

Homework 6: Relational Design Theory (75 points)

Due Date: Thursday, May 26, 2016 11:45 PM, on EEE

Group ID: #53

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Question 1.

- 1) $C \rightarrow D, C \rightarrow A, B \rightarrow A$
 - a. Candidate Key(s): BC
 - b. 1NF, $B \rightarrow A$
- 2) $A \rightarrow B, B \rightarrow C, D \rightarrow A$
 - a. Candidate Key(s): D, AD
 - b. 2NF; $A \rightarrow B$
- 3) $AB \rightarrow D, D \rightarrow B$
 - a. Candidate Key(s): ABC, ADC
 - b. BCNF; RHS is in LHS, and LHS is a key
- 4) $A \rightarrow B, A \rightarrow C, C \rightarrow D$
 - a. Candidate Key(s): A
 - b. 2NF; $C \rightarrow D$
- 5) $BC \rightarrow A, BC \rightarrow D, A \rightarrow C, D \rightarrow B$
 - a. Candidate Key(s): BC, CD, AD
 - b. BCNF; RHS is in LHS, and LHS is a key

Question 2.

- (1) $AB \rightarrow CD, B \rightarrow C$
- (2) $AB \rightarrow CD, C \rightarrow D$

Question 3.

Potentially true: $B \rightarrow E, A \rightarrow B, A \rightarrow C, A \rightarrow D, A \rightarrow E,$
 $C \rightarrow D, D \rightarrow B, D \rightarrow E, F \rightarrow A, F \rightarrow C, F \rightarrow D$

Question 4.

- (a)
1. i. FD: $AC \rightarrow B, B \rightarrow C$
ii. 2NF
 2. i. FD: $AB \rightarrow CD, AC \rightarrow B, BD \rightarrow A, B \rightarrow C$
ii. 1NF
 3. i. FD: $AC \rightarrow B, B \rightarrow C, E \rightarrow G$
ii. 1NF
 4. i. FD: $E \rightarrow G$
ii. 1NF
 5. i. No FDs exist
ii. BCNF

(b) Decomposition 1 is not a dependency preserving because the FD, $AB \rightarrow CD$, is not preserved.

Decomposition 2 is not a dependency preserving because the FD, $E \rightarrow G$, is not preserved.

Extra Credit

(1) ABC, (2) ABCD, (3) ABCEG, (4) DCEGH, (5) ACEH

1. AC, BC
2. BC, AD
3. BC, AEG
4. DCEH, EG
5. ACEH (already in BCNF form)