Introduction to Databases

Tutorial 1

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Database schema. Consider the following schema:

CUSTOMER : *ID*, *Name*, *City*

where *ID* is unique (that is, no two rows in CUSTOMER can have the same value for *ID*);

ACCOUNT : *Number*, *Branch*, *CustID*, *Balance*

where *Number* is unique (that is, no two rows in ACCOUNT can have the same value for *Number*).

Problem 1 (mandatory). Write query the following queries in SQL:

(1) Return the (value of attribute) *Number* of all accounts owned by customers called "John Doe".

(2) Return the *Number* and *Branch* of all accounts owned by a customer with *ID* "xyz123", only if there is such a customer in the CUSTOMER table.

(3) Return the *Number* and *Balance* of all overdrawn accounts in the "London" branch.

(4) Return all pairs (*Name*, *Number*) where *Name* is the name of a customer and *Number* is the number of an account owned by that customer, such that the branch of the account is in a different city than the one where the customer lives.

Problem 2 (mandatory). Write the following queries in relational algebra:

(1) "ID and name of customers who own an account in a branch in their city."

(2) "ID and name of customers who do **not** own any account."

(3) "ID and name of customers who own an account in **every** branch."

(4) "ID and name of customers who own an account with a balance which is no less than the balance of any other account."

Problem 3 (optional). Can query (4) of Problem 2 ever return more than one tuple? If yes, show a database (over the given schema) on which that happens; otherwise, explain why it cannot happen.

Problem 4 (optional). Given the database below

CUSTOMER

ID	Name	City
1	John	London
2	Mary	Edinburgh
3	Jeff	London
4	Jane	Cardiff

ACCOUNT

Number	Branch	CustID	Balance
111	London	1	120
222	Edinburgh	1	62
333	London	3	76
444	London	2	200

compute the answer to the query

$$\text{CUSTOMER} \bowtie \left(\pi_{\text{ID,City}}(\text{CUSTOMER}) \cap \rho_{\text{CustID}\to\text{ID},\,\text{Branch}\to\text{City}}\left(\pi_{\text{Branch,CustID}}(\text{ACCOUNT})\right)\right)$$