

1. For each of the following schema decompositions, determine whether or not it is a dependency preserving decomposition.
 - (a) Schema $R(A, B, C, D)$ with FDs $F = \{A \rightarrow BCD, C \rightarrow D\}$ and decomposition $\{R_1(A, B, C), R_2(C, D)\}$.
 - (b) Schema $R(A, B, C, D)$ with FDs $F = \{A \rightarrow BCD, C \rightarrow D\}$ and decomposition $\{R_1(A, C), R_2(A, B, D)\}$.
 - (c) Schema $R(A, B, C, D, E)$ with FDs $F = \{AB \rightarrow C, AC \rightarrow D, E \rightarrow ABCD\}$ and decomposition $\{R_1(A, B, C), R_2(A, B, E), R_3(A, C, D)\}$.

2. Consider the schema $R(A, B, C, D)$ with FDs

$$F = \{ABC \rightarrow D, D \rightarrow A\}$$
 - (a) Is R in BCNF? Explain.
 - (b) Is R in 3NF? Explain.

3. Consider the schema $R(A, B, C, D, E)$ with FDs

$$F = \{A \rightarrow E, CD \rightarrow A, E \rightarrow B, E \rightarrow D, A \rightarrow BD\}$$
 - (a) Is R in 3NF? Explain.
 - (b) If R is not in 3NF, find a 3NF decomposition of R .
 - (c) Is your decomposition in (b) in BCNF?

4. Consider the schema $R(A, B, C, D, E)$ with FDs

$$F = \{AB \rightarrow CDE, AC \rightarrow BDE, B \rightarrow C, C \rightarrow B, C \rightarrow D, B \rightarrow E\}$$
 - (a) Is R in 3NF? Explain.
 - (b) If R is not in 3NF, find a 3NF decomposition of R .
 - (c) Is your decomposition in (b) in BCNF?