CA Exam MAR-04

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- MODULE: CA269 - Computer Programming 4 (Object Oriented Prog)
- PROGRAMME(S): CASE BSc in Computer Applications (Sft.Eng.); DS BSc in Data Science; ECSAO Study Abroad (Engineering & Computing); ECSA Study Abroad (Engineering & Computing)
- YEAR OF STUDY: 2,O,X
- EXAMINER(S): Dr. Harshvardhan Pandit (Internal) (Ext:6008)
- TIME ALLOWED: 2 Hours
- INSTRUCTIONS: Answer all questions.

- The exam will take place in the labs.
- Submissions for the exam will be uploaded to ***Einstein*** (https://ca269.computing.dcu.ie/einstein/) as indicated in the question.
- **There are NO tests on Einstein for each upload.**
- Only the course website may be accessed. Any other material or resource is not allowed.
- If you have submitted any config/resources: access them here
- Access Java documentation here
- **Submit your solution for Q1 to *Einstein* (https://ca269.computing.dcu.ie/einstein/) in a file called** `CAExam.java` . This is a single upload for Q1a, Q1b, and Q1c.

Weather in Ireland can be complex with rainfall, sunshine, winds, and snow occuring all within the same day. Model this using Object-Oriented programming concepts in Java.

Q1a (10 marks)

Write an interface called `Weather` that has methods for the following:

- `getName` to get the name of the weather, e.g. "Rainy", "Sunny"
- `getDuration` to get the minutes the weather was in effect during the day, e.g. "60", "600"
- `wasItRainy` to get whether it rained when the weather was in effect - this will be either true/yes or false/no

- `wasItSunny` to get whether it was sunny when the weather was in effect - this will be either true/yes or false/no
- `wasItWindy` to get whether it was windy when the weather was in effect - this will be either true/yes or false/no
- `wasItSnowy` to get whether it snowed when the weather was in effect - this will be either true/yes or false/no

Write a class called `TypicalDay` which implements `Weather` with the default values for name as "Typical Day", duration as 1440 minutes, and where it rains, is sunny, windy, and snowy within the same day. For the name and duration, write appropriate getters and setters such that the name cannot be less than 5 letters and the duration cannot be less than 60mins.

Q1b (10 marks)

Write a class called `WeatherStation` which keeps records of the weather in terms of how many hours of sunshine, rain, winds, and snow have occurred. The `WeatherStation` contains the following features:

- a list of `Weather` instances
- a map or dictionary which has string keys as weather type (e.g. 'rainy') and integer values as the count of duration for that weather in hours e.g. "Sunny: 2" would represent sunny weather for a total of 2 hours
- method `addWeather` which takes in an instance of `Weather` and adds it to the list, and increments appropriate counters for sunshine, rain, etc.

Q1c (5 marks)

Implement the singleton pattern using generics in a classed called `SingleWeather` such that only classes implementing `Weather` can be used with it. Write methods to retrieve and set the singleton.

Submission

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