AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

Computer and Systems Engineering, (Junior Level)

Spring, 2021/2022	**Course Code:** ***CSE 231s***	***Time allowed: 2 Hrs.***

Advanced Computer Programming

The Exam Consists of **Three** Questions in **Three** Pages. ***Maximum Marks: 60 Marks*** **1 / 3**

Important Rules:	**تعليمات هامة**
• Having a (mobile -Smart Watch- earphones) inside the examination hall is forbidden and is considered as a cheating behavior. • It is forbidden to have any references, notes, books, or any other materials even if it is not related to the exam content with you in the examination hall.	• حيازة (المحمول- الساعات الذكية - سماعة الأذن) داخل لجنة الامتحان يعتبر حالة غش تستوجب العقاب . • لايسمح بدخول أي كتب أو ملازم أو أوراق داخل اللجنة والمخالفة تعتبر حالة غش.

Question (1): 20 (MARKS)

(1) …… used to enable a constructor to invoke another constructor in the same class while …… used to invoke parent classes' data fields

(2) Analyze the following code.

```
class Test {
    public static void main(String[] args)  {
        String s;
        System.out.println("s is " + s);
    }
}
```

(3) State in which cases you need to define the class constructor as private.

(4) (True or False) A subclass of a non-abstract class must be non-abstract, Explain.

(5) (True or False) At least one method in an abstract class must be abstract, Explain.

(6) Suppose **A** is an inner class in class **Test**. What is the name(s) of the compiled file(s)?

(7) Which of the following statements is preferred to create a string "Welcome to Java"?

a. String s = "Welcome to Java";
b. String s = new String("Welcome to Java");
c. String s; s = "Welcome to Java";
d. String s; s = new String("Welcome to Java");

(8) (True or False) A Java source file can include the definition of more than one public class.

(9) (True or False) All Java classes (except for class Object) directly inherit from one or more classes.

(10) (True or False) Java supports 4 different access modifiers for class members

Question (2): 20 (MARKS)

Analyze the following codes.

(a)
```
public class Test {
     public static void main(String[] args) {
       java.util.Date x = new java.util.Date();
       java.util.Date y = x.clone();
       System.out.println(x = y);
        }
   }
```

(b)
```
public class Test  {
   public static void main(String[] args) {
   Fruit[] fruits = {new Fruit(2), new Fruit(3), new Fruit(1)};
        java.util.Arrays.sort(fruits);
      }
    }
   class Fruit {
     private double weight;

     public Fruit(double weight) {
       this.weight = weight;
     }
   }
```

(c)
```
public class Test {
   public static void main(String[ ] args) {
    Number x = new Integer(3);
    System.out.println(x.intValue());
    System.out.println((Integer)x.compareTo(new Integer(4)));
 }
}
```

(d)
```
class Base {
    Base(){System.out.println("Base is invoked");}  }
    class Derived extends Base {
    Derived(){   System.out.println("Derived is created");  }  }
    class TestSuper3 {
    public static void main(String args[]) {
    Base b=new Base();
    Derived d=new Derived();
     }
    }
```

(e)
```
public class Test {
    public static void main(String[] args) {
    Object o1 = new Object();
    Object o2 = new Object();
    System.out.print((o1 == o2) + " " + (o1.equals(o2)));
    }
}
```

Question (3): 20 (MARKS)

i- Write a Java class **Bag** that represents a travel bag. The class should encapsulate the width (**float**), the height (**float**), and the depth (**float**) of the bag as well as its color (**Color**), and whether it has wheels (**boolean**). The class should have an appropriate constructor and should appropriately override the **toString** and **equals** methods. The class should also have an accessor method for each of its members.

Additionally, the class should have the following methods:

- **getVolume()**: returns the volume of the travel bag
- **isLarger(Bag b)**: returns true only if the current bag has a bigger volume than bag **b**
- **canEnclose(Bag b)**: returns true only if the bag b can be enclosed inside the current bag. Note that this function should return true if bag b can fit inside the current bag in any orientation.
- **findSmallestBag(Bag[] b, Color color, boolean wheeled)**: a **static** method that returns the index of the bag that has the smallest volume in an array of bags. If the color parameter is not null, the method should only consider bags of that color. If the wheeled parameter is set to true, the method should only consider wheeled bags, otherwise it should only consider non-wheeled bags.
- **save(Bag[] bags, String filename)**: a static method that saves the data of all the bags in the array to a file. The first piece of information that should be saved to the file is the number of bags in the array. This task should be executed as a **thread** such that it is not allowed to have more than one thread writing in a file. You need to use a **Lock** to synchronize among threads.
- **open(String filename)**: A **static** method that returns an arrays of Bag objects based on data read from the specified file. The method should throw an **InvalidExtension** exception if the provided file name has any extension other than **.bag** or **.txt**. The **InvalidExtension** class should be defined separately as a checked exception.

ii- Write a Java program that uses the **Bag** class you defined above (without re-writing it). The program should call each of the defined methods at least once. You should be able to print the number of **Bag** objects.

END of Exam, Good Luck

Examination Committee: *Prof. Mahmoud Khalil* ***Exam. Date : 7 June, 2022***