CS2102 Database Systems

Semester 1 2019/2020

Tutorial 07

Quiz

Questions 1-6 uses the following schema $R(A, B, C, D)$ with set of FDs $F = \{AB \rightarrow C, B \rightarrow A, C \rightarrow D\}$

1. Which of the following FDs are *logically implied* by F?
   a) $A \rightarrow D$
   b) $AB \rightarrow D$
   c) $B \rightarrow C$
   d) $B \rightarrow D$
   e) $B \rightarrow CD$
   f) $C \rightarrow A$
2. Which of the following set of FDs are equivalent to F?
   a) $G_1 = \{B \rightarrow A, B \rightarrow D, C \rightarrow D\}$
   b) $G_2 = \{B \rightarrow A, C \rightarrow D, B \rightarrow D, B \rightarrow C\}$
   c) $G_3 = \{B \rightarrow AC, C \rightarrow D\}$
3. Compute the attribute closure of B w.r.t. F
4. What is/are the key(s) of R w.r.t. F?
5. What are the prime attributes of R w.r.t. F?
6. Compute one minimal cover of F

Tutorial Questions *[Discussion: 7(a), 7(b), 8(a), 8(b), 9(ab), 10, 11]*

7. The more *extended* set of Armstrong's axioms has union and decomposition. Proof them only using Armstrong's axioms.
   a) Union if $a \rightarrow b$ and $a \rightarrow c$, then $a \rightarrow bc$
   b) Decomposition if $a \rightarrow bc$, then $a \rightarrow b$

8. The more *extended* set of Armstrong's axioms has two more rules in addition to union and decomposition. For each of the rules below, proof them using only Armstrong's axiom.
   a) Pseudo-transitivity if $a \rightarrow b$ and $bc \rightarrow d$, then $ac \rightarrow d$
   b) Composition if $a \rightarrow b$ and $c \rightarrow d$, then $ac \rightarrow bd$

9. Consider $R(A, B, C, D, E, G)$ with FDs $F = \{ABC \rightarrow E, BD \rightarrow A, CG \rightarrow B\}$.
   a) Use extended Armstrong's axioms to show that $F \vDash CDG \rightarrow E$
   b) Compute CDG^+
   c) Find all the keys of R

10. Consider the schema $R(A, B, C, D, E)$ with FDs $F = \{AB \rightarrow CDE, AC \rightarrow BDE, B \rightarrow C, C \rightarrow B, C \rightarrow D, B \rightarrow E\}$. Find all the prime attributes of R. Show your working.

11. Consider the schema $R(A, B, C, D, E)$ with FDs $F = \{AB \rightarrow CDE, AC \rightarrow BDE, B \rightarrow C, C \rightarrow B, C \rightarrow D, B \rightarrow E\}$. Find one minimal cover of F. Show your working.