SEMESTER ONE EXAMINATIONS 2002

MODULE: ***Object Oriented Programming – EE553***

COURSE: ***M.Eng./Grad.Dip in Electronic Systems***
                   RAE - RACeE

YEAR: ***Postgraduate (Year 5)***

EXAMINERS: ***Dr. Derek Molloy (DCU extension 5355)***

TIME ALLOWED: **3 hours**

INSTRUCTIONS: Answer **FOUR** questions.
                   All questions carry equal marks.

?? **Before you start – put your name and id-number on the supplied disks!**
?? Please use the answer books and the supplied disks to complete your answers to this exam.
?? On the disk, please use separate directories for each question attempted, called question1, question2, etc.
?? For each question you attempt, please reference your files on the disk related to that question in your answer book.
?? **You are responsible for insuring that you have copied all the files that form your answers onto the disk.**

This booklet contains 5 pages, including the cover sheet.

DO NOT TURN OVER THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

Question 1.

(a) Answer the following short questions. Keep your answers concise.
        (i)   How is *scope resolution* performed in C++?
        (ii)   What is a JIT compiler?
        (iii)   Explain the term *event listener.*
        (iv)   Explain the concept of the Class class in Java.
        (v)   In C++ what is a *static global variable* and why would it be used?
        (vi)   What is meant by the term *polymorphism?*
        (vii)   In the following piece of code explain what occurs. What is the value of x
              and y after execution (i.e. after the last line)?

```
int x=1,y=5,*p,*q;
p = &y; q=&x;
*p+=5;
*(q+=2);
```

[14 marks]

(b) What are Java **Interfaces**? Why and when are they used? Give an application
    example of when you might write your own interface.

[6 marks]

(c) Discuss **constructors** in C++. Can they be overloaded? Why can they not be virtual?
    In what order are they called when inheritance takes place?

[5 marks]

Question 2.

(a) Explain **multiple inheritance** in C++. Why is a useful feature? How does it lead to
    difficulties in the design process? In particular explain the use of the virtual keyword
    when it is used in relation to multiple inheritance.

[10 marks]

(b) Write a section of code in C++ that demonstrates how you would structure multiple
    inheritance for banking software where the following account Classes must exist:
    ?? **DepositAccount** (which includes an interest rate state),
    ?? **CurrentAccount** (which includes an overdraft limit state),
    ?? **Account** (which is generic account with balance and account number states)
    ?? **Cashsave** (which has an overdraft limit and an interest rate for credit balances)
    The code should include the following functionality:
    ?? **display**() (which displays the details relevant to the object)
    ?? **makeLodgement**()
    ?? **makeWithdrawal**()
    Do not use separate compilation for this task, i.e. use one C++ file for your code. Add
    constructors for these classes and show them in operation

[15 marks]

Question 3.

(a) What is **Remote Method Invocation** (RMI) and how is it used in Java? Explain the terms *skeletons* and *stubs*. What are the limitations of RMI?

[9 marks]

(b) Write a Java application that uses the Java **Swing** set to create the following **application**. It is a stopwatch that starts when the "start" button is pressed and stops when the "stop" button is pressed. The windows close button should close the application. When "start" is pressed the counter should always start from 0.
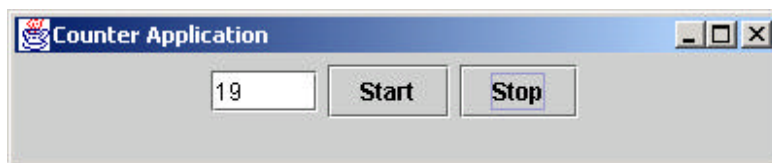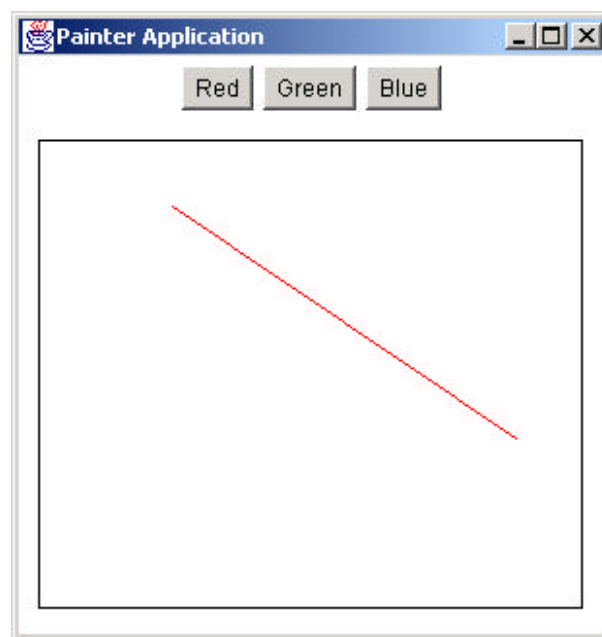

[16 marks]

Question 4.

(a) What is **JDBC**? Give an example of how it may be used. Explain the key steps and terms related to JDBC.

[8 marks]

(b) Write a Java application that uses the AWT package to write an application as shown in the figure below. The colour can be chosen using the buttons on top and the mouse may be used to draw a line, beginning where the mouse is pressed and ending where the mouse is released. Remember that the line must stay visible after the application is minimized and then maximized. A code sample is provided to get you started.

[17 marks]

Question 5.

(a) What does object serialization mean?

[3 marks]

(b) A Java Vector (java.util.vector) is a useful storage mechanism. Compare it to an array and outline its advantages and disadvantages. Give an example of how you might use it.

[6 marks]

(c) Write a Java client/server pair, where the client sends a Vector (java.util.Vector) object containing a number of words to the server and the server sorts the vector alphabetically and sends back a vector with the sorted words. The client should then display the sorted words.

e.g. Send – ["Hello" "World" "Dog" "Cat" "House"] as a Vector and receive back ["Cat" "Dog" "Hello" "House" "World"].

You have been supplied with three sets of code to handle the basic aspects of this application. These are called:

- ?? **Client.java**,
- ?? **Server.java** and
- ?? **ConnectionHandler.java**

These files are in the directory **question5**.

Hint: There is a sort method associated with the Arrays class and there is also a method associated with Vector to convert it to an object array.

[16 marks]