**Name:**

**CSC 229 Homework 4 100 Points**

**Enter your answers into this file, save as a MS Word file (NOT PDF), submit through BB and as an attachment to email to:** [**seyedt1@southernct.edu**](mailto:seyedt1@southernct.edu)

**(20). 1. Develop an abstract class Shapes3D to represent all 3D geometric shapes. Class should represent the name of the shape (a string) the color of the objects (Color) and methods that all subclasses should implement (abstract methods) including:**

* **getAttributes**
* **getSurfaceArea**
* **getVolume**

**(5) Complete the UML**

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| **Shapes3D** |
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|  |

**(5) Develop the complete Abstract class.**

**(20) 2. Using the class Shape3D in question 1 Develop UML and the complete class for Cylinder.**

**(20) 3. Answer the following questions:**

1. **What is the purpose of defining a superclass Shape3D?**
2. **How do you explicitly invoke constructor of Shape3D in class Cylinder class (list actual Java statement)?**
3. **What is method overloading?**
4. **What is method overriding?**
5. **What is a package?**
6. **Given the following definition:**

**package p1;**

**public class X**

**{**

**protected double m;**

**private int n;**

**public float p;**

**String q;**

**}**

1. **Is m accessible from classes inside package p1?**
2. **Is n accessible from classes outside package p1?**
3. **Is p accessible from classes outside package p1?**
4. **Is q accessible from classes inside package p1?**

**(20) 4. Given the inheritance rules, mark the table entries with x if a data member/method is accessible to a class:**

|  |  |  |
| --- | --- | --- |
| **Package P** |  | **Package q** |
| |  | | --- | | **Public class C1** | | **{**  **private int a;**  **public double b;**  **int[] c;**  **protected String d;**  **public void m1()**  **{**  **}**  **}** | | |  | | --- | | **Public class C3 extends C2** | | **{**  **.**  **.**  **.**  **}** | |
| |  | | --- | | **Public class C2** | | **{**  **public int e;**  **protected double f;**  **public int[] g;**  **protected void m2()**  **{**  **}**  **}** | | |  | | --- | | **Public class C4 extends C1** | | **{**  **.**  **.**  **}** | |
| |  | | --- | | **Public class C5** | | **{**  **.**  **}** | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **a** | **b** | **c** | **d** | **e** | **f** | **g** | **m1** | **m2** |
| **C1** |  |  |  |  |  |  |  |  |  |
| **C2** |  |  |  |  |  |  |  |  |  |
| **C3** |  |  |  |  |  |  |  |  |  |
| **C4** |  |  |  |  |  |  |  |  |  |
| **C5** |  |  |  |  |  |  |  |  |  |

**(20) 5. Amazon asked you to develop a class hierarchy for the employees. There are three types of employees in the bank:**

1. **Executives: start date, bonus**
2. **Managers: start date, buyout amount**
3. **Sales personnel: sales area, car allowance**
4. **Secretary: typing speed**

**Information system maintains personal information on all employees including:**

* **Employee number**
* **Social security number**
* **Name**
* **Position**
* **Salary**

**Draw a complete UML diagram for the entire class hierarchy**

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| --- |
| **Staff (superclass)** |
| * **Staff number** * **Social Security Number** * **Name** * **Position** * **Salary** |
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