DBS: Database Systems Carsten Schürmann Date: October 27, 2010

Assignment 4

Due: see course homepage

- 1. Let schema R = (A, B, C, D, E), with the following set of functional dependencies F:
 - $\begin{array}{l} A \rightarrow BC \\ EB \rightarrow C \\ CD \rightarrow E \\ B \rightarrow D \\ E \rightarrow A \end{array}$
 - (a) List all candidate keys for R (4 points).
 - (b) Show that the following decomposition of R is not a lossless decomposition (4 points):

$$R1 = (A, B, C)$$
$$R2 = (C, D, E)$$

Hint: give a sample relation r(R) *and analyze its decomposition.*

- (c) Give a lossless decomposition of R into BCNF. Demonstrate that you understand the algorithm by commenting each step (7 points).
- (d) Compute the canonical cover for F and give a lossless, dependency preserving decomposition of R into 3NF. Demonstrate that you understand the algorithms by commenting each important step (9 points).
- (e) Give SQL expressions that check that your database respect the functional relationships (as discussed in class).
- 2. Give a lossless, dependency preserving decomposition into 3NF of the schema S = (A, B, C, D) with the following set of functional dependencies:

$$\begin{array}{c} A \to B \\ C \to D \\ BC \to A \end{array}$$

Comment as you make each important step (6 points).