**UNITY UNIVERSITY**

**DEPARTMENT OF COMPUTER SCIENCE**

**NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_IDNO\_\_\_\_\_\_\_\_\_\_\_\_DEPARTMENT\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***Part One: Read the questions 1 to 6 carefully and give short and precise answer for each questions in the boxes provided under each questions (20 points).***

1. When an overridden method is called from within the sub-class? Explain the two events observed both in the super class and subclass of overridden method (2 points)
2. Write the difference between Overloading and Overriding methods (4 points)

|  |  |
| --- | --- |
| **Overloading Method** | **Overriding Method** |
|  |  |

1. Write down the syntax or general form to define a subclass, abstract class and to declaration of objects of a class by giving examples (4 points).
2. **Syntax to define Subclass**
3. **Syntax to declare Objects**
4. List down the uses of the **final** key word when it is used with inheritance (2 points).
5. Explain the difference between **this** keyword and **super** keyword and write the syntax for super when super is used to call super class constructor and access instance members of the super class (3 points)

|  |  |
| --- | --- |
| **this keyword** | **Super keyword** |
|  | 1. Syntax to call super class constructor 2. Syntax to access super class members |

1. Explain about Upcasting , ***Abstract Class and properties of Abstract*** class by giving examples (5 points)

|  |  |
| --- | --- |
| ***Upcasting*** | ***Abstract Class*** |
|  | ***Properties of Abstract Class*** |

***Part Two:- Read the java code that is described in each of the following questions (7- 9) carefully and identify the syntax errors you observed and write your answers inside the box provided under each questions (15 points)***

1. Observe the following simple java program and identify the syntax errors and write only the correct code to make the program error free (3 points)

**Syntax Errors**

final class A {

final void meth() {

System.out.println("This is a final method.");

}

}

class B extends A {

void meth() {

System.out.println("This is from sub class B");

}

}

1. Identify the syntax errors you observed for the following java program and write your answer inside the box provided below (7 points).

final class A{

private int i;

public A(){

i=0;

}

public A(int i){

this.i=i;

}

public void M1(){

System.out.println("This is from A");

}

**Syntax Errors**

}

final class B extends A{

privateint j;

public B(){

j=0;

}

public B(int i, int j){

super(i);

this.j = j;

}

public void M2(){

System.out.println("This is from B");

}

}

class C extends B{

protectedint k;

public C(){

k = 0;

}

public C(int i, int j, int k){

super(i, j);

this.k = k;

}

public void M3(){

System.out.println("This is from C");

}

}

classTestOfInheritance{

public static void main(String args[]){

A o = new (10, 4);

B o1 = new (11, 20, 2);

C o2 = new C(3, 5, 9);

o1.M3();

o.M2();

System.out.println(" k = " + o2.k);

System.out.println(" i and j ="+o2.i+" "+o2.j);

}

}

1. Refer questions number 7 and 8 above and write only those codes that are necessary to make the program correct and error free for both questions in the space provided below (5 points).

**Correct Code for Question no. 7**

**Correct Code for Question no. 8**

***Part Three:-Read the java code that is described in each of the following questions (10-12) carefully and determine the output of the program you expect and write your answers inside the box provided under each questions (15 points)***

1. What is the output of the following java program? Write the output inside the box below (5 points).

class A1 {

int i, j;

A1(int a, int b) {

i = a;

j = b;

}

// display i and j

void show() {

System.out.println("i and j: " + i + " " + j);

}

**Output**

}

class B1 extends A1 {

int k;

B1(int a, int b, int c) {

super(a, b);

k = c;

}

// display k – this overrides show() in A1

void show() {

System.out.println("k: " + k);

}

}

class MethodOverriding {

public static void main(String args[]) {

B1 subOb = new B1(1, 2, 3);

subOb.show(); // this calls show() in B1

}

}

1. Determine the output of the following simple java program and indicate the implementation of this program (5 points).

**Output**

class A{

protected int i;

public A(int i){

this.i = i;

}

public void Increment(A parent){

parent.i++;

System.out.println("Incremented I of A = "+parent.i);

}

}

class B extends A{

public B(int i){

super(i);

}

public void Decrement(B child){

child.i--;

System.out.println("Decremented I of B = "+child.i);

}

}

class Test{

public static void main (String args[]){

B b1, b2;

A a1;

b1 = new B(11);

b2 = new B(22);

a1 = new A(110);

a1.Increment(a1);

a1.Increment(b1);

b1.Decrement(b2);

b1.Decrement(b1);

}

}

***Part Four:-* Writing a program*. Write a java program based on the information given to you for the following three questions (13-15). Make your writing neat and provides comment if it is possible to make the program more readable. Use the attached blank paper for your answers (20 points)***

13.

14. Write a program to calculate area of rectangle and perimeter of rectangle, area of circle and circumference of a circle, area of right angle triangle and volume of cylinder in which rectangle, circle, cylinder and right angle triangle inherits both the properties and behavior of the super class shapes. Define the necessary attributes constructors and methods to implement this work. Consider the following information for your work.

* + - Perimeter of a rectangle is calculated as 2\*(width \*height)
    - Circumference of a circle is calculated as 2\*(area of a circle)
    - Area of a circle is calculated as Math.PI\*(radius \* radius)
    - Volume of a cylinder is calculated as 2\*(area of a circle() +circumference of a circle())\*height

15. Write simple java program to implement both method overloading and overriding based on the following information. Use Class A as a super class and class B and C as a subclass, where B inherit properties and methods of class A and C inherits both the properties and methods of class B and A. You can use any kind instance variables and methods which does not violate the java convention about method and variable declaration to implement this activity (10 points).