Tutorial: Dependencies

1. Consider the relational schema $R = \{A, B, C, D, E\}$ with the following set of functional dependencies.

$$\Sigma = \{\{A, B\} \to \{C\}, \{D\} \to \{D, B\}, \{B\} \to \{E\}, \{E\} \to \{D\}, \{A, B, D\} \to \{A, B, C, D\}\}$$

   (a) Compute all the closures of the the sets of attributes that are not equal to themselves, are not super-keys or are candidate keys. What information is not essential and could be removed.

   (b) What are the candidate keys of R with Σ?

   (c) Find a minimal cover of R with Σ that can be reached from Σ using the algorithm from the lecture.

   (d) Find all the minimal covers of R with Σ.

   (e) Prove, using the three Armstrong axioms, that the following set of functional dependencies is equivalent to Σ.

$$\Sigma'''' = \{\{A, B\} \to \{C, D, E\}, \{A, D\} \to \{B, C, E\}, \{A, E\} \to \{B, C, D\},$$
$$\{B\} \to \{D, E\}, \{D\} \to \{B, E\}, \{E\} \to \{B, D\}\}$$