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Database Concepts

Exercise 7

1. Given relational schema $R(ABCDE)$ with following functional dependencies:

   $$AB \rightarrow CDE, B \rightarrow C, C \rightarrow D, E \rightarrow A$$

   Determine all candidate keys and create the BCNF step by step.

2. Given following relational schema

   $$car\_sale\ (\underline{plate\_number, seller}, sale\_date, commision, discount)$$

   with following functional dependencies:

   $sale\_date \rightarrow discount$
   $seller \rightarrow commision$

   To which normal form does this relational schema apply? If necessary, transform the schema into 3. normal form. Is the schema minimal?

3. Given following set of functional dependencies $\Sigma = \{A \rightarrow B; BC \rightarrow A\}$ on the relational schema $R\,(ABCD)$. Specify at least one relation r over the schema R that contradicts all functional dependencies. Explain your answer. (Assume that all attributes are of type integer.)

4. Given following relation:

   Teach

STUDENT	COURSE	INSTRUCTOR
Mueller	C1	Heinz
Meier	C1	Heinz
Meier	C2	Paul
Schmidt	C1	Peter

   Decompose the data according to the three given possibilities and join them together afterwards.

(a) $Teach1\,(\underline{STUDENT, INSTRUCTOR})$ $Teach2\,(\underline{STUDENT, COURSE})$

(b) $Teach1\,(COURSE, \underline{INSTRUCTOR})$ $Teach2\,(\underline{COURSE, STUDENT})$

(c) $Teach1\,(\underline{INSTRUCTOR}, COURSE)$ $Teach2\,(\underline{INSTRUCTOR, STUDENT})$

5. A database designer decomposed relation $R(ABCDE)$ into relations $R_1(ABC)$ and $R_2(CDE)$. State at least two functional dependencies in R so that the decomposition into R_1 & R_2 is:

   (a) neither lossless nor dependency preserving

   (b) lossless but not dependency preserving

   (c) not lossless but dependency preserving

   (d) lossless as well as dependency preserving

Good Luck!