

# INF3100: Databasesystemer

## Oppgavesett 1

**Oppgave 3.1.1:** (men gjøres med tanke på norske forhold, dvs. at vi har fødselsdato, personnummer, navn, husnummer, gatenavn, postnummer, poststed, telefon.)

Consider a relation about people in the United States, including their name, Social Security number, street address, city, state, ZIP code, area code, and phone number (7 digits). What FD's would you expect to hold? What are the keys for the relation? To answer this question, you need to know something about the way these numbers are assigned. For instance, can an area code straddle two states? Can a ZIP code straddle two area codes? Can two people have the same Social Security number? Can they have the same address or phone number?

**Oppgave 3.1.2:** Suppose  $R$  is a relation with attributes  $A_1, A_2, \dots, A_n$ . As a function of  $n$ , tell how many superkeys  $R$  has if:

a) The only key is  $A_1$ .

**Oppgave 3.2.1:** Consider a relation with schema  $R(A, B, C, D)$  and FD's  $BC \rightarrow D$ ,  $D \rightarrow A$  and  $A \rightarrow B$ .

a) What are all the nontrivial FD's that follow from the given FD's? You should restrict yourself to FD's with single attributes on the right side.

b) What are all the keys of  $R$ ?

c) What are all the superkeys for  $R$  that are not keys?

**Oppgave 3.2.9:** Suppose we have relation  $R(A, B, C, D, E)$ , with some set of FD's, and we wish to project those FD's onto relation  $S(A, B, C)$ . Give the FD's that hold in  $S$  if the FD's for  $R$  are:

d)  $AB \rightarrow E$ ,  $AC \rightarrow D$ ,  $BC \rightarrow E$ ,  $E \rightarrow A$ , and  $D \rightarrow B$

In each case, it is sufficient to give a minimal basis for the full set of FD's of  $S$ .

**Oppgave 3.4.1:** Let  $R(A, B, C, D, E)$  be decomposed into relations with the following three sets of attributes:  $\{A, B, C\}$ ,  $\{B, C, D\}$ , and  $\{A, C, E\}$ . For each of the following sets of FD's, use the chase test to tell whether the decomposition of  $R$  is lossless. For those that are not lossless, give an example of an instance of  $R$  that returns more than  $R$  when projected onto the decomposed relations and rejoined.

a)  $BC \rightarrow D$  and  $AC \rightarrow E$

c)  $B \rightarrow E$ ,  $CE \rightarrow D$ , and  $D \rightarrow E$