



CAS CS 460: Introduction to Database Systems – Fall 2021 – Written Assignment #3

Due: 10/04 11:59 PM in Gradescope

Problem 1 [50 pts]

Consider the relation $R = (A, B, C, D, E, F, G, H)$. Assume that the following set of FDs holds:

$$F = \{AB \rightarrow CEF, A \rightarrow D, F \rightarrow G, BF \rightarrow H, BCH \rightarrow ADE, BCF \rightarrow ADE\}$$

1. Find all the candidate keys of the relation R .
2. Decompose the relation in the following normal forms (if it is not there already): a) 3NF, b) BCNF.
3. For each decomposition that you make, state if it is (i) lossless join and (ii) dependency preserving.

Problem 2 [50 pts]

Suppose you are given a relation R with four attributes $WXYZ$. For each of the following sets of FDs, assuming those are the only dependencies that hold for R , do the following:

- (a) Identify the candidate key(s) for R
- (b) Identify the best normal form that R satisfies (1NF, 3NF, or BCNF)
- (c) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies

1. $WX \rightarrow Y, WX \rightarrow Z, XY \rightarrow WX$
2. $X \rightarrow YZ, Y \rightarrow W, W \rightarrow X$
3. $XY \rightarrow WX, XY \rightarrow YZ, Z \rightarrow X$
4. $WX \rightarrow YZ, Y \rightarrow W$
5. $YZ \rightarrow X, X \rightarrow W, W \rightarrow Y$