

CS 405G: Introduction to database systems

Assignment 4

Assigned: Nov. 8th, 2013

Due: Nov. 15th, 2013

Reading assignment: Chapter 7.

Submission instructions: Please try to prepare the assignment in word document (handwritten homework is also acceptable). Print and bring them to class on the due date. Put the course number and your name at the top left corner of the first page of your homework. Please follow the rules in the course syllabus regarding late homework and plagiarism.

Problem (1) Consider the following proposed rule for functional dependencies: If $\alpha \rightarrow \beta$ and $\gamma \rightarrow \beta$, then $\alpha \rightarrow \gamma$. Prove that this rule is *not* sound by showing a relation r that satisfies $\alpha \rightarrow \beta$ and $\gamma \rightarrow \beta$, but does not satisfy $\alpha \rightarrow \gamma$.

Problem(2) Suppose that we are given the schema $R = (A, B, C, D, E)$ and the following set F of functional dependencies holds

$A \rightarrow BC$
 $CD \rightarrow E$
 $B \rightarrow D$
 $E \rightarrow A$

a) Show that the following decomposition is a lossless decomposition

(A, B, C)
 (A, D, E)

b) Show the following decomposition is not a lossless decomposition

(A, B, C)
 (C, D, E)

c) Please identify the candidate keys of the relation R .

d) Please compute B 's closure B^+ .

Problem(3) Please write a short essay discussing the design goals of the relational database and explaining why database normalization is important to reach some of these goals.