

**Rochester Institute of Technology**  
**Department of Computer Science**  
**CSCI-605, Spring '24**

## **Midterm Exam 2**

**Professor Eduardo Lima**

Please make sure you have 7 pages in your exam including this cover page, printed 1-sided.

The last page is blank and can be used for scratch.

Provide complete and concise answers. Try to limit yourself to the space below the question.

If you need more space, use the back of the page.

This exam has 5 questions, each worth 8 points, totalling 40 points.

Student Full Name: \_\_\_\_\_

## Question 1

```
import java.util.*;

class Robot implements Comparable<Robot>{
    String model;
    Integer serialNumber;

    @Override
    public String toString() {
        return serialNumber+": "+model;
    }

    @Override
    public int compareTo(Robot o) {
        return o.serialNumber.compareTo(this.serialNumber);
    }

    Robot(String model, Integer serialNumber) {
        this.model = model;
        this.serialNumber = serialNumber;
    }
}

public class Collection_2235<T> {
    public static void main(String[] args) {
        List<Robot> robotList = new ArrayList<>();
        robotList.add(new Robot("R2D2",0401));
        robotList.add(new Robot("C3PO",0402));
        robotList.add(new Robot("BB8",2403));
        Collections.sort(robotList);
        System.out.println(robotList);

        Collection<Integer> treeSet = new TreeSet<>();
        for (int i=0; i<1000; i++) treeSet.add(i); //1

        Collection<Integer> arrayList = new ArrayList<>();
        for (int i=0; i<10; i++) for (int j=0; j<1000; j++) arrayList.add(i);

        HashMap<Integer, Integer> map = new HashMap<>();
        for (Integer i:arrayList) map.put(i,map.get(i)==null?1:(Integer)map.get(i)+1); //2
        System.out.println(map.keySet().size());
    }
}
```

Answer the following.

1. What is the output of this program?
2. How could you make the line marked with //1 faster?

## Question 2

```
import java.io.*;

public class DataSerialization_2235 {

    public static void main(String args[]) {
        try (DataOutputStream out = new DataOutputStream(new FileOutputStream("input2.txt"));
            DataInputStream in = new DataInputStream(new FileInputStream("input2.txt"));) {
            out.writeInt(42);
            out.writeDouble(0.01);
            out.writeBoolean(false);
            System.out.println(in.readInt());
            System.out.println(in.readBoolean());
            System.out.println(in.readDouble());
//            System.out.println(in.readDouble());

        } catch (IOException ef) {
            System.out.println("bam");
        }
    }
}
```

Answer the following.

1. This is the output of this program:

```
42
true
-4.413197968756032E-287
```

Explain why the original values written did not show up in the terminal (stdout)

2. If the commented line is uncommented, what will be the output of the program?

### Question 3

```
public class Exceptions_2235 {
    int[] intArray = {0};
    public void runAndThrows() throws RuntimeException {
        try {
            try {
                intArray[1] = 1;
                System.out.println("2nd-try");
                try {
                    intArray[1] = 1;
                    System.out.println("3rd-try");
                }
                catch (ArrayIndexOutOfBoundsException e) {
                    intArray[1] = 1;
                    System.out.println("3rd-catch");
                }
            }
            catch (ArrayIndexOutOfBoundsException e) { System.out.println("2nd-catch"); }
            finally {
                System.out.println("2nd-finally");
                intArray[1] = 1;
            }
        }
        catch (ArithmeticException e) { System.out.println("1st-catch"); }
    }

    public static void main (String[] args) {
        try{ new Exceptions_2235().runAndThrows(); }
        catch (Exception e) {} }
}
```

Answer the following questions.

1. What will be the output of this program?
2. Is there any uncaught exception in the execution of this program? If yes, which one(s)?

#### Question 4

```
abstract class Parent_2235<T> {
    T aT;
    private void go(T aT) {
        System.out.println("parent");
    };
}

interface Interface_2235<T> {
    default void go(T aT) {
        System.out.println("interface");
    };
}

public class Generics_2235<T> extends Parent_2235<T> implements Interface_2235<T> {
    public void go(T aT)    { System.out.print("child"); }
    public void set(T aT) { this.aT = aT; }
    public static void main(String args[]) {
        Parent_2235 a = new Generics_2235<Integer>();
        Generics_2235 b = (Generics_2235) a; //1
//      b.set("yo"); //2
        System.out.println((String)b.aT);
    }
}
```

This program compiles as is. Answer the following questions.

1. Is the type-parameter being checked in line commented with //1? Explain.

2. What will happen if we set the type-parameter in the same line to Integer, e.g.:

```
Generics_2235<Integer> b = (Generics_2235<Integer>) a; //1
```

3. What will be the output of the program as is?

4. What will be the output of the program if we uncomment line marked with //2?

### Question 5

```
import java.io.*;

public class Serialization_2235 implements Serializable {
    transient Integer value = 0;

    Serialization_2235 read() {
        try (ObjectInputStream in = new ObjectInputStream(new FileInputStream("object.save"));) {
            Serialization_2235 o = (Serialization_2235) in.readObject();
            System.out.println(o.value);
            setValue(this, 1);
            System.out.println(o.value);
        } catch (Exception e) { }
        return this;
    }

    Serialization_2235 write() {
        try (ObjectOutputStream out = new ObjectOutputStream(new FileOutputStream("object.save"));) {
            Serialization_2235 o = new Serialization_2235();
            out.writeObject(o);
        } catch (Exception e) { }
        return this;
    }

    public static void setValue(Serialization_2235 o, Integer v) {
        o.value = v;
    }

    public static void main (String args[] ){
        new Serialization_2235().write().read();
    }
}
```

Answer the following.

1. What is the output of this program?

2. What does the “transient” used keyword implies?

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