EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

Database Systems 1
Summerterm 2023
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WSI — Database Systems Research Group

Assignment 8

Hand in this assignment until **Thursday, 29 June 2023, 12:00** at the latest.

⚠ Lecture Evaluation

In the upcoming days, you will have the opportunity to **evaluate lectures** you are attending. With this in mind, we kindly ask you to keep an eye on your inbox and to provide us with **your** valuable feedback. Thank you!

Ⓔxam-style Exercises

Exercises marked with Ⓔ are similar in style to those you will find in the exam. You can use these to hone your expectations and gauge your skills.

Running out of ideas?

Are you hitting a roadblock? Are some of the exercises unclear? Do you just need that one hint to get the ball rolling? Refer to the `#forum` channel on our Discord server and check the tag for this assignment —maybe you'll find just the help you need.

Task 1: Aggregate Queries

Note

In the below task, we will be using the university data set, i.e., the schemas and instances from Assignment 6.

Formulate SQL queries. Make sure that the results of your SQL queries adhere to the schemata on the right.

(a) Ⓔ For each type of degree, i.e., B.Sc. and M.Sc., calculate the average age of the students.

pursued_degree	average_age
B.Sc.	20.2359...
...	...

(b) Ⓔ List the **number of different** majors in which students are enrolled.

subject_count
17

(c) Ⓔ Find the oldest student(s).

student_name	age
Kenneth Hill	35

(d) Count the classes each student is enrolled in. Submit **two queries**. The first query should include students who are not enrolled in classes (with a count of zero), the second should omit those students.

student_name	classes_count
Ana Lopez	3
...	...

Task 2: LEGO Data Warehouse

We have provided you with a dataset that you already know from the lecture: The LEGO Data Warehouse (`legodw.sql`). Load the file into a PostgreSQL database. Then, write queries for the following tasks, making sure that the resulting adhere to the schemata on the right.

(a) For each store in Germany, sum the overall sales per day of the week.

store	city	dow	turnover
1	BERLIN	1	$594.26
...	...	...	...

(b) For each store in Germany, find the day(s) with the highest sales.

store	city	dow	turnover
1	BERLIN	6	$644.31
...	...	...	...

(c) Calculate the most popular set(s) per country, i.e., the sets with the most *items* sold.

country	set	items
USA	10000-1	9
...	...	...

Task 3: From NF^2 to 1NF

Table departments contains information about the departments of a company, including the contacts of each department, as well as their employees and their tasks. The Boolean column client indicates whether a contact is a client (as opposed to an employee, for example). The table is presented in a non-first normal form (or NF^2).

(a) (E) Transform the NF^2 schema into an equivalent 1NF database schema using the `nf2to1nf` algorithm from Slide Set 8, Slide 10. Then formulate appropriate SQL DDL statements to create the resulting flat tables.

(b) (E) Provide SQL DML statements that populate the flat tables so that they provide the same information as the NF^2 version in Table departments.

(c) For each of the following tasks, write a single SQL query using the tables of your 1NF representation. Results should adhere to the schemata on the right.

i. Count the number of employees per department.

department	employees_count
IT Security	4
...	...

ii. Find departments without contacts.

department
Engineering

iii. Return the names and department of employees without tasks.

name	department
Alice	IT Security
...	...

iv. Compute the number of clients per department.

department	clients_count
Engineering	0
...	...

> **Note**
>
> Obviously, some departments don't have any clients. Nevertheless, they should be included in the result with their correct number of clients. Think about using a *correlated subquery*.

departments

department	employees	contacts
Engineering	name: John Doe, salary: $7.000, tasks: (task1, 19.01.2014), (task2, 18.01.2014) name: Jane Doe, salary: $10.000, tasks: (task3, 19.01.2014), (task4, 18.01.2014), (task5, 17.01.2014), (task6, 10.01.2014), (task7, 23.12.2013)	∅
IT Security	name: Eve, salary: $10.000, tasks: (task8, 19.01.2014), (task9, 18.01.2014) name: Mallory, salary: $5.000, tasks: (task10, 19.01.2014) name: Alice, salary: $5.000, tasks: ∅ name: Bob, salary: $5.000, tasks: (task11, 02.02.2014), (task12, 18.01.2014), (task13, 18.12.2014)	contact: contact4, client: true contact: contact5, client: false contact: contact6, client: false
Advertising	name: Donal Draper, salary: $10.000, tasks: (task14, 19.01.2014), (task15, 18.01.2014) name: Peter Campbell, salary: $5.000, tasks: ∅	contact: contact7, client: true contact: contact8, client: true contact: contact9, client: true contact: contact10, client: true contact: contact11, client: true contact: contact12, client: true contact: contact13, client: true