B461 Assignment 4: Functional Dependencies and Normal Forms (Due November 10)

November 3, 2009

1. Prove or disprove the following inference rules for functional dependencies.
   (a) \{A \rightarrow C, B \rightarrow D\} implies \(AB \rightarrow C\)
   (b) \{BC \rightarrow D, C \rightarrow A\} implies \(BA \rightarrow D\)
   (c) \{A \rightarrow CE, BE \rightarrow D, E \rightarrow A\} implies \(E \rightarrow C\)
   (d) \{B \rightarrow C, D \subseteq C\} implies \(B \rightarrow D\)

2. Consider the following two sets of FD's.
   \(F = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}\) and \(G = \{A \rightarrow CD, E \rightarrow AH\}\)
   Check if they are equivalent.

3. Given the relation \(R = \{A, B, C, D, E, F, G H, I, J\}\) and the set of functional dependencies \(F = \{AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ\}\):
   (a) Give a key for \(R\)?
   (b) Decompose \(R\) into \(BCNF\). Is the decomposition lossless? Is it dependency preserving?