United International University
CSI 211: Object Oriented Programming, Spring 2018
Final Exam
Total Marks: 40, Time: 2 hours

Answer all questions

1. (a) Edit the ***Player*** class in the following code so that the code gives the expected output. Do not just print the expected output. Do not edit the ***Competition*** class. You are not allowed to add any variables in the ***Player*** class. Only add necessary methods. Will your code give exactly the same output as the expected output? Explain the reason. [3+1]

Code:

```
class Player implements Runnable{
    Thread t;
}
class Competition{
    public static void main(String[] args) {
        Player player1 = new Player("Cersei");
        Player player2 = new Player("Jamie");
        Player player3 = new Player("Tyrion");
    }
}
```

Expected Output:

```
Cersei starts the race.
Jamie starts the race.
Tyrion starts the race.
Cersei crossed 0 obstacle.
Jamie crossed 0 obstacle.
Tyrion crossed 0 obstacle.
Cersei crossed 1 obstacle.
Jamie crossed 1 obstacle.
Tyrion crossed 1 obstacle.
Cersei crossed 2 obstacle.
Tyrion crossed 2 obstacle.
Jamie crossed 2 obstacle.
Tyrion finishes the race.
Cersei finishes the race.
Jamie finishes the race.
```

(b) What will be the output of the following code? [4]

```
1  class NestedException {
2      public static void main(String args[]) {
3      try {
4          try {
5              System.out.println("Inside B");
6              int m = 115 / 0;
7              System.out.println(m);
8          } catch (ArithmeticException e1) {
9              System.out.println("Exception: E2");
10         }
11         try {
12             System.out.println("Inside A");
13             int m = 110 / 0;
14             System.out.println(m);
15         } catch (ArrayIndexOutOfBoundsException e2) {
16         System.out.println("Exception: E1");
17         }
18         System.out.println("Just other statement");
19         } catch (ArithmeticException e3) {
20             System.out.println("Arithmetic Exception");
21             System.out.println("Inside parent try catch block");
22         } catch (ArrayIndexOutOfBoundsException e4) {
23             System.out.println("ArrayIndexOutOfBoundsException");
24             System.out.println("Inside parent try catch block");
25         } catch (Exception e5) {
26             System.out.println("Exception");
27             System.out.println("Inside parent try catch block");
28         }
29         System.out.println("Lets give another input");
30     }
31 }
```

(c) You are given a text file named "numbers.txt" which contains some numbers in each line that are separated with commas. Write a Java program to read the file and for each line print the sum of the numbers in console. A sample input and output is provided below: [4]

input.txt:	**console:**
10,11,12	33
1,18	19
2,13	15
33,22,1,1	57
1	1

```
class A {
    void meth(){
        \\Use class here
    }
}
class C {
}
```

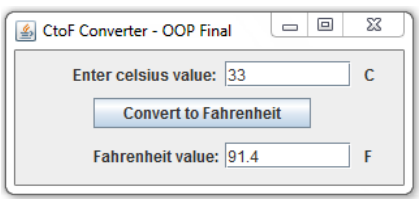
2. (a) You need to use an object of a class ***B extends C*** inside the method ***meth()*** in the code above. You will not have to use class ***B*** anywhere else in your code. However, you need to make several objects of class ***B*** inside the method ***meth()***. Will you make ***B*** a local class or an anonymous class? Explain the reason behind your decision and complete the code accordingly. [2]

(b) Create Java classes **Triangle**, **Rectangle** and **Shape2D** where **Shape2D** is extended by the others. **Shape2D** also implements **Area** interface, which only has one method **getArea()**, that returns area of corresponding Shape. Your classes should be implemented such that running the following main method outputs the corresponding comments. You also need to add a method **compare** in Main class. Method **compare** may take any of the two shapes and prints which shape has larger area or prints "Same area" if both have same areas. However, you are **not** allowed to change the **main()** method. [6]

```
1  class Main
2  {
3      public static void main (String[] args)
4      {
5          Triangle t = new Triangle(10, 5);
6          System.out.println("Triangle area: " + t.getArea());
7                  // Triangle area: 25
8          Rectangle r = new Rectangle(10, 3);
9          System.out.println("Rectangle area: " + r.getArea());
10                 // Rectangle area: 30
11         System.out.println(compare(t, r));  // Rectangle
12         t = new Triangle(10, 10);
13         System.out.println(compare(r, t));  // Triangle
14         System.out.println(compare(r, r));  // Same area
15         System.out.println(compare(t, t));  // Same area
16     }
17 }
```

(c) Write a generic Java method **maximum(arg[])** that returns the maximum element of the argument array. [4]

3. (a) You are required to complete a Java GUI application that has the functionality of converting temperature from Celsius value to Fahrenheit value. The application takes Celsius value from one JTextField (namely textField-Celsius), converts this value into Fahrenheit value on click of a JButton (namely btnConvert) and displays the Fahrenheit value into another JTextField(namely textFieldFahrenheit). Suppose necessary code for GUI creation is already provided. You **only** need to add an ActionListener to the button. Formula for converting C to F: F= (Cx(9/5)) + 32 . [4]



(b) One married couple, *Jack* and *Rose*, share a Bank account. They should first check the balance in the account before making a withdrawal request. But very often their *cheques* bounce and need to pay fine for an overdrawn request. *Rose* identifies that *Jack* checks the balance (say $100) and he needs to withdraw ($50), therefore no problem. Problem arises when *Jack* plans for a sleep before withdrawing the money. In the meantime, *Rose* checks the balance (currently $100) and withdraws the money ($70), *Jack* still sleeps. When *Jack* wakes up, he requests for withdrawal of $50 knowing that the account still has $100. Hence, he requests for withdrawal of $60, and receives an overdrawn ($30) notification. Now, you have to write a java code with available *concurrency* libraries to solve the above problem. You have two classes: *BankAccount*, and *JackAndRoseWithdraw*. Both *Jack* and *Rose* check the balance and withdraw money. Your code restricts to withdraw money by Rose from the account until after *Jack* wakes up. [6]

(c) Consider the following code. Make necessary changes in the class ***Car*** so that the main method gives the expected output. Do not change anything in the ***Test*** class. [3]

Code:

```
import java.util.ArrayList;
import java.util.Collections;

class Test{
    public static void main(String[] args) {
        ArrayList<Car> a = new ArrayList<Car>();
        a.add(new Car(150.0, 5));
        a.add(new Car(120.0, 9));
        a.add(new Car(125.0, 8));
        a.add(new Car(120.0, 7));

        Collections.sort(a);
        for(Car c : a){
            System.out.println(c.speed + " , " + c.durability);
        }
    }
}

class Car{
    double speed;
    int durability;
    public Car(double speed, int durability) {
        this.speed = speed;
        this.durability = durability;
    }
}
```

Expected Output:

```
120.0 , 7
120.0 , 9
125.0 , 8
150.0 , 5
```

Now, make necessary changes in the ***Test*** class so that, duplicate values are not present in the ArrayList. [Hint: You could use other Collections objects, or ensure duplicate elements are not added to the ArrayList, or get rid of the duplicate elements after adding.] [1]

(d) Following table contains data of books in the form of ids (*keys*) and titles (*values*). By using which data structure from *Java Collections* framework, adding and searching books by ID will be most efficient? Why so? [2]

ID (key)	**Title (value)**
101	Structured Programming
102	Algorithms
103	Operating Systems