Course A7B36DBS: **Database Systems**

Practice 06:

Functional Dependencies and Keys

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Exercise 1

- Compute the closure of a set of functional dependencies $\{A \rightarrow B\}$ for a relational schema with attributes {A, B, C}

Exercise 2

- Let us have a relational schema with attributes {A, B, C, D, E} and two different sets of functional dependencies
  - $F = \{A \rightarrow C, BC \rightarrow D, C \rightarrow E, E \rightarrow A\}$
  - $G = \{AB \rightarrow D, A \rightarrow CE, C \rightarrow A, E \rightarrow AE\}$
- Is F a cover of G?
  - Use Armstrong's axioms only (not attribute closures)

Exercise 3

- Assume we have a relational schema with attributes {A, B, C, D, E} and a set of functional dependencies {AC → B, E → B, D → C, AC → E, E → AC}
- Are the following dependencies redundant?
  - AC → B
  - E → B
  - Use Armstrong's axioms only (not attribute closures)

Exercise 4

- Let us have a relational schema with attributes {A, B, C, D, E, F} and functional dependencies {AB → D, A → CE, F → F, C → A, E → AE}
- Compute the following attribute closures
  - $\{A\}^+$
  - $\{F\}^+$
  - $\{B, C\}^+$
  - $\{A, B, F\}^+$

Exercise 5

- Let us have two sets of functional dependencies
  - $F = \{A \rightarrow BEF, BC \rightarrow DE, BDE \rightarrow F, ADF \rightarrow CE, E \rightarrow CBD\}$
  - $G = \{A \rightarrow B, AB \rightarrow E, AD \rightarrow C, BC \rightarrow E, BCE \rightarrow FD, E \rightarrow C, CE \rightarrow B\}$
- Is F cover of G?

Exercise 6

- Find all redundant functional dependencies in a set $\{A \rightarrow C, B \rightarrow A, D \rightarrow AB, B \rightarrow C, D \rightarrow C\}$ for a relational schema with attributes {A, B, C, D}

Exercise 7

- Let {A, B, C, D, E, F} be attributes of a relational schema with functional dependencies {AB → D, A → CE, C → A, E → AE, F → B, BCEF → A}
- Find redundant attributes in the following functional dependencies
  - AB → D
  - BCEF → A

Exercise 8

- Find minimal cover for a relational schema with attributes {A, B, C, D, E, F, G, H} and functional dependencies {AB → H, EB → C, CB → A, C → F, F → G, A → EC, E → D}

Exercise 9

- Find minimal cover for a relational schema with attributes {A, B, C, D, E} and a set of functional dependencies {ABC → DE, BC → A, DE → B, CE → AB}

Exercise 10

- Find minimal cover for a relational schema with attributes {A, B, C, D, E, F, G} and functional dependencies {AB → C, C → A, BC → D, ACD → B, D → EG, BE → C, CG → BD, CE → AG}

Exercise 11

- Find any key for a relational schema with attributes {A, B, C, D, E} and a set of functional dependencies {BC → DE, DE → B, CE → B}

Exercise 12

- Find all remaining keys for the previous schema, i.e. for a schema with attributes {A, B, C, D, E} and functional dependencies {BC → DE, DE → B, CE → B}

Exercise 13

- Let us have a relational schema with attributes {A, B, C, D, E, F} and functional dependencies {AB → C, C → D, DEF → B, DA → EB}
- Find all keys