UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2004

COMPUTING AND INFORMATION SYSTEMS

IS53022A (CIS337)
Internet Programming in Java

Duration: 2 1/4 hours

Date and time:

Full marks will be awarded for complete answers to a total of three questions. 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 75 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.

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 work out what the program does and include comments at appropriate places. The source code for this program, Unknown.java is printed below.

[20 marks]

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

public class Unknown{

    // 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  );
    }
}
}
```

(b) Although Unknown.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]

Question 4

(a) Subclasses of **java.io.InputStream** must provide an implementation of the method

public abstract int read()throws IOException

Write a few lines of code to demonstrate how you would override this method to read an unsigned byte of data.

[6 marks]

(b) What is the drawback of using **read()** in a network application?

[2 marks]

(c) Suppose an application was reading bytes into an array when the connection was unexpectedly terminated. What would happen to your program?

[2 mark]

(d) Sometimes a read will not fail, but it will not succeed either because not all the required bytes have arrived from the server. Explain the purpose of these two lines of code.

```
byte[] input = new byte[1024];
int bytesRead = in.read( input );
```

[4 marks]

(e) Explain in detail the how this code block works and why it is crucial for network streams.

```
int bytesRead = 0;
int bytesToRead = 1024;
byte[] input = new byte[ bytesToRead ];

while ( bytesRead < bytesToRead ){

    int result =
        in.read(input, bytesRead, bytesToRead - bytesRead);
    if ( result == -1 ) break;
    bytesRead += result;
}
```

[11 marks]

Question 5

(a) What is a **Servlet**?

[2 marks]

(b) The Java Servlet API is now a popular architecture for web-based applications. Why is this?

[7 marks]

(c) Describe the 3 **Servlet** methods that are called during the servlet life-cycle.

[6 marks]

(d) Write a servlet HelloWorld program. (You do not need to include any import statements.)

[10 marks]