EBU6501 B

Joint Programme Examinations 2016/17

EBU6501 Middleware

Paper B

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.

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

Instructions

<u>Before the start of the examination</u>

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.

<u>During the examination</u>

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.

<u>At the end of the examination</u>

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) A multi-threaded Java programme is given in Figure 1 below. It does not produce predictable sequential results as shown.

[12 marks]

   i)   Explain why Threads behave in this unpredictable manner.

(6 marks)

   ii) Explain the functions of *join()* method in Threads.

(3 marks)

   iii) If the method *join()* is used in between the threads in Figure 1, will that make the Threads to behave in a predictable way?

(3 marks)

```
class NameRunnable implements Runnable {

   public void run() {

      for (int x = 1; x <= 400; x++) {

         System.out.println("Run by "

               + Thread.currentThread().getName()

               + ", x is " + x);

      }

   }

}

public class ManyNames {

   public static void main(String [] args) {

      // Make one Runnable

      NameRunnable nr = new NameRunnable();

      Thread one = new Thread(nr);

      Thread two = new Thread(nr);

      Thread three = new Thread(nr);
```

```
    one.setName("Fred");

    two.setName("Lucy");

    three.setName("Ricky");

    one.start();

    two.start();

    three.start();

  }

}
```

Figure 1: Multi-Threaded Java Programme

The programme produces the following output:

Run   by   Fred,   x   is   1

Run by Lucy, x is 2

Run by Ricky, x is 3

Run by Lucy, x is 3

Run by Ricky, x is 4

Run by Lucy, x is 4

....

Run   by   Fred,   x   is   345

Run by Lucy, x is 337

Run by Ricky, x is 310

Run by Lucy, x is 338

Run by Ricky, x is 311

Run by Lucy, x is 339

Run by Ricky, x is 312

Run by Lucy, x is 340

Run by Ricky, x is 313

Run by Lucy, x is 341

Run by Ricky, x is 314

Run by Lucy, x is 342

Run by Ricky, x is 315

Run by Fred, x is 346

Run by Lucy, x is 343

Run by Fred, x is 347

Run by Lucy, x is 344
... it continues on ...

	Do not write in this column

	12 marks

b) Threads have FIVE states. Fill in the states represented by **1** and **2** in Figure 2 below. Explain states **1** and **2**.

[6 marks]
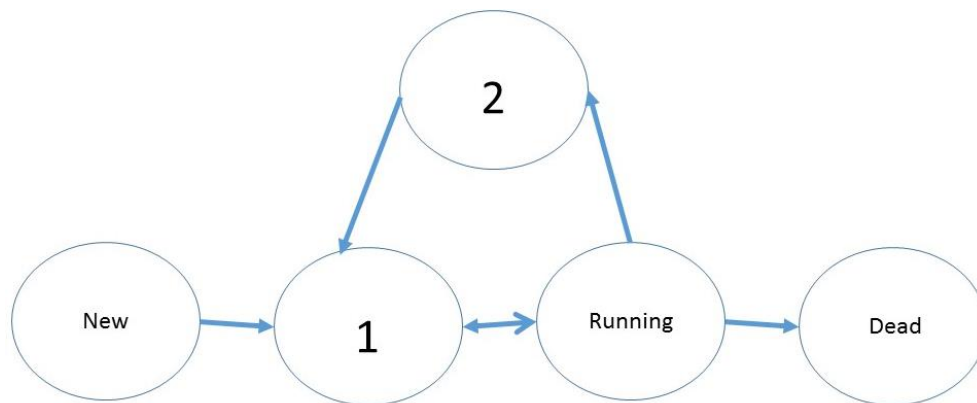
Figure 2: States of a Thread

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	6 marks

c) What is Message-Oriented Middleawre (MOM)? Describe the **THREE** parts of a MOM message.

[7 marks]

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	7 marks

Question marking: $\dfrac{}{12} + \dfrac{}{6} + \dfrac{}{7} = \dfrac{}{25}$

Question 2

a)   Figure 3 below is a server code that listens to the client that sends a sentence of a line to it and the server responds by sending back the same sentence to the client, but in capital letters. Implement the Java client that reads a sentence from a console, opens connection and send the sentence to the server.

[12 marks]

```
class TCPServer {

 public static void main(String argv[]){

   String clientSentence;

   String capitalizedSentence;

   ServerSocket welcomeSocket = new ServerSocket(6789);

   while(true) {

     Socket connectionSocket = welcomeSocket.accept();

     BufferedReader inFromClient =  new BufferedReader(new
InputStreamReader(connectionSocket.getInputStream()));

     DataOutputStream outToClient = new DataOutputStream(connectionSocket.getOutputStream());

     clientSentence = inFromClient.readLine();

     capitalizedSentence = clientSentence.toUpperCase()+'\n';

     outToClient.writeBytes(capitalizedSentence);

   }

 }

}
```

Figure 3: Java Server Code

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	12 marks

b) Differentiate between ServletConfig and ServletContext objects. Write a deployment descriptor (DD) for a servlet named **MyServlet** and class **MyClass**. The application shares a central admin email called **Admin_Email** with a value of **admin@bupt.com**.

[8 marks]

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	8 marks

c) Discuss the use of *volatile* in java key word on variables in relation to CPU, CPU register, CPU cache memory and Main memory (RAM)

[5 marks]

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	5 marks

Question marking: $\dfrac{}{12} + \dfrac{}{8} + \dfrac{}{5} = \dfrac{}{25}$

Question 3

a) Using your knowledge of the Open Services Gateway Initiative (OSGi), answer the following questions:

[10 marks]

i)   Describe Bundles, Modules and Services Registry in OSGi architecture

(6 marks)

ii) Briefly describe TWO advantages of using OSGi

(4 marks)

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	10 marks

b) Write a simple JSP programme that prints the current data. Also state whether the following FOUR JSP expression statements are valid or invalid.

[8 marks]

<%=10+5%>

<%=new String[10]%;>

<% ="200"%>

<%=100+foo%> where foo is undefined

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	8 marks

c) Describe the function of *JSON.stringify()* in JavaScript programme. Write a Java Script programme that uses any standard Java Script Input and Output commands to accept Username, City and Age and then prints them out.

[7 marks]

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	7 marks

Question marking: $\dfrac{}{10} + \dfrac{}{8} + \dfrac{}{7} = \dfrac{}{25}$

Question 4

a) Using your knowledge of Enterprise JavaBeans (EJB), answer the following questions:

[12 marks]

i) In the EJB professional roles, describe the functions of EJB Server Provider EJB Container Provider and EJB Deployer

(6 marks)

ii) Describe Session Beans, Entity Beans and Message-Driven Beans

(6 marks)

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	12 marks

b) Describe Authentication and Authorisation in Web security". Also differentiate between Confidentiality and Integrity in web security.

[4 marks]

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	4 marks

c) Internet Protocols are important mechanisms of communication among Internet of Things (IoT) technologies. Using your knowledge of IoT protocols:

[9 marks]

i) Why is User Datagram Protocol (UDP) not good for transporting data that requires accuracy and reliability?

(3 marks)

ii) Describe THREE good features of Simple Object Access Protocol (SOAP)

(3 marks)

iii) What does LDAP stands for? Describe TWO functions of LDAP

(3 marks)

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	9 marks

Question marking: $\frac{}{12} + \frac{}{4} + \frac{}{9} = \frac{}{25}$

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