EBU6501 A

Joint Programme Examinations 2018/19

EBU6501 Middleware

Paper A

Time allowed 2 hours

Answer ALL questions

Complete the information below about yourself very carefully.

QM student number

BUPT student number

Class number

NOT allowed: Electronic calculators and electronic dictionaries

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INSTRUCTIONS

1. **You must NOT take answer books, used or unused, from the examination room.**

2. Write only with a black or blue pen **and in English**.

3. Do all rough work in the answer book – **do not tear out any pages**.

4. If you use Supplementary Answer Books, tie them to the end of this book.

5. Write clearly and legibly.

6. **Read the instructions on the inside cover.**

Examiners

Dr Gokop Goteng, Dr Gareth Tyson

Instructions

Before the start of the examination

1) Place your BUPT and QM student cards on the corner of your desk so that your picture is visible.

2) Put all bags, coats and other belongings at the back/front of the room. All small items in your pockets, including wallets, mobile phones and other electronic devices must be **placed in your bag in advance**. **Possession of mobile phones, electronic devices and unauthorised materials is an offence.**

3) Please ensure your mobile phone is switched off and that no alarm will sound during the exam. **A mobile phone causing a disruption is also an assessment offence.**

4) Do not turn over your question paper or begin writing until told to do.

During the examination

1) You must not communicate with or copy from another student.

2) If you require any assistance or wish to leave the examination room for any reason, please raise your hand to attract the attention of the invigilator.

3) If you finish the examination early you may leave, but not in the first 30 minutes or the last 10 minutes.

4) For 2 hour examinations you may **not** leave temporarily.

5) For examinations longer than 2 hours you **may** leave temporarily but not in the first 2 hours or the last 30 minutes.

At the end of the examination

1) You must stop writing immediately – **if you continue writing after being told to stop, that is an assessment offence.**

2) Remain in your seat until you are told you may leave.

Question 1

a) This question is on Message-Oriented Middleware (MOM):

[15 marks]

i) What is *Messaging Domain*? List the TWO types of Java Message Domains.

(6 marks)

ii) Java Messaging Service (JMS) is an example of a MOM. List and describe the TWO *Administered Objects* in JMS.

(9 marks)

	Do not write in this column
	15 marks

b) Study the JavaServer Page (JSP) program in Figure 1 and answer the questions that follow:

```
1. <%@ page import="java.util.*" %>

2. <html>

3. <body>

4. <%! Date myDate = new Date();

5. Date getDate()  {

6.     System.out.println( "getDate() method" );

7.     return A;

8. }

9. %>

10. Hello, welcome to QMUL!  The time is now <%= B %>

11. </body>

12. </html>
```

Figure 1: JavaServer Page (JSP) Program

[6 marks]

i) State the JSP terms used to describe lines 1 and 4 in Figure 1 respectively.

(2 marks)

ii) In lines 7 and 10, there are undefined variables **A** and **B** respectively. Replace **A** and **B** with the appropriate variables as defined in Figure 1.

(4 marks)

	Do not write in this column

	6 marks

c) Study the Tomcat directory structure in Figure 2 below and describe the term (or name) given to the XML file **web.xml and explain why the file "web.xml" is located** directly under the WEB-INF directory.
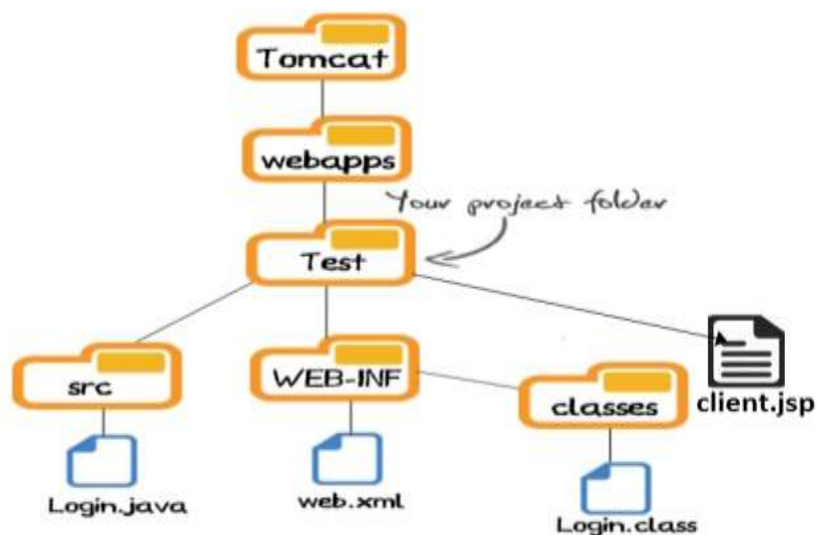
[4 marks]

Figure 2: Directory Structure of Tomcat Container

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		4 marks

Question marking: $\dfrac{}{15} + \dfrac{}{6} + \dfrac{}{4} = \dfrac{}{25}$

Question 2

a) This question is about Threads.

[14 marks]

i) Describe the Runnable and Running states of the life cycle of a Java Thread.

(4 marks)

ii) Figure 3 below is a Java implementation of Java Thread in a Java program. Explain what the code is doing in lines **3, 4, 9, 20 and 24** respectively.

(10 marks)

```
1. class ThreadA {
2. public static void main(String [] args) {
3.    ThreadB b = new ThreadB();
4.    b.start();
5.
6.    synchronized(b) {
7.      try {
8.        System.out.println("Waiting for b to
                  complete...");
9.        b.wait();
10.   } catch (InterruptedException e) {}
11.   System.out.println("Total is: " + b.total);
12.  }
13. }
14. }
15.
16. class ThreadB extends Thread {
17.   int total;
18.
19.   public void run() {
20.     synchronized(this) {
21.       for(int i=0;i<100;i++) {
22.         total += i;
23.       }
24.       notify();
25.     }
26.   }
27. }
```

Figure 3: A Java Code with Thread

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	14 marks

b) A Servlet and JSP program consists of 10 Servlets. Each of the Servlets has their unique configurations and parameters, but they share some configurations such as IP addresses of the main server machine and monitoring system. Describe the Java 2 Enterprise Edition (J2EE) object that will be created for each unique Servlet configurations and the object that will be created only once for the whole application so that all the 10 Servlets can share the configurations.

[4 marks]

	Do not write in this column

	4 marks

c) Describe an **Interrupt and give ONE example how the interrupt methods are invoked** in a Java program. Also describe the THREE ways to terminate a Java *Thread*.

[7 marks]

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	7 marks

Question marking: $\dfrac{}{14} + \dfrac{}{4} + \dfrac{}{7} = \dfrac{}{25}$

Question 3

a) The client side of a Java program named **_DateClient_** is shown in Figure 4 below. This makes a request from the client through a socket connection (20.15.6.5, **9090)**. Write the Java code for the server called DateServer, which must accept connections from the client shown in Figure 4, and return the date as a String using port 9090.

[15 marks]

```
//Client side of the Java code
public class DateClient {
  public static void main(String[] args) throws IOException {
    Socket s = new Socket(20.15.6.5, 9090);
    BufferedReader input = new BufferedReader(new
InputStreamReader(s.getInputStream()));
    String answer = input.readLine();
    System.out.println(answer);
    return;
  }
}
```

Figure 4: Java Server Code

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	15 marks

b) Describe the *Security, Bundle* and *Java Virtual Machine (JVM)* components in the Open Services Gateway Initiative (OSGi) architecture.

[6 marks]

	Do not write in this column
	6 marks

c) List FOUR methods of how to ensure security of web services.

[4 marks]

	Do not write in this column
	4 marks

Question marking: $\dfrac{}{15} + \dfrac{}{6} + \dfrac{}{4} = \dfrac{}{25}$

Question 4

a) Describe the causes of "*Security Misconfigurations*" and the "*Problems with access control level*" in web and middleware applications and give ONE prevention in each case.

[5 marks]

	Do not write in this column
	5 marks

b) This question is on EJB (Enterprise Java Beans) and JavaScript:

[10 marks]

i) Describe the *Modularity* and *Security* features provided in EJB implementations.

(4 marks)

ii) Figure 5 is a JavaScript program that uses regular expressions. Describe what lines **1** and **2** are doing and the outputs/results that will be printed in lines **3, 4, 5** and **6**.

(6 marks)

```
1. var pattern1 =/java/i;
2. var pattern2 =/Java/g;
3. pattern1.test("JavaScript");
4. pattern2.test("JavaScript");
5. pattern1.test("javaScript");
6. pattern2.test("javaScript");
```

Figure 5: Java Script Regular Expressions

	Do not write in this column

	10 marks

c) Describe in details SSH (Secure Shell) and MQTT (Message Queue Telemetry Transport) protocols (include the port SSH used for communication in your answer).

[10 marks]

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	10 marks

Question marking: $\dfrac{}{5} + \dfrac{}{10} + \dfrac{}{10} = \dfrac{}{25}$

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