Obj1		Obj2		Obj3		Obj4		
	30		16		17		12	ı

## **CENG 1004 MIDTERM EXAM**

Name

1) What would be the output of the following code? (5 Pts.) (Objective - 1)

```
public static void main(String[] args) {
    int a = 5, b = 6, c = 7;
    int d = calculate(a++, ++b, c--);

    System.out.println("a= " + a + ", b= " + b + ", c= " + c + ", d= " + d);
}

private static int calculate(int c, int b, int a) {
    return a++ + ++b + c--;
}
```

2) Complete the body of the following method to return minimum of the given values (5 Pts.) (Objective - 1)

```
private static int min(int a, int b, int c) {
```

3) What would be the output of the following code? (5 pts.) (Objective - 1)

```
for (int i = 1; i <= 7; i++) {
    for (int j = 1; j <= 7; j++)
        if ( i < 5 && (j == 5 - i || j == 3 + i)) {
            System.out.print("O");
        }else if (i >= 5 && (j == i - 3 || j == 11 - i)) {
            System.out.print("O");
        }else {
            System.out.print("X");
        }
        System.out.println();
}
```

4) Convert the for loops in Question3 into while loops? (5 Pts.) (Objective - 1)

5) Implement the following function which returns the average of the values in the given 2 dimensional array. (10 Pts.) (Objective - 1)

```
private static double calculateAverage(int[][] values) {
```

6) What would be the return value of the below function for call function(6)? (6 Pts) (Objective - 2)

```
public static int function(int n) {
    if(n == 0 || n == 1 || n == 2)
        return 1;
    else
        return function(n - 1) + 2*function(n - 2) + function(n - 3);
}
```

7) Write a recursion function which calculates the the value of base to the n power. Below find example method calls and their return values. (10 Pts) (Objective - 2)

```
powerN(3, 0) \rightarrow 1
powerN(3, 1) \rightarrow 3
powerN(3, 2) \rightarrow 9
powerN(3, 3) \rightarrow 27
```

8) How many objects are created if you run the following Class? (5 Pts) (Objective - 3)

```
public class Question8 {
   int num;
   public static void main(String[] args) {
      Question8 b = foo();
      b.num = 5;

      Question8 c = b;
      c.num = 4;

      Object obj = c;

      Question8 d = foo();
      d.num = b.num;
   }
   private static Question8 foo() {
      return new Question8();
   }
}
```

9) Consider the following class definition (12 Pts) (Objective - 3)

```
public class Test {
    String aaa;
    public int iii;
    private String ccc;
    protected double ddd;

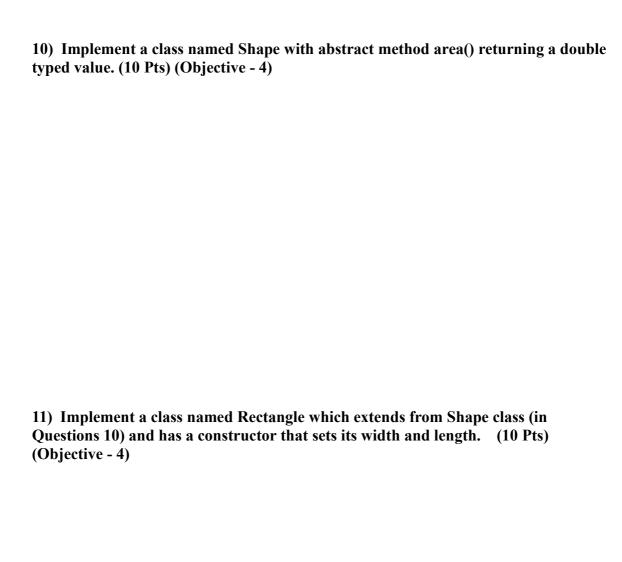
    protected Test() {
    }

    protected boolean methodA() {
        return true;
    }

    public void methodB() {
        return 0.0;
    }

    private int methodD(int days) {
        return 0;
    }
}
```

- A. Which members(fields, constructor, methods) are visible to (accessible from) the subclasses of Test located in different packages?
- B. Which members are visible to (accessible from) only the Test class?
- C. Which members are visible to (accessible from) any class?
- D. Which field(s) should we write getter(s) and setter(s) for, so the subclasses in different packages can access it(them)?



12) Implement a class named Box which extends from Rectangle class (in Question 11) and has a constructor that sets its width, length and height of the box and implements area and volume methods. Reuse existing methods and fields (10 Pts) (Objective - 4)

## 13) Consider the following classes, assume that they are in separate files. (12 Pts) (Objective - 4)

```
public class Animal {
   public String toString() {
      return "I am Animal";
   public static String message() {
      return "Animal";
   }
public class Insect extends Animal {
   public String toString() {
      return "I am Insect " + super.toString();
   public static String message() {
      return "Insect";
public class Spider extends Insect {
   public String toString() {
      return "I am Spider " + super.toString();
   public static String message() {
      return "Spider";
   }
}
What is the expected output of the following code?
   public static void main(String[] args) {
       Animal a0 = new Insect();
       Insect i = new Spider();
       Animal a1 = new Spider();
       System.out.println(a0);
       System.out.println(i);
       System.out.println(a1);
       System.out.println(a0.message());
       System.out.println(i.message());
       System.out.println(a1.message());
   }
```