

DBMS I — Homework 7

December 7, 2007

The purpose of this homework is for you to practice the BCNF decomposition algorithm.

Let $R(A, B, C, D, E)$ be a relation schema with the following set of FDs:

$$F = \left\{ \begin{array}{l} AB \rightarrow C \\ D \rightarrow E \\ B \rightarrow E \end{array} \right\}$$

1. Given an example of a legal instance of R .

Solution:

A	B	C	D	E
1	1	2	1	2
1	1	2	2	2
2	2	2	2	2

2. Identify *all* FDs that do not satisfy the BCNF condition. (A FD $\alpha \rightarrow \beta$ does not satisfy the BCNF condition means that it does not satisfy the two conditions mentioned in the BCNF.) Justify your answer.

Solution:

$AB \rightarrow C$:

+ $AB \rightarrow C$ is not trivial since $C \not\subseteq AB$

+ AB is not a superkey since $AB^+ = \{A, B, C, E\}$

So $AB \rightarrow C$ does not satisfy the BCNF condition

$D \rightarrow E$:

+ $D \rightarrow E$ is not trivial since $E \not\subseteq D$

+ D is not a superkey since $D^+ = \{D, E\}$

So $D \rightarrow E$ does not satisfy the BCNF condition

$B \rightarrow E$:

+ $B \rightarrow E$ is not trivial since $E \not\subseteq B$

+ B is not a superkey since $B^+ = \{B, E\}$

So $B \rightarrow E$ does not satisfy the BCNF condition

3. Decompose R into a set of BCNF relations. Present the steps of your decomposition.

Solution:

Set result = $\{R\}$

Step 1: Consider $AB \rightarrow C$ in R . From the previous question, we know that $AB \rightarrow C$ does not satisfy BCNF condition.

So result = $\{ABDE, ABC\}$

Step 2: Consider $D \rightarrow E$ in the relation (A, B, D, E) . From the previous question, we know that $D \rightarrow E$ does not satisfy BCNF condition.

So result = $\{ABD, DE, ABC\}$.

All the relations are in BCNF.