

Programming Laboratory-I

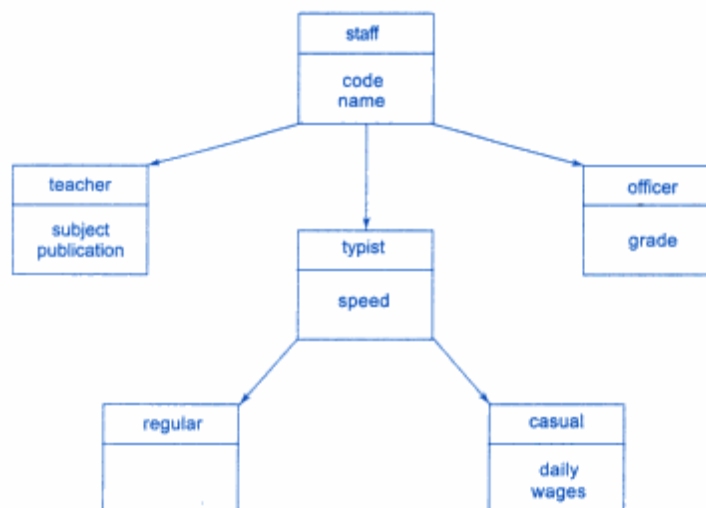
Assignment No-3

(Inheritance and Operator overloading)

Due date-19/9/22

1. Make a class named Fruit with a data member to calculate the number of fruits in a basket. Create two other class named Apples and Mangoes to calculate the number of apples and mangoes in the basket. Print the number of fruits of each type and the total number of fruits in the basket.
2. Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle".
Now, try calling the function by the object of each of these classes.

3. An educational institution wishes to maintain a database of its employees. The database is divided into a number of classes whose hierarchical relationships are shown in below Fig. The figure also shows the minimum information required for each class. Specify all the classes and define functions to create the database and retrieve individual information as and when required.



4. The database created in above example does not include educational information of the staff. It has been decided to add this information to teachers and officers (and not for typists) which will help the management in decision making with regard to training, promotion, etc. Add another data class called education that holds two pieces of educational information, namely, highest qualification in general education and highest professional qualification. This class should be inherited by the classes teacher and officer. Modify the above program to incorporate these additions.
5. Using Hybrid inheritance, design a program which will solve real life problem.
6. Design a class Polar which describes a point in the plane using polar coordinates radius and angle. A point in polar coordinates is shown in below Fig. Use the overloaded + operator to add two objects of Polar. Note that we cannot add polar values of two points directly. This requires first the conversion of points into rectangular co-ordinates, then adding the corresponding rectangular co-ordinates and finally converting the result back into polar co-ordinates.

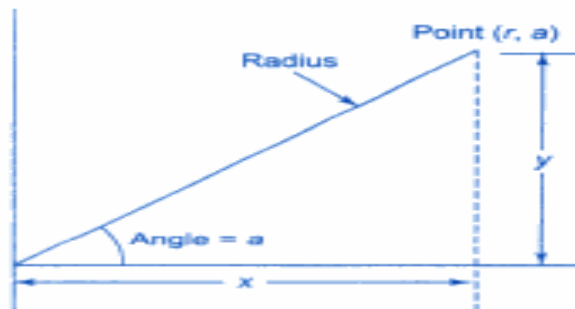
You need to use the following trigonometric formulae:

$$x = r * \cos(a);$$

$$y = r * \sin(a);$$

$$a = \arctan(y/x); \text{ // arc tangent}$$

$$r = \sqrt{x^2 + y^2};$$



7. Create a class INTEGER that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of INTEGER.

8. Create a class MAT of type $m \times n$. Define all possible matrix operations for MAT type objects.
9. Define a class String. Use overloaded `==` operator to compare two strings.