

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

Department of Computing

B. Sc. Examination 2016

IS52025A

Internet and Distributed Programming

Duration: 2 hours 15 minutes

Date and time:

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*This paper is in two parts: part A and part B. You should answer ALL questions from part A and TWO questions from part B. Part A carries 40 marks, and each question from part B carries 30 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.*

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

**Part A**  
Multiple choice

**Question 1** Answer all parts of this question. Unless otherwise stated choose only one option for each part.

(a) What is a Socket? [4]

- a) A java object that represents a thread
- b) A java object that represents an IP address
- c) A connection between one host and another
- d) The lowest networks layer, representing actual physical wired connections

(b) What does this code do? [4]

```
InputStream in = socket.getInputStream();
```

- a) Open a socket
- b) Start an input byte stream on the socket
- c) Convert bytes to char values
- d) Read a char value from the stream

(c) What is the difference between a thread and a process? [4]

- a) A process needs its own dedicated CPU core but multiple threads can run on a single core
- b) A thread needs its own dedicated CPU core but multiple processes can run on a single core
- c) A process needs its own dedicated memory area but multiple threads can share memory
- d) A thread needs its own dedicated memory area but multiple processes can share memory

(d) When implementing your own thread in java by extending the thread class, you need to: [4]

- a) Override both the run and start methods
- b) Override the start method but not the run method
- c) Override the run method but not the start method
- d) You don't need to override either the run or the start method

- (e) What is deadlock? [4]
- a) When two or more threads try to read from the same area of memory
  - b) When two or more threads try to write to the same area of memory
  - c) When two or more threads are both waiting for a lock that the other one holds
  - d) When two or more threads are both trying to access the same lock
- (f) Which interface do you implement to create a thread? [4]
- a) Comparator
  - b) Runnable
  - c) Serializable
  - d) Thread
- (g) In JDBC what does a DriverManager do? [4]
- a) Matches connection requests from the java application with the proper database driver using communication subprotocol.
  - b) Represents communication context and contains all methods for contacting a database
  - c) Submits the SQL statements to the database
  - d) Holds data retrieved from a database after you execute an SQL query
- (h) What do web scrapers do? [4]
- a) Convert HTML into the DOM
  - b) Access data from a database and convert it into HTML so it can be displayed as a web page
  - c) Parse HTML documents to extract data
  - d) Serializes Java Objects
- (i) What is the difference between TCP and UDP? [4]
- a) TCP guarantees that all packets are correct but UDP does not
  - b) UDP guarantees that all packets are correct but TCP does not
  - c) UDP guarantees that all packets are in the right order but TCP does not
  - d) TCP guarantees that all packets are in the right order but UDP does not

(j) What does the **synchronized** keyword do?

[4]

- a) Ensures that an area in memory can be read by multiple threads at the same time but only written by one thread.
- b) Ensures that only one thread at a time will execute some code
- c) Ensures that two hosts will send data at the same rate
- d) Ensures that two hosts will send data at the same time

## Part B

**Question 2**    Threads

- (a) Why is it not a good idea for two threads to write to the same variable at the same time? [5]
- (b) Give an example where the problems you have just described could occur. Include code [10]
- (c) Describe, using code as examples, how you would modify the example you have just given solve the problems you have described. [15]

**Question 3**    Multiplayer game

You have been asked to implement a server for a multi-player game.

- (a) Describe why you would need each of the following. [16]
- i) sockets
  - ii) threads
  - iii) locks
  - iv) a database
- (b) Describe how you would implement a such a server. [14]

#### Question 4

Read 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 elements = doc.select("h1, h2, h3");
        for (Element el : elements) a.add(el.text());

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

- (a) Why do you think `HashSet` is a good data structure to use in this context? [3]
- (b) What does the method `doc.select` do? [3]
- (c) What does the line `Elements elements = doc.select("h1, h2, h3");` do [3]
- (d) Describe what the method as a whole does. [6]
- (e) Using the above method, write a method that scrapes the main goldsmiths website and and saves the results to a database. [15]