Obj1		Obj2		Obj3		Obj4	
	30		16		17		42

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) → 1
powerN(3, 1) → 3
powerN(3, 2) → 9
powerN(3, 3) → 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() {

    }

    double methodC() {
        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)?

10) Implement a class named Shape with abstract method area() returning a double typed value. (10 Pts) (Objective - 4)

11) Implement a class named Rectangle which extends from Shape class (in Questions 10) and has a constructor that sets its width and length. (10 Pts) (Objective - 4)

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());
   }
```