UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2004

COMPUTING AND INFORMATION SYSTEMS

IS52014A (CIS220)
Graphical Object Oriented and Internet Programming in Java

Duration: 3 hours

Date and time:

This paper is in two parts, Part A and Part B. There are a total of three questions in each part. ***You should answer <u>two</u> questions from Part A and <u>two</u> questions from Part B.*** *Your answers to Part A and Part B should be written in separate answer books.*

Full marks will be awarded for complete answers to a total of four questions, two from Part A and two from Part B. Each question carries 25 marks. The marks for each part of a question are indicated at the end of the part in [.] brackets.

There are 100 marks available on this paper.

Electronic calculators must not be programmed prior to the examination. Calculators which display graphics, text or algebraic equations are not allowed.

Part A: answer TWO questions from this Part

Question 1 The Object Model

a. What does it mean to say that Java is an object-oriented language? Your answer should include notions of Class, DataField, Method, Object, Constructor, and Message.

[3 marks]

b. What does it mean for datafield or a method to be static?

[2 marks]

c. You are to implement a class called ***Coloured Rectangle*** that is composed out of two Ranges (one for the x values and one for the y values). Your class should have at least two constructors and allow access (through getters and setters) x-position of the upper-left hand position,and the width (you may assume that the equivalent y methods have been done). You should also implement a method for determining the shape of the Rectangle and whether a point is contains within it. Every instance of this class should be filled with the same colour.

[12 marks]

d. Write a method that would paint a coloured rectangle, called myCRect, as part of a panel.

[3 marks]

e. What happens if you change the colour of one of your rectangles? Explain your answers with reference to the way Java stores values of variables.

[2 marks]

f. Consider the following two sequences of statements

```
int x = 3;
int y = x;
int x = 4;
```

```
Point p = new Point(10,20);
Point q = p;
s.setX(40);
```

What are the values of the variables at the end? Explain your answer.

[3 marks]

Question 2 Inheritance

a. Explain each of the following three purposes of inheritance. Your explanation should include a description of an example:

   i. inheritance for Specialisation

   ii. inheritance for Extension

   iii. inheritance for Specification

[9 marks]

b. You are asked to build a Pong Game in Java. Explain the class structure of a possible implementation. Make sure that your implementation includes two of the types of inheritance that you explained in part a. Sketch in detail the implementations of some of your classes to illustrate your uses of inheritance.

[16 marks]

Question 3 Frameworks and GUI Building

a. Explain what is meant by an object-oriented application framework, or simply a framework

[2 marks]

b. Explain what is meant by a Design Pattern. Briefly explain the Observer Pattern

[3 marks]

c. What are the steps involved in making a user interface that can respond to mouse click. How does this relate to your answers to a and b.

[5 marks]

d. Design and implement an application that includes two buttons, one coloured red and the other blue, and a textfield. When the red button is clicked on the textfield should contain the text: “you have pressed the red button”. The behaviour for the blue button is similar.

[15 marks]

Part B: answer TWO questions from this Part

Question 1

(a) What is RFC? [4 marks]

(b) RFC867 specifies a daytime server. What exactly is this specification for TCP? [4 marks]

(c) Explain this Java fragment:

```
ServerSocket server = new ServerSocket( 5776 );
connection = server.accept();
OutputStreamWriter out =
     new OutputStreamWriter(
          connection.getOutputStream() );
```

[5 marks]

(d) Write a simple daytime server. (The application does not need to be threaded, and you do not need to write try-catch blocks or import statements.)

[12 marks]

Question 2

(a) What is the difference between a process and a thread? [2 marks]

(b) Suppose a server invokes a new process to service each incoming connection. Explain why you would not use such a server to serve large, dynamic web pages. [2 marks]

(c) Suggest a solution to (b), explaining in detail how this solution would work. [5 marks]

(d) Are there any dangers in thread programming? [2 marks]

(e) Explain, with example code, the two ways that threads may be implemented in Java. [14 marks]

Question 3

(a) Someone in your development team has handed you a Java program which has not been commented. Your job is to provide comments at appropriate places. The source code for this program, **`UDPEchoServer.java`** is printed below.

```
// comment 1
import java.io.*;
import java.net.*;

public class UDPEchoServer{

      // comment 2
      private static final int ECHOMAX = 255;

      public static void main( String[] args ){

      // comment 3
      if ( args.length != 1 ) throw new
IllegalArgumentException( "Parameter(s): <Port>" );

      // comment 4
      int servPort = Integer.parseInt( args[ 0 ] );

      // comment 5
      DatagramSocket socket = new DatagramSocket( servPort );

      // comment 6
      DatagramSocket packet =
            new DatagramPacket(
                  new byte[ ECHOMAX ], ECHOMAX );


      // comment 7
      for (;;){

            // comment 8
            socket.receive( packet );

            // comment 9
            socket.send( packet );

            //  comment 10
            packet.setLength( ECHOMAX  );
      }
}
```

[20 marks]

(b) Although **`UDPEchoServer.java`** will do its job, it can be improved. Suggest one improvement, and show the Java code that you would insert/change in order to implement this improvement.

[5 marks]