

Task 1, R(A,B,C,D,E,F)

$$\begin{aligned} FD1: \{A\} &\rightarrow \{B, C\} \\ FD2: \{C\} &\rightarrow \{A, D\} \\ FD3: \{D, E\} &\rightarrow \{F\} \end{aligned}$$

a) $\{C\} \rightarrow \{B\} \Rightarrow / \text{Decomposition} / \Rightarrow$

$$\begin{aligned} \{C\} \rightarrow \{A, D\} &\Rightarrow / \text{Decomposition} / \Rightarrow \{C\} \rightarrow \{A\} \Rightarrow \\ &\Rightarrow / \text{Transitivity} / \Rightarrow \{C\} \rightarrow \{B, C\} \Rightarrow / \text{Decomposition} / \Rightarrow \{C\} \rightarrow \{B\} \end{aligned}$$

\Rightarrow

b) $\{A, E\} \rightarrow \{F\}$

$$\begin{aligned} \{A\} \rightarrow \{B, C\} &\Rightarrow / \text{Decomposition} / \Rightarrow \{A\} \rightarrow \{C\} \Rightarrow \\ &\Rightarrow / \text{Transitivity} / \Rightarrow \{A\} \rightarrow \{A, D\} \Rightarrow / \text{Decomposition} / \Rightarrow \\ &\Rightarrow \{A\} \rightarrow \{D\} \Rightarrow / \text{Pseudo-transitivity} / \{A, E\} \rightarrow \{F\} \\ &\quad (\{A, D\} \rightarrow \{F\}) \end{aligned}$$

Task 2

a) $X = \{A\} \Rightarrow X^+ = \{A, B, C, D\}$

b) $X = \{C, E\} \Rightarrow X^+ = \{A, B, C, D, E, F\}$

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

FD1: $\{A, B\} \rightarrow \{C, D, E, F\}$

FD2: $\{E\} \rightarrow \{F\}$

FD3: $\{D\} \rightarrow \{B\}$

- a) A must be part of candidate key because it only exists in LHS and not RHS
C and F can't be part of candidate key because they only exist in RHS and not LHS

b) $\begin{cases} AB \\ AD \end{cases}$

b) FD2 and FD3

c) Decompose with FD2

R1(E,F) with FD2 CK(E)

R2(A,B,C,D,E) with FD1 and FD3 CK(AB)

Decompose with FD3

R2a(D,B) with FD3 CK(D)

R2b(A,C,P,E) with FD1 CK(A) \Rightarrow FD4: $\{A, D\} \rightarrow$

$\{C, E\}, F$



WHITELINES

Task 4 , R(A,B,C,D,E)

FD1: $\{A, B, C\} \rightarrow \{D, E\}$

FD2: $\{B, C, D\} \rightarrow \{A, E\}$

FD3: $\{C\} \rightarrow \{D\}$

a) BC must be candidate key

FD3 violates BCNF properties

b) Decompose with FD3

R1(CD) with FD3 CK(C)

R2(A,B,C,E) with FD1 and FD2 CK(BC)

FD4: $\{B, C\} \rightarrow \{A, E\}$

FD5: $\{A, B, C\} \rightarrow \{E\}$