Introduction to Databases

Tutorial 3

Dr Paolo Guagliardo

Fall 2020 (week 5)

Problem 1. Consider a schema with the following tables:

CUSTOMER over attributes *ID*, *Name*, *City*

ACCOUNT over attributes *Number*, *Branch*, *CustID* and *Balance*

under the following constraints:

- no two rows of CUSTOMER have the same value for *ID*,
- no two rows of ACCOUNT have the same value for *Number*, and
- all values in column *CustID* in ACCOUNT appear in column *ID* in CUSTOMER.

Write the following queries in SQL:

(1) "ID and name of customers living in London who do **not** own any account in Edinburgh."

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

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

(4) "Customers who own an account with a balance that is at least 500 pounds higher than the average balance of all accounts in the same branch (of the account in question). Return the customer's ID, their name, and the corresponding account number."

Problem 2 (optional). Given two relations R and S, each over attributes A, B (in this order), express the following relational calculus query in relational algebra:

$$\{x \mid \neg(\forall y\ R(x,y) \to S(x,y)) \wedge \neg(\exists z\ S(x,z) \wedge R(z,x))\}$$

Use only the translation rules from RC to RA we have seen in class.

Problem 3 (optional).

(a) Can we simplify the relational algebra expression obtained in Problem 2 into an equivalent expression that does not mention the active domain? If yes, give such an expression. Otherwise, explain why this is the case.

(b) How would you translate the relational calculus query of Problem 2 if the output tuple (i.e., the head of the query) were x, x rather than x?