

Lab exercises – 4

Date : 12.09.2020

Level – I (10 marks)

1. Define an Abstract class called **Time** that has protected data fields: **seconds**, **minutes** and **hour** of type integer. **Time** should have **get** methods and constructors (default, three arguments), **display()** that prints the instance data fields. Derive two classes from class **Time** : **TwentyFrHrClock** and **TwelveHrClock**. Override the display function in the derived classes to print the respective instance as 24-hr clock display and 12-hr clock display.

Provide the following instance method to class **TwentyFrHrClock**: **timeelapsed(int)** method that takes the number of seconds of elapsed and the instance invoking method should add the seconds to its seconds data field. If the seconds exceed 60, the minute should be incremented and subsequently the hour has to be incremented if exceeds 60 minutes.

Provide the following instance method to class **TwelveHrClock**: **int difference(Time)**: that returns the number of seconds which is the difference between the two Time instances.

Write a Test program that demonstrates the functionalities of all the classes.

2. Write an abstract class called **Person** whose protected data fields are: **name(String)**, **age(int)**, **height(double)** and **weight(double)**. The methods are: constructor with four arguments, get methods and **toString()** to display the details of Person.

Derive class called **FootballPlayer** and **Cricketer**. **FootballPlayer** with data fields: **teamname(String)**, **uniformnumber(int)** and **numberofgoals(int)**. Provide the following methods : constructor, **int getnogoals()** that returns the number of goals obtained by the player and override **toString()** that displays **FootballPlayer** details. **Cricketer** will have data fields: **countryname(String)**, **role(String)** which indicates the role played by the person as batsman, bowler, all-rounder, and wicket-keeper, **nowickets(int)** and **noruns(int)**. The methods are: constructor, get methods and overridden **toString()** that displays the details of **Cricketer**. Write a test application to invoke the functionalities of the each class.

Level – 2(10 marks)

3. Implement the following interface for the **Invoice** class defined in the previous lab session:

```
public interface TaxCalculator{  
  
    public static final salestaxrate = 0.30;  
  
    public abstract double calculateTax();  
  
}
```

4. Create an interface for the class **Time** defined as follows:

```
public interface StopWatch{  
  
    public static final TimerSeconds = 20;  
  
    public abstract void StartTimer();  
  
}
```

Level -3 (5 marks)

5. Create an array of **Person** and store the references of derived classes. Invoke the methods of different classes using Person array variable. Define another arraylist<FootBallPlayer> that stores instances of FootbalPayers in the ascending order of goals.