Date : 15-04-2023 Approved by :

Assignment: 10 Sheet : 1 OF 1

Course :PROGRAMMING Batch No. :

Module :CPP Type Practical : Internal

Time : Marks :

**Multiple Inheritance**

**1. Multiple Inheritance: Combining Different Functionalities**

**Problem Statement:** Create a C++ program using multiple inheritance to combine two functionalities into one class. Define two base classes: Printer and Scanner.

* The Printer class should have a method print() that outputs "Printing document...".
* The Scanner class should have a method scan() that outputs "Scanning document...".
* Define a derived class MultiFunctionDevice that inherits from both Printer and Scanner. This class should have a method display() that outputs "Multi-function device in use", and call both print() and scan() methods from the base classes.

Write the C++ code to demonstrate the functionality of the MultiFunctionDevice by calling all relevant methods.

**2. Multiple Inheritance: Managing a Student and Faculty System**

**Problem Statement:** Create a system for managing a Student and Faculty using multiple inheritance. Define two base classes: Student and Faculty.

* The Student class should have attributes name (string), rollNo (int), and a method study() that outputs "Studying...".
* The Faculty class should have attributes facultyName (string), department (string), and a method teach() that outputs "Teaching students...".
* Define a derived class TeachingAssistant that inherits from both Student and Faculty. The TeachingAssistant class should have an additional method assist() that outputs "Assisting with teaching...".

Write the C++ code to create an object of TeachingAssistant and demonstrate calling methods from both Student and Faculty base classes.

**3. Multiple Inheritance: Shape and Color System**

**Problem Statement:** Design a system where a class ColoredShape uses multiple inheritance from two base classes: Shape and Color.

* The Shape class should have an attribute area (float) and a method calculateArea() that outputs the area of the shape.
* The Color class should have an attribute color (string) and a method setColor() that sets the color of the shape.
* The derived class ColoredShape should inherit from both Shape and Color, and provide a method displayDetails() that shows both the area and color of the shape.

Write the C++ code to create a ColoredShape object, set the color, calculate the area, and display both the area and color.

**Hierarchical Inheritance**

**1. Hierarchical Inheritance: Employee and Manager System**

**Problem Statement:** Design a system with a base class Employee and two derived classes Manager and Engineer, using hierarchical inheritance.

* The Employee class should have the attributes name (string) and id (int), along with a method displayInfo() to show these details.
* The Manager class should inherit from Employee and add an additional attribute department (string). It should also have a method displayManagerInfo() to display the department.
* The Engineer class should inherit from Employee and add an additional attribute specialization (string). It should also have a method displayEngineerInfo() to display the specialization.

Write a C++ program that creates objects of both Manager and Engineer and demonstrates how each derived class can access and extend the functionality of the base class.

**2. Hierarchical Inheritance: Animal Classification**

**Problem Statement:** Create a class hierarchy to classify animals using hierarchical inheritance. The base class Animal should be inherited by two derived classes Mammal and Bird.

* The Animal class should have attributes name (string) and age (int). It should have a method sound() that outputs "Animal makes a sound".
* The Mammal class should inherit from Animal and have an additional attribute furType (string), along with a method displayFur() to display the type of fur.
* The Bird class should inherit from Animal and have an additional attribute wingSpan (float), along with a method displayWingSpan() to display the bird's wingspan.

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Question Paper :ITC-EDU-IE-1204-S-069-1211 Sheet : 2 OF 3

Question Paper :ITC-EDU-IE-1204-S-069-1211 Sheet : 3 OF 3

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| Write the C++ program to demonstrate the hierarchical inheritance by creating objects of Mammal and Bird and displaying their respective information.  **3. Hierarchical Inheritance: Vehicle System**  **Problem Statement:** Design a vehicle system using hierarchical inheritance. Create a base class Vehicle and two derived classes Car and Truck.   * The Vehicle class should have the attributes make (string), model (string), and year (int), along with a method displayInfo() that shows these details. * The Car class should inherit from Vehicle and add an attribute seatingCapacity (int). It should also have a method displayCarInfo() to display the seating capacity. * The Truck class should inherit from Vehicle and add an attribute loadCapacity (float). It should also have a method displayTruckInfo() to display the load capacity.   Write the C++ code to create objects of Car and Truck and display the vehicle details for both using the hierarchical inheritance structure. |  |

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