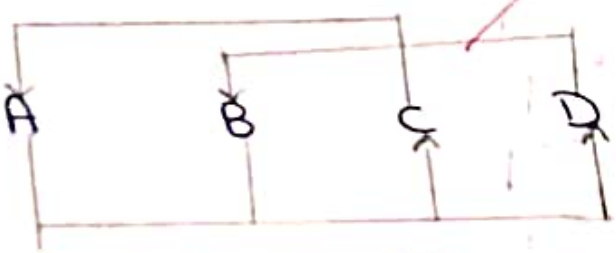
Name:-Mohammed Waseem.R.Naikar
Roll.no:-456
USN:-01FE24BCS406
Div:-D

DBMS ASSIGNMENT

Find the Super Keys & candidate keys for the following:

1. R(A,B,C,D) FD: {AB→CD, D→B, C→A}



NO essential attributes

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

All are not Super keys.

$AB^+ = \{ABCD\}$ is a super key

$AC^+ = \{AC\}$ is not a Super key.

$AD^+ = \{ADBC\}$ is a super key

$BC^+ = \{BCAD\}$ is a Super key

$CD^+ = \{CDAB\}$ is a Super key

$ABC^+ = \{ABCD\}$ is a Super key

$BD^+ = \{BD\}$ is not a Super key

$ABD^+ = \{ABCD\}$ S.K

$BCD^+ = \{BCDA\}$ S.K

∴ AB^+, AD^+, BC^+, CD^+ are the Super keys → ①

$AB^+ = \{A\}\{B\}$ are the subsets
$AD^+ = \{A\}\{D\}$ are the Subsets
$BC^+ = \{B\}\{C\}$ are the Subsets
$CD^+ = \{C\}\{D\}$ are the Subsets

} The proper Subsets are not Super keys.

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

FD: {AB→C, AD→GH, BD→EF, A→I, H→J}

∴ AB & D are essential attribute

$A^+ = \{AI\}$
$B^+ = \{B\}$
$D^+ = \{D\}$
} not s.k

$ABD^+ = \{ABDCGHEFIJ\}$ is super & candidate key.

$AB^+ = \{ABC\}$, $AD^+ = \{ADGHIJ\}$, $BD^+ = \{BDEF\}$ are not super keys.

5. R(A,B,C,D,E) FD: {A→B, BC→E, DE→A}

C & D are essential attributes.

$C^+ = \{C\}$, $D^+ = \{D\}$ are not S.K's

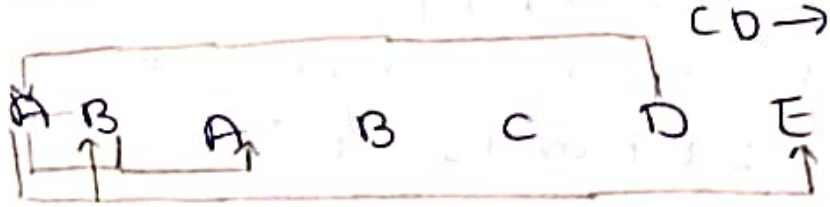
$CD^+ = \{CD\}$ not S.K

$ACD^+ = \{ACDBE\}$ S.K & C.K

$BCD^+ = \{BCDAE\}$ S.K & C.K

$ECD^+ = \{CDEAB\}$ S.K & C.K

6. R(A,B,C,D,E) FD: {AB→C, D→A, AE→B, CD→E, BE→D}



D & E are essential attributes.

from ①, all are candidate keys.

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

∴ B is essential attribute.

Combining B with other attributes

$AB^+ = \{ABCDE\}$ is a super key.

$BC^+ = \{BCDEA\}$ is a super key

$BD^+ = \{BDACE\}$ is a super key

$BE^+ = \{BE\}$ is not a super key

∴ AB^+, BC^+, BD^+ are super keys

~~A+~~ whose proper subsets are not the super keys

∴ are the candidate keys.

3. R(A,B,C,D,E) FD: {CE→D, D→B, C→A}

C & E are the essential attributes

$A^+ = \{A\}$ is not S.K

$C^+ = \{CA\}$ is not S.K

$E^+ = \{E\}$ is not S.K

$B^+ = \{B\}$ is not S.K

$D^+ = \{DB\}$ is not S.K.

$CE^+ = \{CEDBA\}$ is a superkey whose proper subsets $\{C\}$ & $\{E\}$ are not super key.

∴ CE^+ is a candidate key.

$D^+ = \{DA\}$, $E^+ = \{E\}$ } not S.K's.

$DE^+ = \{DEABC\} = \{ABCDE\}$ is S.K & C.K

$ADE^+ = \{ADEBC\}$ S.K but not C.K

$BDE^+ = \{BDEAC\}$ S.K but not C.K

$CDE^+ = \{CDEAB\}$ S.K but not C.K

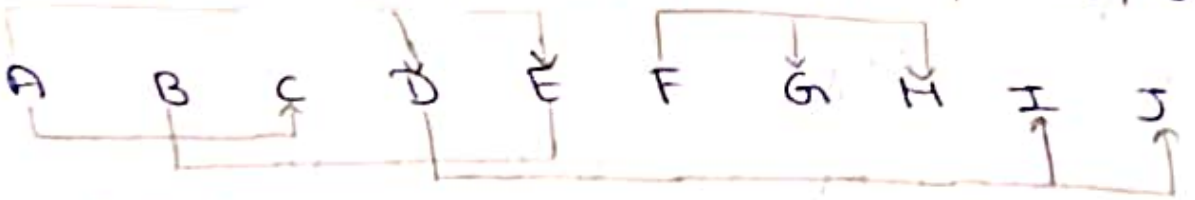
$ABCDE^+ = \{ABCDE\}$ is a Super key

Super key = $DE^+, ADE^+, BDE^+, CDE^+, ABCDE$

Candidate key = DE^+

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

FD : {AB → C, A → DE, B → F, F → GH, D → IJ}



∴ A, B & D are essential attributes

$A^+ = \{ADEIJ\}$ is not S.K

$B^+ = \{BFGH\}$ is not S.K

$D^+ = \{DIJ\}$ is not S.K

$ABD^+ = \{ABDCEFGHIJ\}$ is S.K & C.K

$ABCD^+ = \{ABCDEFGHIJ\}$ is S.K

$ABDE^+ = \{ABDECFGHIJ\}$ is S.K

$ABDF^+ = \{ABDFCEGHIJ\}$ is S.K

$ABDG^+ = \{ABDCEFHIJ\}$ is S.K

$ABDI^+ = \{ABCDEFGHIJ\}$ is S.K

$ABDJ^+ = \{ABCDEFGHIJ\}$ is S.K.

$D^+ = \{D\}$
$E^+ = \{EG\}$
$F^+ \{F\}$
∴ no primary key.

9. Given set FD: A→B, ABCD→E & EF→G
is ACDF→G

→ $ACDF^+ = \{ACDFBEG\}$
Hou closure of $ACDF^+$ contain 'G'
So, ACDF → G //

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

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

14. R(ABCDE) FD:-{AB→C, C→D, C→E}
Find super key

∴ A & B are essential attributes.

$A^+ = \{A\}$ $B^+ = \{B\}$ are not S.K.
$AB^+ = \{ABCDE\}$ is S.K
ABC^+, ABD^+, ABE^+ are Super Keys.
$C^+ = \{CDE\}$, $D^+ = \{D\}$, $E^+ = \{E\}$ are not S.K's.

is the closure of {A,B})

→ $A^+ = \{A C\}$, $B^+ = \{B\}$, $AB^+ = \{ABCD\}$

∴ AB is closure.

Q5 a) If $D\{A \to BC, CD \to E, E \to C, D \to AEH, ABH \to BD, DH \to BC\}$ & R(A B C D E F G H). Find minimal cover?

→ $\{A \to B, A \to C, E \to C, D \to A, D \to H, CD \to E, DH \to B, DH \to C, ABH \to B, ABH \to D\}$

$A \to B = A^+ = \{AC\}$, $A \to B$ is required

$A \to C = A^+ = \{AB\}$, $A \to C$ is required

$E \to C = E^+ = \{E\}$, $E \to C$ is required

$D \to A = D^+ = \{DEHBC\}$ is required,

$D \to E = D^+ = \{DABCE\}$ is not required

$D \to H = D^+ = \{DABCE\}$ is required.

$\not{D} \to E \Rightarrow D \to E$ is not required

∴ $CD \to E$ is not required

$\not{D}H \to B$, $H \to B \Rightarrow H^+ = \{H\}$ is required

$D\not{H} \to B$, $D \to B \Rightarrow D^+ = \{DAHB\}$ is not required.

∴ $DH \to B$ is not required.

$\not{D}H \to C$, $H \to C$, $\Rightarrow H^+ = \{H\}$ is required

$D\not{H} \to C$, $D \to C$, $\Rightarrow D^+ = \{DAHBC\}$ is not required

∴ $DH \to C$ is not required.

$ABH \to B$, $H \to B \Rightarrow H^+ = \{H\}$ is required

$AB \to B$, $B \to B \Rightarrow B^+ = \{B\}$ is required

$AB \to B$, $A \to B \Rightarrow A^+ = \{AC\}$ is required

$\therefore ABH \to B$ is required.

∴ Final required FD's

$\{A \to B, A \to C, E \to C, D \to A, D \to H, ABH \to B, ABH \to D\}$

minimal cover.

b. Given these FD's find primary key

$\{A \to B, C, D, A, E \to F, E \to G, D \to H, F, E \to I\}$

→ $A^+ = \{ABCDH\}$ ×

$AE^+ = \{AE\ BC\ D\ GH\ FI\}$

It super key, candidate key, and also the primary key.

$A^+ = \{ABCDH\}$ ×

$E^+ = \{EG\}$ ×

$D^+ = \{DH\}$ ×

$FE^+ = \{FEIG\}$ ×

∴ $\{AE\}$ is the primary key.

$A^+ = \{A\}$ $B^+ = \{B\}$ $D^+ = \{D\}$ are not Super Keys.

I $AB^+ = \{ABC\}$ not S.K & C.K

$ABD^+ = \{ABDCE\}$ is S.K & C.K

II. Given FD's $F = \{A \to BC, CD \to E, E \to C, D \to AEH, ABH \to BH, DH \to BC\}$ for relational schema. $R(ABCDEFGH)$ FD Find minimal cover.

$\{A \to B, A \to C, CD \to E, E \to C, D \to A, D \to H\}$

→ $A \to B = A^+ = \{AC\}$, $A \to B$ is required

$A \to C = A^+ = \{AB\}$, $A \to C$ is required

$E \to C = E^+ = \{E\}$, $E \to C$ is required

$D \to A = D^+ = \{DECH\}$; $D \to A$ is required

$D \to E = D^+ = \{DAHBCE\}$, $D \to E$ is redundant then discard it.

$D \to H = D^+ = \{DABCE\}$, $D \to H$ is required

$\not{C} D \to E \Rightarrow D \to E$ is already redundant.

$C \not{D} \to E \Rightarrow C \to E \Rightarrow C^+ = \{C\}$ is required

$\therefore CD \to E$ is not required

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

12. Given FD's. Find Primary key.

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

→ $A^+ = \{ABCDH\}$

$B^+ = \{B\}$

$C^+ = \{C\}$

$A^+ = \{ACDE\}$ not S.K

$AD^+ = \{AD\}$ not S.K

$AE^+ = \{AE\}$ not S.K

$BC^+ = \{BCDE\}$ not S.K

BD^+, BE, CD^+, CE^+, DE^+ are not S.K's

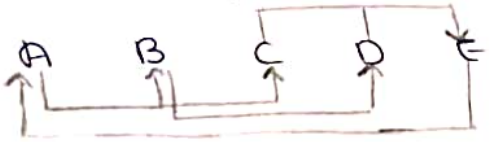
$ABCD^+$, $ABCDE^+$, are the Super Keys.

∴ Super keys = AB^+, ABC^+, ABD^+, ABE^+, $ABCD^+$, $ABCDE^+$.

15. Compute the closure of the following set of FD's for

a). relational schema R(A,B,C,D,E),

$(A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A)$, what are the candidate keys for R?



No essential attributes

$A^+ = \{AB\ CDE\}$ is S.K

$B^+ = \{BD\}$ is not S.K

$C^+ = \{C\}$ is not S.K

$D^+ = \{D\}$ is not S.K

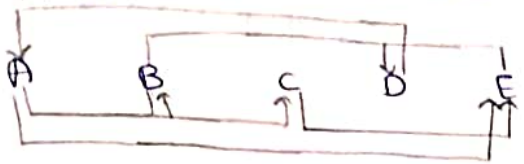
$E^+ = \{EABCD\}$ is S.K

AB^+, AC^+, AD^+, AE^+ are Super Keys.

BE^+, CE^+, DE^+, are Super Keys.

ABC^+, ~~AD~~ $ABCD^+$, $ABCDE^+$ are Super Keys & Candidate Keys.

Suppose a relation R(A,B,C,D,E) has FD's
AB → C, D → A, AE → B, CD → E, & BE → D
Find all the candidate keys of R.



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

$AB^+ = \{ABC\}$ not S.K

$AC^+ = \{AC\}$ not S.K

$AD^+ = \{AD\}$ not S.K

$AE^+ = \{AEBCD\}$ is S.K & C.K

$BC^+ = \{BC\}$

$BD^+ = \{BDACE\}$ is S.K & C.K

$BE^+ = \{BEDAC\}$ is C.K & S.K

$CD^+ = \{CDEAB\}$ is S.K & C.K

$CE^+ = \{CE\}$ is not S.K

$ABC^+ = \{ABC\}$ is not S.K

$ABD^+ = \{ABDCE\}$ is S.K

$ABE^+ = \{ABEDC\}$ is S.K

$ABCDE^+ = \{ABCDE\}$ is S.K

$BCD^+ = \{BC\}$ not S.K

$BCD^+ = \{BCDAE\}$ is S.K

BCE^+ is S.K CDE^+ is S.K $BCDE^+$ is S.K

∴ Candidate Keys = AE^+, BD^+, BE^+, CD^+, CE^+

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

FD: {A → BC, CD → E, B → D, E → A}

There is no essential attribute.

$A^+ = \{ABCDE\}$ is S.K

$B^+ = \{BD\}$ is not S.K

$C^+ = \{C\}$ is not S.K

$D^+ = \{D\}$ is not S.K

$E^+ = \{EABCD\}$ is S.K

$BD^+ = \{BD\}$ is not S.K

$BE^+ = \{BEDAC\}$ is S.K

$CD^+ = \{CDEAB\}$ is S.K & C.K

$CE^+ = \{CEABD\}$ is S.K

$AB^+ = \{ABCDE\}$ is S.K

$AC^+ = \{ABCDE\}$ is S.K

$AD^+ = \{ABCDE\}$ is S.K

$AE^+ = \{ABCDE\}$ is S.K

$BC^+ = \{BCDEA\}$ is S.K & C.K

$DE^+ = \{DEABC\}$ is S.K

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

$BCD^+ = \{BCDEA\}$, $BCDE^+ = \{ABCDE\}$, CDE^+, BCE^+ are S.K but not ~~candidate~~ candidate keys.

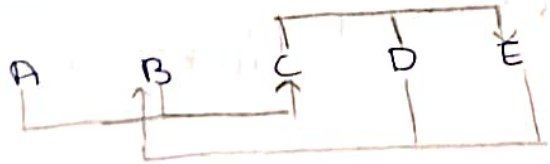
∴ C.K = BC^+, CD^+.

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

FD: {AB → C, CD → E, DE → B}

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

→



∴ A & D are the essential attributes.

Q3. Consider the Universal relation R (A, B, C, D, E, F, G, H, I, J) on a set of FD's, F = AB → C, A → DE, B → F, F → GH, D → IJ

What is the key of R? Decompose R into 2NF.

...ute the closure of the following set of FD's
... relation schema R(A B C D E)

A → BC, CD → E, B → D, E → A

A+ = {A B C D E} is a closure.

B+ = {B D} is not a closure

C+ = {C} is not a closure

D+ = {D} is not a closure

∴ A+ is a closure.

Q7. consider Relation R(A, B, C, D, E) with the following dependencies.

FD: {AB → C, CD → E, DE → B}

Is AB a candidate Key of this relation?

If not? explain.

→ A+ = {A}

AB+ = {A B C}

B+ = {B}

are not Super Keys

∴ AB+ is not a candidate key, ∵ it is not a Super Key.