

Exercises

Exercise

1. Consider the relation schema $R(A, B, C)$ with FD $B \rightarrow C$. If A is a candidate key for R , can R be in BCNF? If so, under what conditions? If not, explain why not.
2. Suppose we have a relation schema $R(A, B, C)$ representing a relationship between two entity sets with keys A and B , respectively. Suppose that R has (among others) the FDs $A \rightarrow B$ and $B \rightarrow A$. Explain what such a pair of dependencies means

Solution

1. The only way that R could be in BCNF is if B includes a key, i.e., if B is a key for R
2. It means that the relationship is one to one. That is, each A corresponds to at most one B and vice-versa.

Exercise

Consider a relation $R(ABCDE)$ with FDs $A \rightarrow B$, $BC \rightarrow E$, and $ED \rightarrow A$

1. List all the keys for R
2. Is R in BCNF?

Solution

1. ACD , BCD , and CDE

2. No. $A \rightarrow B$ and A is not a key

Exercise

Consider the following relation

X	Y	Z
x_1	y_1	z_1
x_1	y_1	z_2
x_2	y_1	z_1
x_2	y_1	z_3

1. List all the functional dependencies that this relation instance satisfies
2. Assume that the value of attribute Z of the last record in the relation is changed from z_3 to z_2 . Now list all the functional dependencies that this relation instance satisfies.

Solution

1. $Z \rightarrow Y$, $X \rightarrow Y$, and $XZ \rightarrow Y$
2. The same

Exercise

Consider a relation $S(A, B, C, D, E, F, G, H, I)$. Are the following subrelations in BCNF? If not, decompose them into BCNF

1. $R_1(A, C, B, D, E), A \rightarrow B, C \rightarrow D$
2. $R_2(A, B, F), AC \rightarrow E, B \rightarrow F$
3. $R_3(A, D), D \rightarrow G, G \rightarrow H$
4. $R_4(D, C, H, G), A \rightarrow I, I \rightarrow A$
5. $R_5(A, I, C, E)$

Solution

1. BCNF decomposition: AB, CD, ACE
2. BCNF decomposition: AB, BF
3. In BCNF.
4. In BCNF.
5. In BCNF.