

# Introduction to Databases, ITU, Fall 2005

Rasmus Pagh

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## Exercises on September 19

### 1. Problem 4 from the IDB exam, January 2004.

Consider the following instance of a relation R:

saleID	salesman	regNo	make	office
42	B. Honest	VY 34718	Opel	City
53	W. Gates	PQ 11112	Ford	Redwood
87	B. Honest	MX 32781	Ford	City
99	L. R. Harald	AB 12345	Porche	City

The functional dependencies of R, not including trivial ones, are:

- (a)  $\text{saleID} \rightarrow \text{salesman regNo make office}$
- (b)  $\text{salesman} \rightarrow \text{office}$
- (c)  $\text{regNo} \rightarrow \text{make}$

**a)** Decompose the relation into BCNF. For each step of the decomposition procedure, state what functional dependency it is based on, and give the relation schemas after the step has been carried out.

**b)** State the relation instances in your BCNF schema corresponding to the above instance of R. Give an example of an update anomaly of the original relation schema that has been eliminated in the BCNF schema.

- 2. Gradiance “homework” *Normalization*.
- 3. G UW 3.4.1 considers the relation schema `People(name, ssn, street, city, state, zip, areacode, phone)`. Assume that a zip code corresponds to a unique area code, and that an area code corresponds to a unique state.
  - (a) Use the method described at the lecture to find all nonreducible FDs.
  - (b) Construct a relation instance exhibiting redundancy, update anomalies, and deletion anomalies.
  - (c) Decompose the relation into BCNF.
  - (d) Compare how the following updates are done (in SQL) before and after decomposition:
    - i. Changing the name of a street.
    - ii. Changing the area code corresponding to a zip code.
    - iii. Delete all people from a specific state. (You probably don’t know enough SQL to do this, but consider how the relation(s) must be updated.)
- 4. Gradiance “homework” *E/R to relations*.