INFO 210 — Database Management Systems
Assignment – Milestone 4

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1 Logistics

The following exercises are for the INFO 210 course in the year 2023. Solutions for the example must be provided as one PDF and uploaded to the course's Moodle page by 18:10, December 8, 2023, at the latest.

2 Querying a Database

The goal of the fourth assignment of your project is to

1. query your PostgreSQL database using the SQL query language;
2. practice queries in relational algebra.

For this milestone, you will have an occasion to apply the material of the lectures on relational algebra and the SQL query language.

3 Requirement Queries

As the first step in your requirement collection, you have specified 10 queries from your application's domain. Now, try to express them in SQL.

It may be the case that some of your queries were too ambitious, so SQL cannot capture them. In that case

- explain why you think the query cannot be written as SQL query;
- identify other queries that can retrieve useful data for your original query and describe how that data has to be processed further to obtain answers for the original query.

4 New Queries Over the Database

In addition to the queries stemming from the requirements, write new queries over your database schema that are interesting in your application domain. The queries may be simple SELECT statements or INSERT, UPDATE, DELETE statements that contain a SELECT statement.

For each query, write in English what it is supposed to do, and then give the SQL code. Groups of two students should write at least 16, groups of three at least 24, groups of four at least 32, and

groups of five at least 40 essentially different queries. (Note: This means that all in all, you write 10+16, 10+24, 10+32, or 10+40 queries.)

Among those queries, at least two-thirds should be complex in the sense that they contain at least one of the following features:

- joins involving the same table twice,
- aggregation with a group by and having clause,
- nesting with aggregation,
- nested negation, involving NOT EXISTS or NOT IN,
- outer join,
- usage of an auxiliary view.

5 Queries in Relational Algebra

Choose 6 queries you have written in SQL and express them in relational algebra. For each algebra query, say which is the corresponding SQL query.

6 Deliverables

The deliverable will (i) be a report consisting of three parts and (ii) a separate text file comprising the SQL statement named `queryDB.sql`.

- a brief report part on the translation of the requirement queries into SQL, showing for each query in English, the SQL translation, or discussing the difficulties encountered;
- a brief report part containing the new queries and, for each query, an explanation in English of
  - what it is supposed to do, and
  - why the query is interesting in your application;
- a brief report part with the relational algebra queries.

Note: All queries must be tested and in a form that PostgreSQL can execute them. SQL queries containing a syntax error do not count as part of the submission.

7 Deadline

The work is to be submitted as a report in PDF and a text file comprising the SQL statement with the name `queryDB.sql`. The deadline is

Friday, 8th December 2023; 18:10 pm

8 Check the following before submission!

- ☐ The report in PDF comprises 3 parts as explained
- ☐ The report fulfills the requirements for reports specified for Assignment 1
- ☐ An SQL file named `queryDB.sql` comprising all SQL queries
- ☐ The file `queryDB.sql` comprises comments for the queries (explaining them in English) and a comment comprising the group name and the name of all authors at the beginning

9 Bonus Points: Database Access from a Programming Language

Write a simple Java application that runs the queries by connecting to the database via JDBC. Another option is writing a simple Python program with a Python library to access the database.

There is no need for a graphical user interface or anything fancy. A simple command line interface where the user chooses between options using numbers will do.

To connect to the PostgreSQL database using Java, you have to download a JDBC driver for PostgreSQL, which you can find on the Web at

`http://jdbc.postgresql.org/`

For Python, you may search for appropriate libraries or use the one described in the lecture.

You can get a maximum of 10 bonus points! Note that the maximum number of points, including bonus points for all assignments, is 100! You cannot get more for all assignments.

Submit your Bonus example solution via Moodle. Generate a ZIP file with the name 'BONUS_Example_<GN>.zip' where <GN> is the number of your group.