CSCI 201L Final - Written
Fall 2014
12% of course grade

1. **Interfaces and Inheritance** – Does the following code compile? If so, what is the output? If not, why not? Explain your answer. **(1.5%)**

```java
interface I2 {
  public void meth1();
}
interface I1 extends I2 {
  public void meth1();
}
class C1 implements I1 {
  public void meth1() {
    System.out.println("2");
  }
}
class C2 extends C1 implements I2 {
  public void meth1() {
    System.out.println("1");
  }
}
public class Question1 {
  public static void main(String[] args) {
    I1 i1 = new C1();
    i1.meth1();
    I2 i2 = new C2();
    i2.meth1();
    C1 c1 = new C2();
    c1.meth1();
  }
}
```

2. **Network Addresses** – Assume that your employer decided to disable DHCP and instead have each employee assigned a static IP address. Your laptop is assigned IP address 192.168.2.5 with no subnets.

    At home, you have DHCP enabled on your network. You forgot to change your static IP address from work one day on your laptop when you got home, and you didn't have network access. You checked your other computer (which does have network access), and you saw the IP address on your other computer on your home network was 192.168.1.3 with no subnets. Explain why your laptop does not have network access on your home network. **(1.5%)**

    ```
    192.168.2.5 = 1100 0000  1010 1000  0000 0010  0000 0101

    192.168.1.3 = 1100 0000  1010 1000  0000 0001  0000 0011
    ```

3. Serialization – Does the following code compile? If so, what is the output? If not, explain why. **(0.5% + 1.0%)**

```java
import java.io.FileInputStream;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.ObjectInputStream;
import java.io.ObjectOutputStream;
import java.io.Serializable;

class SerializeMe implements Serializable {
  public static final long serialVersionUID = 2;
  public transient String s1 = "csci201";
  public String s2 = "csci103";
  public int num = 3;
  public void print() {
    System.out.println(serialVersionUID);
    System.out.println(s1);
    System.out.println(s2);
    System.out.println(num);
  }
}
public class Question3 {
  public static void main(String[] args) {
    try {
      SerializeMe sm1 = new SerializeMe();
      sm1.print();
      FileOutputStream fos = new FileOutputStream("output.txt"));
      ObjectOutputStream oos = new ObjectOutputStream(fos);
      oos.writeObject(sm1);
      oos.close();
      FileInputStream fis = new FileInputStream("output.txt");
      ObjectInputStream ois = new ObjectInputStream(fis);
      SerializeMe sm2 = (SerializeMe)ois.readObject();
      ois.close();
      sm2.print();
    } catch (IOException ioe) {
      System.out.println("IOE: " + ioe.getMessage());
    } catch (ClassNotFoundException cnfe) {
      System.out.println("CNFE: " + cnfe.getMessage());
    }
  }
}
```

4. **Monitors and Locks –** When Java uses the **synchronized** keyword, it is utilizing monitor functionality. There is also Lock functionality in Java through the Lock interface. Is the functionality behind a monitor the same as that through an explicit Lock variable? Why would a programmer choose to use a Lock instead of a monitor? **(1.0% + 1.0%).**

5. **Semaphores** – We learned three different ways to implement critical sections of code with concurrent programming – monitors, locks, and semaphores. Assume one of your friends tells you about this new programming language called JavaSem. It has all of the functionality of Java but no monitors and locks, just semaphores. Would you consider this a limitation to the language or would JavaSem be able to implement all of the functionality of Java? Explain your answer. **(2.0%)**

6. **Distributed Programming** – RMI, CORBA, and Web Services all have advantages and disadvantages, which is why all three of them still exist. Assume you are working at a company who does not have any distributed application currently but wants to implement one because of the heavy processing power needed to factor large numbers. Give three design decisions that you would need to take into consideration to determine which distributed computing paradigm to use, along with the paradigm to use based on the decision. (**0.5% + 0.5% + 0.5%**)

   Here is a sample answer: The language of the client and server should be taken into consideration. If both can be written in Java, RMI should be used. If they may be in different languages, CORBA or Web Services should be used.

7. **Threads** – Give three possible outputs of the following code? What are two rules that will always be true for the output (i.e. what will always be printed before or after something else)? **(1.0% + 1.0%)**

```java
class T extends Thread {
  private int num;
  public T(int num) {
    this.num = num;
  }
  public void run() {
    System.out.println(num + "a");
    Thread.yield();
    System.out.println(num + "b");
  }
}
public class Question7 {
  public static void main(String[] args) {
    T t[] = new T[4];
    for(int i=0; i < 4; i++) {
      t[i] = new T(i);
      t[i].setPriority(Thread.MIN_PRIORITY + i);
    }
    for(int i=0; i < 4; i++) {
      t[i].start();
    }
  }
}
```