**Assignment 4: Deadline:1-01-2025**

**Simple Inheritance:**

**Task 1: (CLO1,CLO2,CLO3)**

Create a Book class as base class that have data member Name (string), inherited with Computer Science class that have data member Author name (string). Each of two classes should have setters, getters and display functions. Also add appropriate constructors and destructors in all classes. Write main to test the book and author class by creating instances and setting and getting data by appropriate functions.

**Task 2: (CLO1,CLO2,CLO3)**

Create Calculator class as base class that have member function add(int,int), SC\_calculater as derived class hat have data member function square(int,int). Each of two classes should have Setters, getters and display functions. Also add appropriate constructors and destructors in all three classes. Write main to test the calculator and SC\_ calculator by creating instances and setting and getting data by appropriate functions.

**Hierarchal Inheritance:**

**Task 3: (CLO1,CLO2,CLO3)**

Imagine a publishing company that markets both books and Audiocassettes versions of its work. Create a class Publication that stores the title (String) and price (Float) of a publication. Now inherit this class to two further classes: 1. Book that has count (Integer) data member. 2. Audiocassettes which has playing time (Float) data member. Each of these classes should have setters, getters and display functions also add appropriate constructors and destructors in all three classes. Write a main function to test functionality of all these classes by creating instances.

**Task 4: (CLO1,CLO2,CLO3)**

Create a class Personthat stores name (String) and id (Float) of a person. Now inherit this class to two further classes: 1.Student which has grade (char) and marks (Integer). 2. Teacher which has salary (float) and tax(float). Each of these classes should have setters, getters and display functions also add appropriate constructors and destructors in all three classes. Write a main function to test functionality of all these classes by creating instances.

**Multi-level Inheritance**

**Task 5: (CLO1,CLO2,CLO3)**

Extend task 4 inherit student class with further two classes. 1. BS\_student that has Project(String) data member. 2.MS\_student which has Survey\_summary(String) Each of these classes should have setters, getters and display functions also add appropriate constructors and destructors in all three classes. Write a main function to test functionality of all these classes by creating instances.

**Task 6: (CLO1,CLO2,CLO3)**

**Shape Inheritance Hierarchy**

1. ADT: BasicShape

Design a BasicShape class that has the following members:

# Private Member Variable:

* + area, a double used to hold the shape’s area.

# Public Member Functions:

* getArea – return the value in the member variable area.
* calcArea – a virtual function that display a message “Basic Shape Calculate Area Function…”.

1. ADT: Circle

Design a Circle class that is derived from the BasicShape class. The Circle class should have the following members:

# Private Member Variable:

* + centerX, a long integer used to hold the x coordinate of the circle’s center.
  + centerY, a long integer used to hold the y coordinate of the circle’s center.
  + radius, a double used to hold the circle’s radius. Public Member Functions:
* constructor – accepts values for centerX, centerY, and radius. Should call the overridden calcArea function described below.
* getCenterX – returns the value in centerX.
* getCenterY – returns the value in centerY.
* calcArea – calculates the area of the circle (area = 3.14159 \* radius \* radius) and stores the result in the inherited member area.

1. ADT: Rectangle

Design a Rectangle class that is derived from the BasicShape class. The Rectangle class should have the following members.

# Private Member Variable:

* + width, a long integer used to hold the width of the rectangle.
  + length, a long integer used to hold the length of the rectangle.

# Public Member Functions:

* constructor – accepts values for width and length. Should call the overridden calcArea function described below.
* getWidth – returns the value in width.
* getLength – returns the value in length.
* calcArea – calculates the area of the rectangle (area = length \* width) and stores the result in the inherited member area.

1. Main Function

Demonstrate the classes in a program that has a BasicShape pointer. Initialize it with the dynamically created object of Circle and make call to calcArea function, then assign the BasicShape’s pointer with dynamically created Rectangle objects and make call to calcArea function.