CSCI 6333/6315 Database Systems

Spring 2020

ASSIGNMENT 3: Functional Dependencies and Normalization

All answers shall be typed using a word processor and some drawing utilities. A cover page shall be prepared with course title, homework number, submitted date and time, and contact info including your email address.

Due: Midnight, Tuesday, March 10, 2019

The total score of this assignment is 140. The seven problems are equally weighted, with 20 points each.

For this homework assignment, consider the schema $R = (A, B, C, D, E)$ and the following set F of functional dependencies holds on R:

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

Problem 1. Suppose that we decompose the schema R into $R_1 = (A, B, C)$ and $R_2 = (A, D, E)$. Show that this decomposition is a lossless-join decomposition with respect to F.

Problem 2. Suppose that we decompose the relation schema R into $R_3 = (A, B, C)$ and $R_4 = (C, D, E)$. Show that this decomposition is not a lossless-join decomposition.

Hint: Give an example of a relation r on schema R such that

$$r \neq \Pi_{A,B,C}(r) \bowtie \Pi_{C,D,E}(r)$$

Problem 3. Compute $(BC)^+$.

Problem 4. Compute the canonical cover F_c.

Problem 5. Show that the decomposition of R into $R_1 = (A, B, C)$ and $R_2 = (A, D, E)$ is not a dependency-preserving decomposition.

Problem 6. Give a lossless-join decomposition into BCNF of R.

Problem 7. Give a lossless-join, dependency preserving decomposition into 3NF of R.