Ryerson University
Department of Electrical & Computer Engineering
COE318

Midterm **Oct. 17, 2012**

Name:_____ Student number:_____

Time: **60 minutes**
Circle the name of your Professor: E. Bagheri, K. Clowes, O. Das, T. Yang
This is a closed-book exam. If in doubt on any question, then you must clearly state your own assumption(s).

Question 1. (15 marks)
What is the output when the following is executed?

```
public class Robot {
    static int robotlets=0;
    static int population=0;
    double age;

    //the constructor for the Robot Class
    public Robot(int tempAge)
    {
        age = tempAge;
        population++;
    }

    // A method that generates child robots
    public Robot clone()
    {
        robotlets++;
        return new Robot((int)age-5);
    }

    public static void main(String[] args)
    {
        Robot iRobot = new Robot(100);
        Robot temp = iRobot;

        for (int i=0;i<5;i++)
        {
            if (Robot.robotlets<Robot.population/2)
            {
                temp = temp.clone();
                System.out.println("New Robotlet Age: "+temp.age);
            }
            else
            {
                temp = new Robot(100);
                System.out.println("Population: "+Robot.population);
            }
        }
```

```
    }
}
```

Answer:

Population: 2
New Robotlet Age: 95.0
Population: 4
New Robotlet Age: 95.0
Population: 6

Question 2. (15 marks)
What is the output when the following is executed?

```
public class BirdsNest {
    Bird[] birdsNests;

    //constructor or BirdsNest Class
    public BirdsNest()
    {
      //there are 10 bird nests for the birds to sit in
      birdsNests = new Bird[10];
    }

    public void landInNest(Bird b, int newLoc, int oldLoc)
    {
        birdsNests[newLoc] = b;
        birdsNests[oldLoc] = null;
    }

    public static void main(String[] args)
    {
        BirdsNest ourHome = new BirdsNest();
        for (int i=0;i<10;i++)
        {
            ourHome.birdsNests[i] = new Bird("Bird "+i);
        }

        ourHome.landInNest(ourHome.birdsNests[5], 8, 5);
        ourHome.landInNest(ourHome.birdsNests[8], 5, 8);
        ourHome.landInNest(ourHome.birdsNests[2], 7, 2);

        for (int j=9;j>-1;j--)
        {
              if (ourHome.birdsNests[j]==null)
                     System.out.println("The bird already flew away!");
              else
                     System.out.println(ourHome.birdsNests[j].toString());
```

```
        }
    }
}


public class Bird {
    String name="";

    //Bird Class construcor
    public Bird(String tempName)
    {
        name = tempName;
    }

    public String toString()
    {
        return "I am "+name;
    }
}
```

Answer:

I am Bird 9
The bird already flew away!
I am Bird 2
I am Bird 6
I am Bird 5
I am Bird 4
I am Bird 3
The bird already flew away!
I am Bird 1
I am Bird 0

Question 3. (20 marks)
What is the output when the following is executed?

```
public class D {
  int d = 9;
  D left;

  public D(D left) {
    this.left = left;
  }

  public int getD() {
    return d;
  }

  public void decr() {
    d--;
    if (d == -1) {
      d = 9;
      if (left != null) {
        left.decr();
      }
    }
  }

  public int c() {
    if(left == null) {
      return d;
    } else {
      return d + 10 * left.c();
    }
  }

  public static void main(String[] args) {
    D[] ds = new D[3];
    ds[2] = new D(null);
    ds[1] = new D(ds[2]);
    ds[0] = new D(ds[1]);
    for(int i = 0; i < 200; i++) {
      ds[0].decr();
    }
    System.out.println("ds[2]: " + ds[2].c());
    System.out.println("ds[1]: " + ds[1].c());
    System.out.println("ds[0]: " + ds[0].c());
    System.out.println("ds.length: " + ds.length);
  }
}
```

Answer:

ds[2]: 7
ds[1]: 79
ds[0]: 799
ds.length: 3

Question 4. (10 marks)
What will be the output if we run the main method of the Tester class:
Assume there are two classes - Tester and Product - in the same package.

The source code for the Tester class is:

```
public class Tester {
    public static void main(String[] args) {
        int x = 5;
        Product p = new Product(25);

        System.out.println( x );
        System.out.println( p.getPrice() );

        test( x, p );

        System.out.println( x );
        System.out.println( p.getPrice() );
    }

    public static void test( int j, Product k ) {
        j = 7;
        k.setPrice(16);
        k = new Product(8);
    }
}
```

The source code for the Product class is:

```
public class Product {
    private int price;

    public Product(int i) {
        price = i;
    }

    public void setPrice( int i ) {
        price = i;
    }

    public int getPrice() {
        return price;
    }
}
```

Answer:

5
25
5
16