19300261 43　　薛劭杰

1、(a) A→B (x) [1→2, 1→3, 1→4]

(b) A→C (v) [1→2, 2→2]

(c) B→A (v) [2→1, 3→1, 4→1, 5→2]

(d) B→C (v) [2→2, 3→2, 4→2, 5→2]

(e) C→A (x) [2→1, 2→2]

(f) C→B (x) [2→2, 2→3, 2→4, 2→5]

(g) AB→C (v) [12→2, 13→2, 14→2, 25→2]

(h) AC→B (x) [12→2, 12→3, 12→4]

(i) BC→A (v) [22→1, 32→1, 42→1, 52→2]

2. (a) A→B, BC→D then AC→D is correct (v)

(b) AB→C then A→C is incorrect (x)

course ~~class~~, student ~~de~~ detemine the teacher, but only the ~~cou~~ course can not detemine teacher.

(c) correct.

(d) If A→C and B→C and ABC→D, then A→D is incorrect. Because A→C, B→C and intepret the C→D but not A→D.

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3. R(A,B,C,D,E)

A → B, B → D, so A → D, and CD → E, so AC → E

So $\{AC\}^+ = \{ABCDE\} = R$.

B → D, CD → E so BC → E, and E → A, so BC → A.

So $\{BC\}^+ = \{ABCDE\} = R$.

CD → E, E → A, A → B so CD → A, CD → B.

So $\{CD\}^+ = \{ABCDE\} = R$.

E → A, A → B, B → D, so E → B, E → D.

So $\{CE\}^+ = \{ABCDE\} = R$.

candidate key is {AC} {BC} {CD} {CE}.

(a) A → BCD, ~~So~~ D → E, So $\{A\}^+ = \{ABCDE\}$

F → GH, So $\{AF\}^+ = \{ABCDEF\} = R$

So candidate key is {AF}.

(b) A → BCD, ~~AD → E~~. So A → AD → E.

So AD → E is ~~canon~~ redundant, change to {A → E}

F → GH, so F → H.

So EFG → H is redundant. change to {F → H}

Then the canonical cover is {A → BCD, A → E, F → H}

5. (a) $A \to C$, $B \to D$, so $\{AB\}^+ = \{ABCD\}$

$B \to D$, $DE \to F$, so $BE \to F$.

So $\{ABE\}^+ = \{ABCDEF\} = R$.

$\{ABE\}$ is a candidate key

(b) A is a key and ~~att~~ attribute ~~is~~ is one both right and left side in the new dependent.

So we ~~now~~ have $\{A \to B, A \to C, DE \to F, B \to D\}$ now

$\{A\}^+ = \{ABCD\}$, so if A can determine the E, we can infer the $\{A\} \to \{F\}$. So the new dependency is $\{A \to E\}$ or $\{C \to E\}$ or $\{B \to E\}$ or $\{D \to E\}$

6. $F_1 = \{A \to B, B \to C\} \to$ it can imply the $A \to C$

$F_2 = \{A \to B, A \to C\} \to$ it can not imply the $B \to C$

$F_3 = \{A \to B, AB \to C\} \to$ it can imply the $A \to C$

but it can not imply the $B \to C$.

So F_2 is equivalent to the F_3

7. (a) $\{A \to B\}$ $[1 \to 2, 5 \to 2]$

$\{C \to B\}$ $[3 \to 2, 4 \to 2, 6 \to 2]$

$\{A\cancel{B}C \to B\}$ $[13 \to 2, 14 \to 2, 53 \to 2, 56 \to 2]$

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(b) $F = \{A \to B, C \to B, AC \to B\}$

candicate key = $\{A\overset{C}{\cancel{B}}\}$ ~~Bes~~ because $\{AC\}^+ = F$

so $\{A\}$ and $\{C\}$ is not candidate

~~so~~ it violates BCNF, R is decomposed to

$R_1 = \{AB\}$ $R_2 = \{AC\}$

so the result is $\{AB\}$, $\{AC\}$

8. (a) $\{AB\} = \{ABCDE\} = R$.

as $\{AB \to BC\}$ $\{BC \to CD\}$ $\{CD \to DE\}$

$\{BC\} = \{ABCDE\} = R$.

as $\{BC \to CD\}$ $\{CD \to DE\}$ $\{DE \to A\}$

~~$\{BCD\} = \{$~~

$\{BDE\} = \{ABCDE\} = R$.

So $\{AB\}$ $\{BC\}$, $\{BDE\}$ ~~is~~ are candicate keys for R.

(b) {CD → E} {DE → A} is ~~viola~~ violations

(c) R_1 = {CDE}
R_2 = {ABCD} not ~~do~~ violate the BCNF.

(d) R_1 = {DEA}
R_2 = {BCDE} DE → A ~~is~~ ~~do~~ violates the BCNF
R_3 = {CDE~~A~~} {BCD}.

(e) ~~At~~ CD → E ~~vol~~ violates 3NF.

~~R_1 {BC → DEA}~~

F_c = {AB → C, BC → D, CD → E, DE → A}

R_1 = {ABC} R_2 = {BCD} R_3 = {CDE}
R_4 = {ADE}

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(a) F = {StuID → StuName , profID → profOffice}

(b) {StuID, profID , course}$^+$ = R.

candidate key: {StuID , profID , course}

(c) StuID → StuName violate the BCNF.

So the R$_1$ = {StuID, ~~profID~~ StuName}

R$_2$ = {StuID, profID, course, profOffice}.

violate because profID → profOffice

R$_3$ = {profID , profOffice}

R$_4$ = {profID. stuID, ~~profOffice~~ course}

for R4 , candidate key is {profID, stuID, course}.

So the result is R$_1$, R$_3$, R$_4$

(d) F={stuID → stuName , profID → profOffice ,

$\underbrace{\text{stuID → profID, course, profID → course}}_{\text{new}}$}

(e) stuID → profID, profID → profOffice , profID → course

So stuID → profOffice , ~~studen~~ stuID → course.

{stuID}$^+$=R , {stuID} is candidate key.

(f) profID → profoffice violates the BCNF

R$_1$ = {profID, profoffice}

R$_2$ = {profID, stuID, course}

candidate key for R$_2$ is {StuID}.

stuID → course (√)

profID → course violates BCNF.

$R_3 = \{ profID, course \}$.

$R_4 = \{ stuID, \cancel{course}\ profID \}$.

So the result is { ~~stuID, profID~~ } ⇒ {stuID, profID, course}

{ ~~stuID, course~~ }

{ profID, course }

{ profID, profoffice }.

10.

(1) $\{AB\}^+ = \{A B C E F D\} \neq R$.

$\{B\}^+ = \{B E F C D A\}$

$\{G\}^+ = \{G\}$.

{AB} is not a surkey

(2) $\{B\}^+ = \{ABCDEF\}$

$\{BG\}^+ = \{ABCDEFG\} = R$

$\{CFG\}^+ = \{ABCDEEG\} = R$ ①

$\{CDG\}^+ = \{ABCDEFG\} = R$ ②

because $\begin{cases} CF \to CD,\ CD \to B & ① \\ CD \to B & ② \end{cases}$

So {BG}, {CFG}, {CDG} are candidate keys.

(3)

$B \to C$, $B \to E$ and $CE \to F$

can imply $B \to CE \to F$

so $B \to F$ ~~is~~ should be deleted.

Then $B \to C$, $B \to E$, ~~B~~ can be written as $B \to CE$.

so the $F_c = \{AB \to C, B \to CE, CF \to D, CD \to B, C \to A\}$