

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

B. Sc. Examination 2013

IS52025A

Internet and Distributed Programming

Duration: 2 hours 15 minutes

Date and time:

There are four questions on this paper. Please answer all four questions

**THIS PAPER MUST NOT BE REMOVED
FROM THE EXAMINATION ROOM**

Question 1

- (a) Consider the following Java code, with 4 missing fragments:

```
import java.io.*;
import java.net.*;

class client
{
    public static void main(String[] argv) throws Exception
    {
        Socket s = /*missing 1*/;
        OutputStreamWriter p = /*missing 2*/;
        InputStream i = /*missing 3 */;
        InputStream b = /* missing 4 */;
        int c;
        while(true)
        {
            c=b.read();
            p.write((char)c);
            p.flush();
            System.out.print((char)i.read());
        }
    }
}
```

Complete the missing fragments so that the above program acts as a client which sends data one character at a time to a server running on the localhost listening at port 8000. It sends whatever is typed on the console one character at a time to the server and prints out on the console whatever characters it receives back from the server.

[10]

- (b) Write a client with two threads, one which continuously accepts input from the keyboard a character at a time and sends them to a server listening on localhost port 5000 and another which continuously waits for input from the server and prints it at the console. [8]
- (c) Write a complete single threaded server that listens on port 8011 for characters, converts them to upper case and sends them back to the client. [7]

Question 2

(a) Consider the following Java program:

```
class p
{
    void f()
    { while (true) System.out.println("hello");}

    void g()
    { while (true) System.out.println("goodybye");}
}

class t1 extends Thread
{ p x;
  t1(p y)
  {x=y;}

  public void run()
  {x.g();}
}

class t2 extends Thread
{ p x;
  t2(p y)
  {x=y;}

  public void run()
  {x.f();}
}

class z
{
  public static void main(String[] argv)
  {
    p it= new p();
    new t2(it).start();
    new t1(it).start();
  }
}
```

- i. Explain what is output when it is executed.
- ii. What would happen if we declared the methods `f()` and `g()` as synchronized? What common problem in concurrent programming is this an example of?

[10]

(b) Given the following class definition:

```
import java.io.*;
public class Person implements Serializable
{
    String name;
    int age;

    public Person (String n, int a)
    {
        age=a;name=n;
    }

    public String toString()
    {
        return name+" "+age;
    }
}
```

Write a complete single-threaded client that repeatedly reads names and ages from the console, constructs Person objects from them, and sends these Person objects to a server listening on port 5000 on "localhost". It doesn't listen out for messages from the server.

[7]

(c) Write a complete single-threaded 'Object' server that listens on port 5000 for Objects and prints them out on the console if they are Person Objects. It doesn't send messages back to its client.

[8]

Question 3

- (a) Briefly describe the purpose of the following method:

```
static HashSet<String> links (String url)
{
    HashSet<String> a= new HashSet<String>();
    try{org.jsoup.Connection z=Jsoup.connect(url);
        Document doc = z.get();
        Elements links = doc.select("a[href]");
        for (Element link : links) a.add(link.attr("abs:href"));

    }
    catch (Exception e)
    {
        System.out.println(e);
    }
    return a;
}
```

[9]

- (b) Given a method `HashSet <String> links(String url)` write a method whose heading is

```
static void Spider (String url, int n)
```

which finds and prints out n distinct links reachable from a url given by the first parameter. It should find *all* links if there are less than n of them.

To do this, the spider should maintain two sets:

```
HashSet<String> alreadyVisited = new HashSet <String> ();
HashSet<String> toVisit = new HashSet <String> ();
```

[8]

- (c) Rewrite your `Spider` method so that the spider stays within a particular domain. Write a `main` method which calls your `Spider` method. Very briefly explain how your `Spider` method works.

[8]

Question 4

(a) Briefly explain what the following program does:

```
public class seb5
{
    public static void main(String[] args) throws Exception
    {
        Class.forName("com.mysql.jdbc.Driver");
        Connection c=
        DriverManager.getConnection("jdbc:mysql://localhost/bla","mas01sd","sebastian");
        Statement st = c.createStatement();
        st.executeUpdate("INSERT INTO one VALUES('" + args[0] + "','" + args[1] + "')");
        ResultSet resultSet = st.executeQuery("SELECT * from one");
        while (resultSet.next())
        {
            for (int i=1;i<3;i++)System.out.print(resultSet.getString(i) + " ");
            System.out.println();
        }
    }
}
```

[10]

(b) Given the class Pair

```
class Pair
{
    String first;
    String second;
    Pair (String f,String s)
    {
        first=f;second=s;
    }
}
```

Write a method, makeSetFromTable which takes a ResultSet resulting from a query like

```
ResultSet resultSet = st.executeQuery("SELECT * from one");
```

and returns a HashSet of Pairs, each pair corresponding to a row of the table (which we assume has two String fields).

[8]

(c) Write a function makeTableFromSet which takes a HashSet of Pairs and inserts each pair one at a time into a table.

[7]