In each of the following Java examples there are more than one error. Indicate these errors and give your comment (why you consider it as an error?). (*Give a possible solution under each example*).

# Example 1

```
public interface Interface1 {
    public void g();
    public void f();
}
```

```
public class Class1 implements Interface1{
    private int a =2;
    public Class1(){}
    public void g("Hi") {
        System.out.println("Hi");
    }
    public int f(){return a;}
}
```

# Example2

```
public abstract class Abstract1 {
    protected int a =2;
    public Abstract1(){}
    public void g(){
        System.out.println("Hi");
    }
    Public abstract int f(){};
}
```

```
public class Class1 extends Abstract1{
    public Class1(){}
    public int f(){return a;}
}
```

```
public class AbstractDriver1 {
   public static void main(String[] args) {
        Abstract1 x = new Abstract1();
        Class1 y = new Class1();
   }
}
```

## Example3

```
abstract public class Class1 {
   protected int a = 0;

   public Class1() {
       System.out.println("Welcome to Class1");
   }

   public Class1(int a) {
       this.a = a;
       System.out.println("Welcome to Class1");
   }
   abstract public void f();
}
```

```
public class Class1_1 implements Class1 {
    public Class1_1() {
        System.out.println("Welcome to Class1_1");
    }
    public Class1_1(int a) {
        System.out.println("Welcome to Class1_1");
        super(a);
    }
}
```

# **Question 2**

We consider the following one interface: **Taxable**, and three classes: **Certificate**, **Employee**, and **Teacher**.

# **Employee**

All attributes should be declared to be private.

- int id //an integer to identify each employee.
- String name
- Certificate diploma
- int rank

//an integer to classify an employee position that can be assigned only the values 1, 2, or 3.

#### +Constructor

#### +String toString()

//to return information about an employee in a formatted string in the following format:

4567 Imad Sami holding a BS degree in IT, and has rank 2

## +int getRank()

//returns the rank of an employee



#### Certificate

- String major
- String degree 7/BS, MS, PhD, ...
- + Constructor
- + toString()
- + getters/setters

# <<Taxable>>

final double  $INCOME\_TAX = 0.7$ 

- + double monthlyTaxAmount()
- + double totalTaxAmount(int nbMonths)

# Teacher

//an integer to store the number of hours taught by a teacher

#### - int hours

//an integer that is shared by all objects of the class Teacher. It should accumulate the value of all teachers' salaries.

- double totalsalary
- + constructor()
- + double calculateSalary()

//Returns the salary of a teacher. Note that the salary is equal to:

- hours \* 75000 if rank = 1.
- hours \* 50000 if rank = 2.
- hours \* 40000 if rank = 3.

### + double getTotalSalary()

//Returns the value of totalsalary.

+ String toString()

implements

//Returns information about a teacher as follows: 4239 Roger Eid holding a MS degree in CCE and has rank 2 Hours = 30, Salary = 1500000.

a) Write the interface Taxable by specifying its attributes and methods.

- b) Write the class Certificate by:
  - 1- declaring all its attributes.
  - 2- defining its constructor.
  - 3- writing the attributes' setters and getters
  - 4- implementing its toString()
- c) Write the class Employee by:
  - 1- declaring all its attributes.
  - 2- defining its constructor.
  - 3- implementing its toString()
  - 4- writing the getRank() method
- d) The class Teacher is a subclass of Employee. In plus, it should implement the interface Taxable. Write the class Teacher by:
  - 1- declaring all its attributes.
  - 2- defining its constructor.
  - 3- implementing its toString() method
  - 4- writing a possible implementation for the methods of the interface Taxable

Note: the *nbMonths* argument of the method *totalTaxAmount(int nbMonths)* represents the number of months for which we would like compute the total sum of taxes.

- 5- writing the calculateSalary() method
- 6- writing the getTotalSalary() method
- .Writing a driver class. In this class you are asked to create two methods:
  - a) The method main(), in which:
- 1- create an array of 3 objects of type **Teacher** using data input by the programmer (not the user)
- 2- display information about each object using the toString() method of the class Teacher.
- 3- display the total salary of all teacher in this array.
- 4- display information about the teacher with the highest salary in the array by calling the method displayMaximum() that you are asked to write in the next part b).
  - b) The method *public void displayMaximum(Teacher [] list)* that receives an array of teachers to display information about the teacher with the highest salary.