CMPT 354 Spring 2023
Database Systems
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Assignment 6

Total marks: 100 (5% of the assignments)
Due date: March 17, 2023

Assignment 6.1 (70 marks)

a) Consider the relation **R(A,B,C,D,E,F,G,H)** and the following set of FDs:

A→B
AB→CD
D→G
DE→F
DG→CH
F→D

Compute the closure of **AB** under these functional dependencies. Assume that in every step the algorithm applies the first applicable functional dependency. Show all the steps of the algorithm and the final result. *[18 marks]*

b) Consider relation **R(A,B,C,D,E)** with functional dependencies **AB→CD**, **D→E** and **E→A**. List all the dependencies that follow from the given functional dependencies that:

- are non-trivial;
- have only **C** on the right-hand side.

List ordering alphabetically by the left-hand side and then by the right-hand side. *[18 marks]*

c) Consider the same dependencies as in b). What are all the keys of **R**? What are all the superkeys of **R** that are not candidate keys? (Order the answers alphabetically) *[18 marks]*

d) Show that the following rule about functional dependencies does not hold

If **AB→C** then **A→C** and **B→C**

by presenting a relation and a corresponding functional dependency of the form **AB→C** that serves as a counterexample. *[16 marks]*

Assignment 6.2 (30 marks)

Consider a table R with the following set of attributes

R(A, B, C, D, E, F)

and the following set of functional dependencies:

AB→CF
C→D
D→E
B→F

Design a sequence of decompositions with a minimal number of such decompositions that transforms the table **R** into a set of tables that are all in BCNF.

For every decomposition:

- state the input table to be decomposed,
- list the primary key of the input table and explain why it is a key,
- list the FD **A1, . . ., An→B1, . . ., Bm** that violates BCNF,
- add all attributes to the right side of the FD that are (indirectly) functionally dependent on **A1, . . ., An**,
- list the attribute sets of the two tables resulting from the decomposition.

Finally, list the set of tables that result from your sequence of decompositions (and that are all in BCNF).

Submission

Submit your solution in pdf format as assignment6.pdf in CourSys.