COM S 461: ASSIGNMENT II

Date Assigned: September 24, 2004
Due: October 8, 2004 by 2:00 pm
Percentage in your final grade: 6%
Maximum score for this assignment: 100 points

Objectives:
1. To test your understanding of functional dependencies and normalization.

Questions

1. (20 points): Suppose that we have the following three tuples in a legal instance of a relation schema S with three attributes ABC (listed in order): (1,2,3), (4,2,3), and (5,3,3).
   - Which of the following dependencies can you infer does not hold over schema S?
     - $A \rightarrow B$, $BC \rightarrow A$, $B \rightarrow C$
   - Can you identify any dependencies that hold over S?

2. (20 points): Consider the attribute set $R=\text{ABCDEG}$ with the set of dependencies
   $F = \{AB \rightarrow C, AC \rightarrow B, AD \rightarrow E, B \rightarrow D, BC \rightarrow A, E \rightarrow G\}$.
   - Is $D_1 = \{ABC, ACDE, ADG\}$ a lossless join decomposition?
   - Is $D_1$ a dependency-preserving decomposition?
   - What is the strongest normal form of ABC and why?

3. (20 points): Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $F = \{AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ\}$.
   Given the following decomposition.
   $D_2 = \{R_1, R_2, R_3, R_4, R_5\}$
   $R_1 = \{A, B, C, D\}$
   $R_2 = \{D, E\}$
   $R_3 = \{B, F\}$
   $R_4 = \{F, G, H\}$
   $R_5 = \{D, I, J\}$
   - Is $D_2$ a dependency-preserving decomposition? Why?
   - Is $D_2$ a lossless-join decomposition? Explain your answer using the matrix algorithm discussed in the class (i.e., the slide titled "Testing for the lossless join property").

Submission Requirements:
Put your answers in a Word document. Submit your word document using the turnin script with “hw2” as the last argument for the script.