UNIVERSITY OF LIMERICK

COLLEGE OF INFORMATICS AND ELECTRONICS

Department of Computer Science
and Information Systems

**Assessment Paper**

Semester 1
Module Code: CS4135
Duration of Exam: 2 $\frac{1}{2}$ Hours
Lecturer: C. Ryan & A. Azad
Calculators **are** allowed

Academic Year: 2007/08
Module Title: Computer Software Architecture
% of Total Marks: 50 %

Instructions to Candidates:
- Answer **five** questions with at least two from each section.
- All questions carry equal marks

# 1 Java section

Answer at least 2 questions from this section.

1. Answer ALL parts.

   (a) Between C++ and Java which language would you use to avoid re-compiling on different machine architectures? Explain with reference to the output produced after compiling and linking a C++ program and that produced by compiling a Java program. (1+4 marks)

   (b) What is the special memory management system in Java that is not present in C++? Describe its advantages. (1+4 marks)

   (c) What happens when the following piece of code is executed in

      i. C++
      ii. Java

   (2.5+2.5 marks)

```
void method1(){
int w;
w++;
}
```

(d) Evaluate (if it returns **true** or **false**) the boolean expression `(a == b)` in the following scenarios:

i. `String a = ''Dublin'', b = ''Dublin'';`
Explain with reasoning. (0.5+2 marks)

ii. `String a = new String(''Dublin''), b = new String(''Dublin'');`
Explain with reasoning. (0.5+2 marks)

2. (a) Assuming a class `Book` is pre-defined consider the following code fragment:

```
void method1(){
  int i=0;
  Book b = new Book();
  b.author = ''Tom'';
  method2(b, i);
  System.out.println(i);
  System.out.println(b.author);
}
```

```
void method2(Book b, int i){
  b.author = ''John'';
  i = 30;
}
```

Give the output for the two println() statements in `method1()` and separately explain why the variables retain or do not retain their values after calling `method2()`. (2.5+2.5+2.5+2.5 marks)

(b) Describe the difference between a checked and an unchecked (run time) exception. (2.5 marks)

i. If a method declares `ArrayIndexOutofBoundsException` in its signature, does it compile successfully if we write no code to handle it? Explain. (0.5+2 marks)

(c) Have a look at the following code.

```
public interface Book{
    void printTitle();
}

class javaBook implements Book{
        void printTitle(){
         System.out.println(''A book on Java'');
    }
}
```

Is the code correct? Explain. (1+4 marks)

3. Answer ALL parts.

   (a) Describe the three major uses of nested classes. (6 marks)

   (b) Write a public class with two private member variables of the type int. Then write a static nested (public) class. In its main method, print the values of the private member variables of the outer class. (2+2+6 marks)

   (c) Is it correct to access the variable `w` in the class `inner`? Explain (2+2 marks)

```
class out{
 int w=2.

 static class inner{
 int a =w;
}
```

4. Answer ALL parts.

   (a) Write a class Frame1 with three member variables of the types JLabel, JButton and JTextField. Write an instance method

setUp(). Write the code of this instance method so that you create a frame with a GridLayout that allows for a single column and 3 rows. The label should have an intial value "intial" when the frame shows up. When you enter some text in the textfield and click the button, the label is updated with the text entered in the text field. Write the event handling code with the help of an anonymous inner class.

You can use the method getText() to get the text entered in the field and use the method setText to set the label of JLabel control.

Ensure that the frame is visible and that clicking its 'x' button (available at the right top of any window) exits the application. Also ensure that the frame fits the size of its components.

Note: that all this functionality (apart from declaring the label, button and textfield) has to be inside the setup Method. You do NOT need to write the call to the event dispatching thread. (10 marks)

(b) What is the significance of adapters in Swing? (5 marks)

(c) What is the significance of Models in Swing? Describe an example situation concerning updating several swing controls. (2.5+2.5 marks)

## 2 Software Architecture Section

Answer at least two questions from this section.

5. Answer ALL parts

(a) Describe Kruchten's 4+1 View Model of Software Architecture, detailing what each of the views are and who uses them. (18 marks)

(b) What are *joint effects* in terms of components? Give two examples, one from software and one from a non-software industry. (2 marks)

6. Answer ALL parts

   (a) What is a software component? Give two well known definitions and state where the definition comes from. (10 marks)

   (b) Give three examples of components from two industries other than software, e.g. automotive industry, and say how they fit in with the view this module takes on components. (10 marks)

7. Answer ALL parts

   (a) Briefly discuss the differences between Analysis and Design. (2 marks)

   (b) Describe in detail the differences between Logical and Physical Design, using examples where appropriate. (5 marks)

   (c) In terms of Software Architecture, what are *Cohesion* and *Coupling*? What sort of impact do they have on design? (5 marks)

   (d) Describe the *Business Model*. How does something like the JAVA AWT fit in with this? (8 marks)

8. Answer ALL parts.

   (a) What is a software pattern? Give two well known definitions and state where they come from. (3 marks)

   (b) In terms of software architectures, describe three categories of patterns. (3 marks)

   (c) What are the key principles that drive the evolution of good patterns? Give at least **six** principles and describe each of them. (14 marks)