



**Advanced Computer Programming**

The Exam Consists of Three Questions in Four Pages.

Maximum Marks: 60 Marks

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**Important Rules:**

- 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.

**تعليمات هامة**

- 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)**

Answer the following:

- 1) (Complete) ..... used to enable a constructor to invoke another constructor in the same class while ..... used to invoke parent classes' data fields.
- 2) Can a Java source file have more than one class?
- 3) What does "interned strings" mean?
- 4) Can the advantage of reusability be achieved by applying the concept of encapsulation?
- 5) Which keyword is used to acquire a lock on any object when executing a block of the code in a method.
- 6) When "finally" block is executed in try-catch statement?
- 7) What is the Java compiled file named "Test\$3.class" means ?
- 8) How to make creating a large number of threads takes smaller time during the run time?
- 9) Can the interface have no members? Give an example.
- 10) How to make a class member shared by all the instances of this class

**Question (2): 20 (MARKS)**

(a)

```
public class Test extends Exam {
    public static void main(String[] args) {
        System.out.println(new Test());
    }
    public Test() {
        System.out.print("t");
    }
}

class Exam {
    private static int counter;
    public Exam() {
        this("r");
        System.out.print("c");
    }
    public Exam(String s) {
        System.out.print("Co" + s + s);
        System.out.print(this);
    }
    public String toString() {
        String retVal;
        if (counter == 0) {
            counter++;
            retVal = "e";
        } else {
            retVal = " A";
        }
        return retVal;
    }
}
```

1- What is the output of the previous code?

2- Complete the missing: The "Exam" Class inherits the Class ..... and it is .....the "toString" Method.



- 3- What would be the problem if the no-argument constructor of "Exam" Class was not defined?
- 4- In which case the no-argument constructor is not created?
- 5- The keyword final has different meanings according to the usage, explain it is meaning in case of usage with variables, classes and methods.

(b)

```
1 public class Test {  
2     public static void main(String[] args) {  
3         Exam f = new FinalExam();  
4         if(f instanceof Exam)  
5         {  
6             System.out.println("1");  
7         }  
8         else if (f instanceof FinalExam) {  
9             System.out.println("2");  
10        }  
11        else  
12        {  
13            System.out.println("3");  
14        }  
15    }  
16  
17 }  
18 class Exam{}  
19  
20 class Midterm extends Exam{}  
21  
22 class FinalExam extends Exam {}
```

- 1- What is the expected output ?
- 2- Draw the UML Diagram.
- 3- Is it possible that we replace line 2 by line 3 ?

**Question (3): 20 (MARKS)**

Create three classes: **Triangle**, **Square** and **Rectangle** which have the following properties:

- You can create one array that has objects of these class. ✓
- You can sort the objects in this array using "**java.util.Arrays.sort**" method based on the area of these objects. ✓
- These classes have a method "**printData**" that prints the data of their objects.
- An exception is thrown when invalid data is entered. ✓
- An incremental method is used to increment the object data and this method runs as a thread. ✓
- You can compare between any 2 objects of these classes (based on their areas) using the method "**equals**". ✓

Write a test class that has a main method to show the usage of the above features of these classes.

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END of Exam, Good Luck

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