Equivalence on Set of Functional Dependencies

R (A B C D E F G)

F:
- A → B
- AC → D
- E → AD
- E → H

G:
- A → CD
- E → AH

(a) $F \subseteq G$
(b) $G \subseteq F$
(c) $F = G$
(d) $F \neq G$

R (A B C D E F G)

F: A → C
AC → D
E → AD
E → H

F ⊆ G

$(A)^+$ = ACD
$(AC)^+$ = ACD
$(E)^+$ = EAHCD

G: A → CD
E → AH

G ⊆ F

$(A)^+$ = ACD
$(E)^+$ = EADHC

(a) F ⊆ G
(b) G ⊆ F
(c) F = G
(d) F ≠ G

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Minimal Set(Canonical Cover)

R(WXYZ)

$X \Longrightarrow W$

$WZ \Longrightarrow XY$

$Y \Longrightarrow WXZ$

$X \Longrightarrow W$ ✓

$WZ \Longrightarrow X$ ✗

$WZ \Longrightarrow Y$ ✓

$Y \Longrightarrow W$ ✗

$Y \Longrightarrow X$ ✓

$Y \Longrightarrow Z$ ✓

$X^+ = \{X\}$

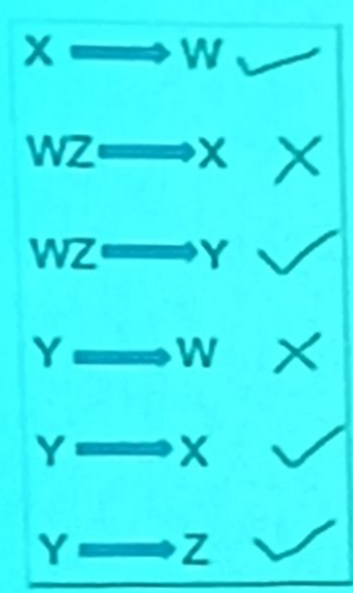
$\{WZ\}^+ = \{WZYX\}$

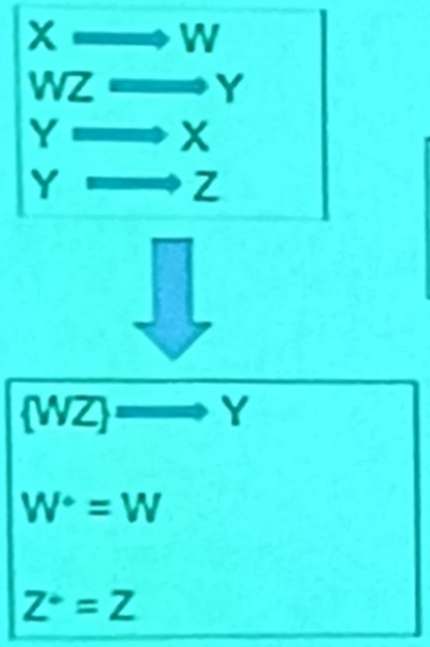
$\{WZ\}^+ = \{WZ\}$

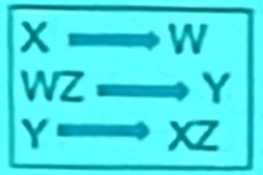
$Y^+ = \{YXZW\}$

$Y^+ = \{YZ\}$

$Y^+ = \{YXW\}$







$(A'+B')' = A'.B''$

For the following functional dependencies, find the correct Minimal Cover.

$\{ A \longrightarrow B,\ C \longrightarrow B,\ D \longrightarrow ABC,\ AC \longrightarrow D \}$

a) $A \rightarrow B,\ C \rightarrow B,\ D \rightarrow A,\ AC \rightarrow D$

b) $A \rightarrow B,\ C \rightarrow B,\ D \rightarrow C,\ AC \rightarrow D$

c) $A \rightarrow BC,\ D \rightarrow CA,\ AC \rightarrow D$

d) $A \rightarrow B,\ C \rightarrow B,\ D \rightarrow AC,\ AC \rightarrow D$

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Example) For the following functional dependencies, find the correct Minimal Cover.

$\{A \Longrightarrow B,\ C \Longrightarrow B,\ D \Longrightarrow ABC,\ AC \Longrightarrow D\}$

Step 1:

$\{A \Longrightarrow B,\ C \Longrightarrow B,\ D \Longrightarrow A,D \Longrightarrow B,\ D \Longrightarrow C,\ AC \Longrightarrow D\}$

Step 2:

$\{A \Longrightarrow B,\ C \Longrightarrow B,\ D \Longrightarrow A,D \not\Longrightarrow B,\ D \Longrightarrow C,\ AC \Longrightarrow D\}$

Step 3:

$\{A \Longrightarrow B,\ C \Longrightarrow B,\ D \Longrightarrow A,\ D \Longrightarrow C,\ AC \Longrightarrow D\}$

Step 4:

$AC \Longrightarrow D$

$A^+ = \{AB\}$

$C^+ = \{CB\}$

Step 5:

$\{A \Longrightarrow B,\ C \Longrightarrow B,\ D \Longrightarrow AC,\ AC \Longrightarrow D\}$

$A^+=A$

$C^+=C$

$D^+=\{DBC\}$

$D^+=\{DCAB\}$

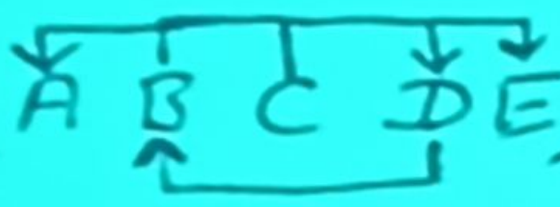
$D^+=\{DAB\}$

$\{AC\}^+=\{ACB\}$

(A'+B')

Example

(A) $R(A\ B\ C\ D\ E)$



$BC \rightarrow ADE$

$D \rightarrow B$

BC is not having incoming edge

$\{C\}^+ - \{C\}$ ↖ not a candidate Key

$\{CA\}^+ - \{AC\}$ ✗

$\{CB\}^+ - \{BCADE\}$ ↙ Key

$\{CD\}^+ - \{CDBAE\}$ ↙ Key

$\{CE\}^+ - \{CE\}$ ✗

$(A'+B')'$

$\{ACE\}^+ - \{ACE\}$ ✗

we have two candidate Key (BC) & (CD)