

Exercise 19.7 Suppose you are given a relation R with four attributes $ABCD$. For each of the following sets of FDs, assuming those are the only dependencies that hold for R , do the following: (a) Identify the candidate key(s) for R . (b) Identify the best Normal form that R satisfies (1NF, 2NF, 3NF, or BCNF). (c) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

1. $C \rightarrow D, C \rightarrow A, B \rightarrow C$
2. $B \rightarrow C, D \rightarrow A$
3. $ABC \rightarrow D, D \rightarrow A$
4. $A \rightarrow B, BC \rightarrow D, A \rightarrow C$
5. $AB \rightarrow C, ABC \rightarrow D, C \rightarrow A, D \rightarrow B$

Exercise 19.8 Consider the attribute set $R = ABCDEGH$ and the FD set $F = \{AB \rightarrow C, AC \rightarrow B, AD \rightarrow E, B \rightarrow D, BE \rightarrow A, B \rightarrow G\}$.

1. For each of the following attribute sets, do the following: (i) Compute the set of dependencies that hold over the set and write down a minimal cover. (ii) Name the strongest normal form that is not violated by the relation containing these attributes. (iii) Decompose it into a collection of BCNF relations if it is not in BCNF.
 - (a) ABC , (b) $ABCD$, (c) $ABCEG$, (d) $DEBGH$, (e) $ACEH$
2. Which of the following decompositions of $R = ABCDEG$, with the same set of dependencies F , is (a) dependency-preserving? (b) lossless-join?
 - (a) $\{AB, BC, ABDE, EG\}$
 - (b) $\{ABC, ACDE, ADG\}$

Exercise 19.10 Suppose you are given a relation $R(A,B,C,D)$. For each of the following sets of FDs, assuming they are the only dependencies that hold for R , do the following: (a) Identify the candidate key(s) for R . (b) State whether or not the proposed decomposition of R into smaller relations is a good decomposition and briefly explain why or why not.

1. $B \rightarrow C, D \rightarrow A$; decompose into BC and AD .
2. $AB \rightarrow C, C \rightarrow A, C \rightarrow D$; decompose into ACD and Be .
3. $A \rightarrow BC, C \rightarrow AD$; decompose into ABC and AD .
4. $A \rightarrow B, B \rightarrow C, C \rightarrow D$; decompose into AB and ACD .
5. $A \rightarrow B, B \rightarrow C, C \rightarrow D$; decompose into AB, AD and CD .