entered from the keyboard (via a JTextField). A JLabel should be used to display the converted temperature. Use the following formula for the conversion.Your program should be able to handle errors such as users entering strings instead of numbers.

$$Celsius = \frac{5}{9} \times (Fahrenheit - 32)$$

[10 Marks]

QUESTION THREE

(a) A Junior programmer as given the following code below.

```
int i;
URL url = new URL("http://java.sun.com/");
URLConnection javaSite = url.openConnection();
InputStream input = javaSite.getInputStream();
InputStreamReader reader = new InputStreamReader(input);
while ((i = reader.read()) != -1) {
    System.out.print(i);
}
```

How can you improve the performance of the given above? Explain your answer and show the new line(s) of code. (**Note:** Class URL represents a Uniform Resource Locator, a pointer to a "resource" on the World Wide Web. A resource can be something as simple as a file or a directory, or it can be a reference to a more complicated object, such as a query to a database or to a search engine).

[8 Marks]

(b) Assume that you have written some classes. Belatedly, you decide that they should be split into three packages, as listed in the table below. Furthermore, assume that the classes are currently in the default package (they have no package statements). The Server and Client class uses the Utilities class.

Package Name	Class Name
zm.unza.cs.server	Server
zm.unza.cs.shared	Utilities
zm.unza.cs.client	Client

(i) What line of code will you need to add to each source file to put each class in the right package? **[3 Marks]**

(ii) To adhere to the directory structure, you will need to create some subdirectories in your development directory, and put source files in the correct subdirectories. What subdirectories must you create? Which subdirectory does each source file go in? **[3 Marks]**

(iii) Do you think you'll need to make any other changes to the source files to make them compile correctly? If so, what? **[3 Marks]**

(c) Has-a relationship is a form of composition/aggregation where a class has reference types has member variables and is-a relationship refers to inheritance. Given the following statements below write Java code describing the statements given.

(i) A city has a community center. A community center is a building.**[4]**

(ii) A classroom has a whiteboard. The classroom is a room **[4]**

END EXAMINATION
GOOD LUCK