

Homework 3

Problem 1:

For each of the tables, calculate the indicated closures.

- (a) Table $R(A, B, C, D, E, F)$ has functional dependencies $AB \rightarrow C$, $BC \rightarrow AD$, $D \rightarrow E$, and $CF \rightarrow B$. What is the closure of $\{A, B\}$?
- (b) Table $R(A, B, C, D, E, F, G)$ with functional dependencies $A, B, C \rightarrow EF$, $BCD \rightarrow F$, $C \rightarrow D$ and $E \rightarrow G$. What is $\{A, B, C, D\}^+$?
- (c) Table $R(A, B, C, D, E, F, G)$ with functional dependencies $B \rightarrow DE$, $BCD \rightarrow F$, $C \rightarrow D$ and $E \rightarrow FG$. What is $\{A, B\}^+$?

Problem 2:

Table $R(A, B, C, D, E, F, G)$ with functional dependencies $B \rightarrow DE$, $CD \rightarrow F$, $A \rightarrow D$, $D \rightarrow E$ and $E \rightarrow FG$ is projected on $S = \pi_{A,D,F,G}(R)$, i.e. a table with attributes A, D, F, G . Find all functional dependencies in the projection.

Problem 3:

Identify the functional dependencies in the following scenarios. Argue why functional dependencies should or should not exist. Identify any keys if they exist. (People can have different opinions so the one and only true answer does not exist.)

- (a) A table with information on books to be sold on a web-site:

Book-title, Editor, Edition, ISBN, Author name, Author ID, Book Title, Language, Price

- (b) A table with information on chess players:

First-name, Middle name, Last name, Birth-date, Country, Title, Over-the-board Classical Rating, Rapid Chess Rating, Blitz Rating, FIDE Identification Number, Won Tournament.

Problem 4:

A database about WW2 capital ships (men-of-war) has information on operator, class, type, ship yard, displacement, commission date, end-of-service date, fate (e.g. "sunk", "scrapped"), armament (restricted to major guns), crew, length, beam, draft, speed. Identify all possible functional dependencies, and argue whether they exist or not.