CAS CS 460: Introduction to Database Systems – Fall 2020 – Written Assignment #6

Due: 11/24 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:

$F = \{AB \longrightarrow CEFGH,\ A \longrightarrow D,\ F \longrightarrow G,\ BF \longrightarrow H,\ BCH \longrightarrow ADEFG,\ BCF \longrightarrow ADE\}$

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