



United International University
CSI 211: Object Oriented Programming, Spring 2018
Mid Term Exam
Total Marks: 30, Time: 1 hour 45 minutes
Answer all 5 questions (5 X 6 = 30).

Question 1

- (a) Complete the **Student** class below by adding appropriate attributes and/or methods such that running the main method provides the following expected output. You must not modify the main method. [4]

<pre> public class Student { private String name, id; private double cgpa; public static void main(String[] args){ Student s1 = new Student("011162101", "Kratos", 3.0); Student s2 = new Student("011162102", "Thanos", 4.0); System.out.println("Before swap"); System.out.println(s1); System.out.println(s2); swap(s1, s2); System.out.println("After swap"); System.out.println(s1); System.out.println(s2); } } </pre>	<p>Expected Output:</p> <pre> Before swap 011162101 Kratos 3.0 011162102 Thanos 4.0 After swap 011162102 Thanos 4.0 011162101 Kratos 3.0 </pre>
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Or

Write three classes: **Animal**, **Cat**, and **AnimalHeredityTest**. The **Animal** class has three **private** variables: **vegetarian**, **eats**, and **noOfLegs**. On the other hand, **Cat** class has only one private variable: **color**. **Cat** class inherits **Animal** Class. In **AnimalHeredityTest** class, create an object **c1** of **Cat** class and display the properties of the object **c1** and its parent's. Use any of the Object Oriented feature to access the private variables of the base and child classes. Note: You need to write code for all 3 classes. [4]

- (b) What is probably wrong with the following code? Explain briefly. [2]

<pre> package p1; public class Test3 { int addTwoNumbers(int a, int b) { return a + b; } } </pre>	<pre> package p2; import p1.*; public class Test1 { public static void main(String args[]){ Test3 obj = new Test3(); obj.addTwoNumbers(10, 21); } } </pre>
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Question 2

- (a) What will be the output of the following code? Answer one of them. [2]

<pre> public class E { int a; public int getA() { return a; } public void setA(int a) { a = a; } E show() { return this; } public static void main(String[] args) { E obj = new E(); obj.setA(10); System.out.println(obj.getA()); E obj2 = obj.show(); System.out.println(obj2.getA()); } } </pre>	OR	<pre> public class E { public static void main(String[] args){ int a = 10; double b = 5; String c = "Bazinga"; System.out.println(a + b + c); System.out.println(c + a + b); System.out.println(b + a + c); } } </pre>
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(b) Write down the output of the program below.

[4]

```
public class TestAnimal {
    public static void main(String[] args){
        Animal a = new Animal("Rat");
        Dinosaur d = new TRex();
        a.display();
        d.display();

        a=d;
        a.display();
        d=(Dinosaur)a;
        d.display();
    }
}

class Animal{
    String name;
    float weight;
    Animal(String n){ name = n; }

    public void display(){
        System.out.println("Animal can be Omnivorous.");
    }
}
```

```
class Dinosaur extends Animal{
    Dinosaur(String n) {
        super(n);
    }

    public void display(){
        System.out.println("Dinosaur mostly Herbivorous");
    }
}

class TRex extends Dinosaur{

    TRex(){
        super("TRex");
    }

    public void display(){
        super.display();
        System.out.println("but "+name+" is carnivorous");
    }
}
```

Question 3

- (a) "The package is both a naming and a visibility control mechanism."-explain the statement. [2]
- (b) Briefly explain with an appropriate example the differences between Class, Reference and Object. [2]
- (c) Can an **abstract method** be declared **private**? Explain your answer. [2]

Question 4

- (a) Create two concrete Java classes **Cat** and **Dog** such that the main method produces the expected output. You must not modify the **Pet** and **Main** class and it **is not necessary to re-write** them in your answer script. Note that a Cat's body gets heated if its body temperature is at least 50 units whereas for a dog it is 80 units. [4]

```
abstract public class Pet {
    int bodyTemperature;

    public Pet(int bodyTemperature) {
        this.bodyTemperature = bodyTemperature;
    }

    abstract void make_noise();
    boolean is_heated() {
        return (bodyTemperature >= 80);
    }
    final void sleep() {
        System.out.println("Pet sleeping");
    }
}
```

```
public class Main {

    public static void main(String[] args) {
        Pet [] pets = new Pet[2];
        pets[0] = new Cat(50);
        pets[1] = new Dog(60);

        for (Pet p : pets) {
            p.make_noise();
            System.out.println("Warm: " + p.is_heated());
            p.sleep();
        }
    }
}
```

Expected output:

Meow
Warm: true
Pet sleeping
Ghew
Warm: false
Pet sleeping

- (b) Assume there is a java class named **Voter** which has 3 attributes **name**, **voterId** and **age**. Carefully observe the code below; the **output** of the code is **false** as v1 and v2 are 2 different objects with 2 different names. But in reality v1 and v2 refer to the same person; v1 is using his first name and v2 using last name.

What changes do you need to implement in Voter class so that the output of following code segment is **true**? You do not need to write the complete code of **Voter** class, write just the code segment that is required for the expected output. [2]

```
public static void main(String[] args) {
    Voter v1 = new Voter("Hasan", "001227593", 70);
    Voter v2 = new Voter("Mahmud", "001227593", 70);
    boolean isSamePerson = v1.equals(v2);
    System.out.println(isSamePerson);
}
```

Question 5

- (a) Consider the Vector2D class. [3]

We want to add **multiplication** methods in this class. If a vector is **multiplied by a real number**, then both **x** and **y** values are simply multiplied by that real number. If it is **multiplied by another vector v**, then it will follow the rule of dot product. **Dot product of two vectors u & v**, **$u.v = u.x*v.x + u.y*v.y$** .

In this Vector2D class, write two overloaded methods for **multiplication**; 1) **one method takes a double parameter**, does the real number multiplication, then returns a Vector2D object and 2) the **other one takes a Vector2D parameter**, does the dot product and then return a double number.

```
public class Vector2D{
    double x, y;
    Vector2D(){
        x = 0;
        y = 0;
    }
    Vector2D(double x, double y){
        this.x = x;
        this.y = y;
    }
}
```

- (b) Find and fix the errors in the given code snippet. For each error, point out the error, explain why it is an error and write down a possible way to fix it. You can edit any line of code but you are not allowed to delete any line of code. [3]

```
class A{
    public static final int var;
    public int par;
    static{
        var = 10;
        par = 5;
        System.out.println("Static block in A");
    }
    void meth(){
        var = 15;
        System.out.println("Method in class A");
    }
}
class B extends A{
    final void meth(){
        var += 20;
        System.out.println("Method in class B");
    }
}
```

```
final class C extends B{
    int star;
    void meth(){
        System.out.println("Method in class C");
    }

    public static void main(String[] args) {
        B obj1 = new B();
        B obj2 = new B();
        obj1.meth();
        star = 100;
        System.out.println("par = " + obj1.par + ",
var = " + obj2.var + ", star = " + star);
    }
}
```