

INFS 614 – Fall 2013

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Homework 4

Due Dec 3, 2013

Problem 1: Consider the relation Stocks(B, O, I, S, Q, D), whose attributes may be thought of informally as broker, office of the broker, investor, stock, quantity (of the stock owned by the investor), and dividend (of the stock). Let the set of FDs for Stocks be $F = \{S \rightarrow D, I \rightarrow B, IS \rightarrow Q, \text{ and } B \rightarrow O\}$. Find all the candidate keys for Stocks.

Problem 2: Find all the candidate keys for the following relation:

$$R(A, B, C, D), F = \{AB \rightarrow C, BCD \rightarrow A, D \rightarrow A, B \rightarrow C\}$$

Problem 3: For each of the following relations and the corresponding FDs, (1) show whether it's in BCNF; (2) if not in BCNF, decompose it into a BCNF relation; (3) show whether it's in 3NF.

- (a) $R(A, B, C, D), F = \{BD \rightarrow C, AB \rightarrow D, AC \rightarrow B, BD \rightarrow A\}$
- (b) $R(A, B, C, D), F = \{ABC \rightarrow D, BCD \rightarrow A, D \rightarrow C, ACD \rightarrow B\}$
- (c) $R(A, B, C, D), F = \{AB \rightarrow C, BCD \rightarrow A, D \rightarrow A, B \rightarrow C\}$
- (d) $R(A, B, C, D), F = \{C \rightarrow B, B \rightarrow A, AC \rightarrow D, AC \rightarrow B\}$

Problem 4. Let $R(A, B, C, D, E)$ be decomposed into relations with the following three sets of attributes: ABC, BCD, and ACE. For each of the following sets of FDs, (1) determine whether the decomposition of R is lossless; and (2) determine whether the decomposition of R is dependency-preserving.

- (a) $F = \{B \rightarrow E, CE \rightarrow A\}$
- (b) $F = \{AC \rightarrow E, BC \rightarrow D\}$

Problem 5. Consider the attribute set $R = ABCDEGH$ and the set of FDs $F = \{AB \rightarrow C, AC \rightarrow B, AD \rightarrow E, B \rightarrow D, BC \rightarrow A, E \rightarrow G\}$.

Find the minimal cover.

Problem 6. For each of the relations in your project,

- (a) list the set of non-trivial FDs that hold over the relation;
- (b) determine if the relation is in BCNF; and
- (c) if the relation is not in BCNF, decompose it into a set of BCNF relations.