



Tutorial: Third Normal Form

1. Consider the schema $R = \{A, B, C, D\}$ with the set of functional dependencies $\Sigma = \{\{A\} \rightarrow \{B, C, D\}, \{C\} \rightarrow \{D\}\}$.
 - (a) Is the decomposition into $\sigma = \{R_1(A, B, D), R_2(A, C)\}$ a dependency preserving decomposition?
 - (b) Is the decomposition into $\sigma = \{R_1(A, B, C), R_2(C, D)\}$ a dependency preserving decomposition?
2. Consider the schema $R = \{A, B, C, D, E\}$ with a set of functional dependencies $\Sigma = \{\{A\} \rightarrow \{B, D, E\}, \{C, D\} \rightarrow \{A\}, \{E\} \rightarrow \{B, D\}\}$.
 - (a) Is R in third normal form with respect to Σ ?
 - (b) If R is not in third normal form with respect to Σ , find a third normal form decomposition of R with respect to Σ that are both dependency preserving and lossless join.
 - (c) Is your decomposition in part (b) above in Boyce-Codd normal form with respect to Σ .