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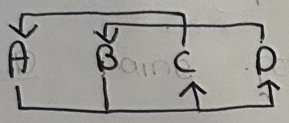
Employee

① R(A,B,C,D), FD; {AB → CD, D → B, C → A} Find all SK & CK



NO EA (Essential attribute

$A^+ = \{A\}$ $B^+ = \{B\}$ $C^+ = \{CA\}$ $D^+ = \{B\ D\}$

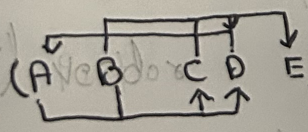
$AB^+ = \{ABCD\}$ SK
$AC^+ = \{AC\}$
$AD^+ = \{ABCD\}$ SK
$BC^+ = \{ABCD\}$ SK
$BD^+ = \{BD\}$
$CD^+ = \{ABCD\}$ SK
$ABC^+ = \{ABCD\}$ SK

AB^+, AD^+, BC^+, CD^+ are SK → ①

$AB^+ = \{A\}\{B\}$ are subset
$AD^+ = \{A\}\{D\}$ " "
$BC^+ = \{B\}\{C\}$ " "
$CD^+ = \{C\}\{D\}$ " "

From ① all are CK

② R(A,B,C,D,E), FD: {AB → CD, D → A, BC → DE}



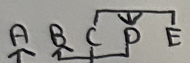
B is EA

$AB^+ = \{ABCDE\}$ SK
$BC^+ = \{ABCDE\}$ SK
$BD^+ = \{ABCDE\}$ SK
$BE^+ = \{BE\}$

AB, BC, BD are SK CK

$ABC^+ = \{ABCDE\}$ is SK but not CK

3] R(A B C D E) FD $\{CE \to D, D \to B, C \to A\}$



C & E ⇒ E A

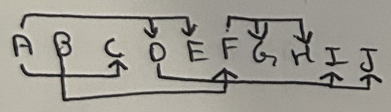
$A^+ = \{A\}$ $B^+ = \{B\}$
$C^+ = \{CA\}$ $D^+ = \{DB\}$

$CE^+ = \{ABCDE\}$ is SK, CE^+ is CK

$AB^+ = \{AB\}$ $AD^+ = \{ADB\}$
$BC^+ = \{BCA\}$ $BE^+ = \{BE\}$
$DE^+ = \{DEB\}$ $AE^+ = \{AE\}$
$AC^+ = \{AC\}$ $CD^+ = \{CDBA\}$
$BD^+ = \{BD\}$ CE^+ is CK //

4] R = (A, B C D E F G H I J)

FD = $\{AB \to C, A \to DE, B \to F, F \to GH, D \to IJ\}$



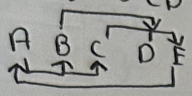
A B D are EA

$A^+ \Rightarrow \{ADE IJ\}$
$B^+ = \{BFGH\}$
$D^+ = \{DIJ\}$.
$ABD^+ = \{AB DCEFGHIJ\}$ is SK & CK

$AB CD^+ = \{AB CDEFGHIJ\}$ SK
$AB DE = \{ABC DEFGHIJ\}$ SK

ABDF$^+$ = {ABCDEFGHIJ} SK
ABDG$^+$ = {ABCDEFGHIJ} SK
ABDH$^+$ = {ABCDEFGHIJ} SK
ABDI$^+$ = {ABCDEFGHIJ} SK
ABDJ$^+$ = {ABCDEFGHIJ} SK

8] R = {A B C D E} FD: {A→BC, CD→E, B→D, E→A}



NO EA

A$^+$ = {ABCDE} SK
B$^+$ = {BD}
C$^+$ = {C}
D$^+$ = {D}
E$^+$ = {ABCDE} SK
BD$^+$ = {BD}
BE$^+$ = {BEDAC} SK
CD$^+$ = {CDEAB} SK
CE$^+$ = {CEABD} SK

AB = {ABCDE} SK
AC$^+$ = {ABCDE} SK
AD$^+$ = {ABCDE} SK
AE$^+$ = {ABCDE} SK
BC$^+$ = {BCDEA} SK
DE = {DEABC} SK

CK = BC$^+$, CD$^+$

10] R(ABCDE) FD: {AB→C, CD→E, DE→B}

A D are EA

A$^+$ = {A}
D$^+$ = {D}
AB$^+$ = {ABC}
ABD$^+$ = {ABDCE} SK & CK

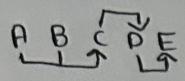
13] R = {A B C D} and FD: {A→C, AB→D,}

⇒ A$^+$ = {AC}

B$^+$ = {B}

AB$^+$ = {ABCD}

14] R={ABCDE} : FD{AB→C, C→D, D→E}



A & B are EA

$A^+ = \{A\}$ $B^+ = \{B\}$.

$AB^+ = \{ABCDE\}$ SK

ABC^+, ABD^+, ABE^+ are SK

$C^+ = \{CDE\}$ $D^+ = \{D\}$ $E^+ = \{E\}$ are not SK

$AC^+ = \{ACDE\}$

$AD^+ = \{AD\}$

$AE^+ = \{AE\}$

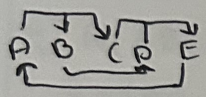
$BC^+ = \{BCDE\}$

BD, BE ⊇ D, CE DE are not SK

$ABCD^+$, $ABCDE^+$ are SKs

SKs → AB^+ ABC^+ ABD^+ ABE^+ $ABCD^+$ $ABCDE^+$

15] R(ABCDE) A→BC, CD→E, B→D, E→A



$A^+ = \{ABCDE\}$

$B^+ = \{BD\}$

$C^+ = \{C\}$

$D^+ = \{D\}$

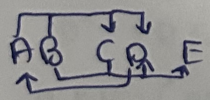
$E^+ = \{ABCDE\}$

AB^+ AC^+ AD^+ AE^+ are SK

BE^+ CE^+ DE^+ are SK

BC^+

2] R(ABCDE), FD={AB→CD, D→A, BC→DE}



$AB^+ = \{ABCDE\}$ SK

$BC^+ = \{BCDEA\}$ SK

$BD^+ = \{ABCDE\}$ SK

$BE^+ = \{BE\}$ SK.

AB^+, BC^+, BD^+ are SK

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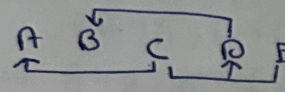
3] R(A B C D E) FD={CE→D, D→B, C→A}



C & E are EA

$A^+ = \{A\}$

$C^+ = \{CA\}$

$E^+ = \{E\}$

$B^+ = \{B\}$

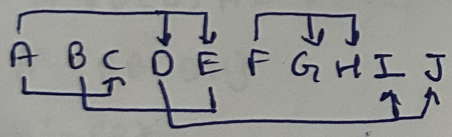
$D^+ = \{DB\}$

set {C} & {E} are not SK

∴ $(CE)^+$ is a candidate key

7] R(A B C D E F G H I J)

FD{AB→C, A→DE, B→F, F→G H, D→I J}



A, B & D are EA

$A^+ = \{A\ D\ E\ I\ J\}$ is not SK

$B^+ = \{B\ F\ G\ H\}$

$D^+ = \{D\ I\ J\}$

$(AB)^+ = \{A\ B\ C\ D\ E\ F\ G\ H\ I\ J\}$

$(ABC)^+ = \{A\ B\ C\ D\ E\ F\ G\ H\ I\ J\}$

$(ABDE)^+ = \{A\ B\ C\ D\ E\ F\ G\ H\ I\ J\}$

$(ABDF)^+ = \{A\ B\ C\ D\ E\ F\ G\ H\ I\ J\}$

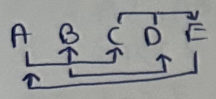
$(ABDG)^+ = \{A\ B\ C\ D\ E\ F\ G\ H\ I\ J\}$

$(ABDI)^+ = \{A\ B\ C\ D\ E\ F\ G\ H\ I\ J\}$

$(ABDJ)^+ = \{A\ B\ C\ D\ E\ F\ G\ H\ I\ J\}$

9] R(ABCDE}

FD: {A→BC, CD→E, B→D, E→A}



A^+ = {ABCDE}

B^+ = {BD}

C^+ = {C}

D^+ = {D}

E^+ = {EDABC} SK

BD^+ = {BD}

BE^+ = {BEACD} SK

CE^+ = {CEABD} SK

AB^+ = {ABCDE} SK

AC^+ = {ABCDE} SK

AD^+ = {ABCDE} SK

AE^+ = {ABCDE} SK

BC^+ = {BCDEA} SK

DE^+ = {DEABC} SK

ABC^+ = {ABCDE} $ABCD^+$, $ABCDE^+$

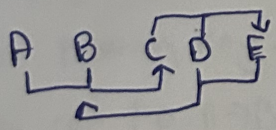
BCD^+ = {BCDEA} $BCDE^+$ = {ABCDE} CDE^+ =

$CK = BC^+, CD^+$

10] R(ABCDE}

FD = {AB→C; CD→E, DE→B}

is AB a C.K? Is ABD is C.K



A & D are not in RHS

A^+ = {A} B^+ = {B} D^+ = {D} is not SK.

AB^+ = {ABC} not S.K & CK

ABD^+ = {ABDCE} is SK & C.K

i) $F=\{A\to BC, CD\to E, E\to C, D\to AEH, ABH\to BD, DH\to BC\}$
$\{A\to B, A\to C, CD\to E, E\to C, D\to A, D\to H\}$

⇒ $A\to B = A^+ = \{ABC\}$, $AB\to B$ → required
$A\to C = A^+ = \{ABC\}$ $A\to C$ → "
$E\to C = E^+ = \{EC\}$ $E\to C$ → "
$D\to A = D^+ = \{DEACH\}$ $D\to A$ → "
$D\to E = D^+ = \{DAHBCE\}$ $D\to E$ → "
$D\to H = D^+ = \{ADBCEH\}$ $D\to H$ is "
$D\to E \Rightarrow D\to E$ is already redundant
$CD\to E \Rightarrow C\to E \Rightarrow C^+ = \{C\}$ is req

∴ Final required FD's are $\{A\to B, A\to C, E\to C, D\to A, D\to H\}$

ii) $A\to BCD, AE\to E, E\to G, D\to H, FE\to I$

⇒ $A^+ = \{ABCDH\}$
$B^+ = \{B\}$
$C^+ = \{C\}$
$D^+ = \{D\}$
$E^+ = \{EG\}$
$F^+ = \{F\}$
∴ no primary key.

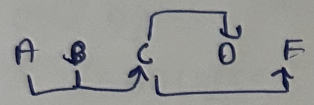
q). Given set FD: $A\to B$, $ABCD\to E$, & $EF\to G$ is $ACDF\to G$

→ $ACDE^+ = \{ACDFBEG\}$
to closure of $ACDE^+$ contain 'G'
So $ACDF\to G$

[3] Let R(A, B, C, D) &
FD{A→C, AB→D}
What is the closure of A, B?

⇒ $A^+ = \{AC\}$
$B^+ = \{B\}$
$AB^+ = \{ABCD\}$

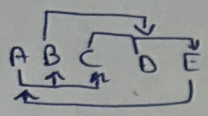
[4] R(A B C D E) FD :- {AB → C, C → D, BC → E}
Find Super Key



$A^+ = \{A\}$ · $B^+ = \{B\}$ are SK
$AD^+ = \{ABCDE\}$
ABC^+, ABC^+, ABE^+ are SK
$C^+ = \{CDE\}$ $D^+ = \{D\}$ $E^+ = \{E\}$ are not SK
$AC^+ = \{ACDE\}$
$AD^+ = \{AD\}$
$AE^+ = \{AE\}$
$BC^+ = \{BCDE\}$
$BD^+ = BE$ CD^+, CE, DE are not SK
$ABCD^+$, $ABCDE^+$ are SK
∴ SK = AB^+, ABC^+, ABD^+, ABE, $ABCD^+$, $ABCDE^+$

15]

(i) $A \to BC,\ CD \to E,\ B \to D,\ E \to A$



$A^+ = \{ABCDE\}$ SK

$B^+ = \{BD\}$

$C^+ = \{C\}$

$D^+ = \{D\}$

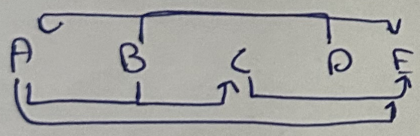
$E^+ = \{EABCD\}$ SK

AB^+, AC^+, AD^+, AE^+ are SK

BE^+, CE^+, DE^+ are SK

$ABC^+, ABCD^+, ABCDE^+$ are SK BCK

(ii) $AB \to C,\ D \to A,\ AE \to B,\ CD \to E,\ BE \to D$



$A^+ = \{A\}, B^+ = \{B\}$ $C^+ = \{C\}$, $D^+ = \{DA\}$, $E^+ = \{E\}$ are not SK.

$AB^+ = \{ABC\}$

$AC^+ = \{AC\}$

$AD^+ = \{AD\}$

$AE = \{ABCDEBCD\}$ SK

$BC^+ = \{BC\}$

$BD^+ = \{BDABCE\}$ SK

$BE^+ = \{BDABCE\}$ SK

$CD^+ = \{ABCDE\}$ SK

$CE^+ = \{CE\}$

$ABC^+ = \{ABC\}$

$ABD^+ = \{ABDEC\}$ SK

$ABE^+ = \{ABCDE\}$ SK

$ABCDE^+ = \{ABCDE\}$ SK

$BCE^+ = \{BCE\}$

$BCD^+ = \{BCDAE\}$ SK

BCE is SK CDE is SK BCDE is SK

CK = AE^+, BD^+, BE^+, CD^+, CE^+

Q3) Consider the universal relation R(A, B, C, D, E, F)

$A \to BC$, $CD \to E$, $B \to D$, $E \to A$

=> $A^+ = \{ABCDE\}$ ✓

$B^+ = \{BD\}$

$C^+ = \{C\}$

$D^+ = \{D\}$

∴ A^+ is a closure

Q7) FD: {AB → C; CD → E, DE → B}

=> $A^+ = \{A\}$

$AB^+ = \{ABC\}$

$B^+ = \{B\}$

are not SK.

AB^+ is not CK [∵ it is not a SK]