Ahmadu Bello University, Zaria
Department of Computer Science

2016/2017 First Semester Test 2
COSC 211 Object Oriented Programming I

Date: February 10, 2017 **Time Allowed**: 60 Minutes

Instructions: Attempt **Question 1 and any other two** questions.

1. (**20 marks**). An arithmetic progression (AP) is a sequence of numbers such that the difference between any two consecutive terms is constant. For instance, the sequence 1,2,3,4,5,6,7,8,9,10… is an AP with first term 1, common difference 1 and number of terms 10. Also the sequence 5, 7, 9, 11, 13, 15 is an AP with first term 5, common difference of 2 and number of terms 6.
    a. (**7 marks**). Create an AP class with three fields: first term of type **double**, common difference of type **double** and number of terms of type **int**. Your class should have the necessary getters and setters, and two constructors – a no-args constructor and one that sets the values of the three fields.

```
//AP.java
public class AP{
    private double a;       //first term
    private double d;       //common difference
    private int n;          //number of terms
  //getters
    public double getA(){
            return a;
    }//end of getA()
  public double getD(){
            return d;
    }//end of getD()
  public int getN(){
            return n;
    }//end of getN()
  //setters
    public void setA(double a){
            this.a = a;
    }//end of setA()
  public void setD(double d){
            this.d = d;
    }//end of setD()
  public void setN(int n){
            if (n < 2)
                    n = 2;
            this.n = n;
    }//end of setN()
  //constructor
    public AP(double a, double d, int n){
            setA(a);
            setD(d);
            setN(n);
```

```
    }//end of constructor
  //no-args constructor
    public AP(){
        this(0, 0, 1);
    }//end of no-args constructor

// end of class AP
```

b. (**9 marks**). There should be a method that returns the sum of the AP (using a loop), and a method that returns the value of the n^{th} term. [The n^{th} term is given by a + (n – 1)d.]

```
public double getSum(){
      double sum = 0;
      double term = a;
       for(int i = 0; i < n; i++){
           sum = sum + term;
           term = term + d;
       }
      return sum;
}//end of getSum()

public double nthTerm(){
      return a + (n - 1) * d;
}//end of nthTerm
```

c. (**4 marks**). Write test code that will instantiate at least three objects from this class and demonstrate the use of its methods. In each case the values of the fields should be entered by the user from the keyboard.

```
//TestAP.java
import java.util.Scanner;
public class TestAP {
   public static void main(String[] args){
                Scanner input = new Scanner(System.in);
                System.out.println("Enter the first term, common difference and the number of terms: ");
                double a1 = input.nextDouble();
                double d1 = input.nextDouble();
                int n1 = input.nextInt();
                AP ap1 = new AP(a1, d1,  n1);

                System.out.println("Enter the first term, common difference and the number of terms: ");
                double a2 = input.nextDouble();
                double d2 = input.nextDouble();
                int n2 = input.nextInt();


                AP ap2 = new AP(a2, d2, n2);
                AP ap3 = new AP();
                        ap3.a = 1.0;
                        ap3.d = 2.0;
                        ap3.n = 10;
                        System.out.printf("Sum: %.0f\tTerm: %.0f\n", ap1.getSum(), ap1.nthTerm());
                        System.out.printf("Sum: %.1f\tTerm: %.1f\n", ap2.getSum(), ap2.nthTerm());
                        System.out.printf("Sum: %.0f\tTerm: %.0f\n", ap3.getSum(), ap3.nthTerm());
        }//end of main()
}//end of class TestAP
```

2. (**10 marks**). Study the following code segment carefully and write down its output, if any.

```
String inputLine = "(2+5)/(10-1)";
StringTokenizer tokenizer = new StringTokenizer(inputLine,"+-/",true);
while(tokenizer.hasMoreTokens())
   System.out.println(tokenizer.nextToken());
```

```
(2
+
5)
/
(10
-
1)
```

3. (**10 marks**). Answer both the following questions
   a. (**5 marks**) Study the following code segment and write down its output.

Code segment	Output

`for(i=0; i<7; ++i){`
`  for (j=0;j<i; ++j)`
`  System.out.println(i*j);`
`}`
	0
	0
	2
	0
	3
	6
	0
	4
	8
	12
	0
	5
	10
	15
	20
	0
	6
	12
	18
	24
	30

   b. (**5 marks**). Write Java statement(s) to create an object of the ShoppingBasket class below:

```
public class ShoppingBasket{
  private ShoppingBasket sb;
  private double unitPrice;
  private int quantity;
  public ShoppingBasket(ShoppingBasket s, double p, int q){
    sb  = s;
    unitPrice = p;
    quantity = q;
  }
  public ShoppingBasket(){
     this(null,0.0,0);
  }
  public static void main(String[] args){
     ShoppingBasket sb = new ShoppingBasket(new
ShoppingBasket(),30.5,4);
  }
}
```

4. (**10 marks**). Create a one-dimensional array of 1000 objects of the AP class in Question 1. Initialize the even entries in the array with AP objects.

```
AP[] ap = new AP[1000];
for(int i=0;i<ap.length;i++){
        if(i % 2 == 0){
                ap[i] = new AP(i, i, i);
        }
}
```