

# DATABASE SYSTEMS

## Practice Exercises 1

CMPT 354, Course Section of Dr. E. Ternovska

**Database schema.** Consider the following schema:

CUSTOMER : *ID, Name, City*

where *ID* is the primary key.

ACCOUNT : *Number, Branch, CustID, Balance*

where *Number* is the primary key and *CustID* is a foreign key referencing CUSTOMER on *ID*.

**Problem 1.** 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 2.** Can query (4) of Problem 1 ever return more than one tuple? If yes, come up with a database (over the given schema) on which that happens; otherwise, explain why it cannot happen.

**Problem 3.** Write query (1) of Problem 1 in SQL.

**Problem 4.** Given the database below

CUSTOMER			ACCOUNT			
ID	Name	City	Number	Branch	CustID	Balance
1	John	London	111	London	1	120
2	Mary	Edinburgh	222	Edinburgh	1	62
3	Jeff	London	333	London	3	76
4	Jane	Cardiff	444	London	2	200

compute the answer to the query

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