COMPUTER SCIENCE

Database Management System

FD's & Normalization

Key Concepts & Finding Number of Candidate Keys Part-02

Lecture_03

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01 Finding Candidate keys

RDBMS Concept

FD Concept

FD Type ⟶ Trivial FD:

AB → AB

AB → A

A → A

Sid → Sid

Sid Sname → Sid

Sid Sname → Sid Sname

Attribute closure $[x]^+$

Sid → CGPA

Sid → Branch

Sid → Sname

Non Trivial FD

A → B

A → C

Keys Concept

Super key : Let R be the Relational Schema, X be the attribute set of R.

If all attribute of Relation R. is determined by the attribute closure of X then X is a Super key.

OR

If $[X]^+$ Attribute closure of X, determine the all Attribute of Relation R then X is a Super key.

R(ABCDE) [A → B, B → C, C → D, D → E]

$[A]^+ = [ABCDE]$

$[B]^+ = [BCDE]$

$[C]^+ = [CDE]$

$[D]^+ = [DE]$

$[E]^+ = [E]$

A is C.k

A is a Super key.

Any Super set of A is also Super key.

AB
AC
AE
ABD
.
.
ABCDE

Super key

Note

Any Super Set of Super key is also super key.

eg

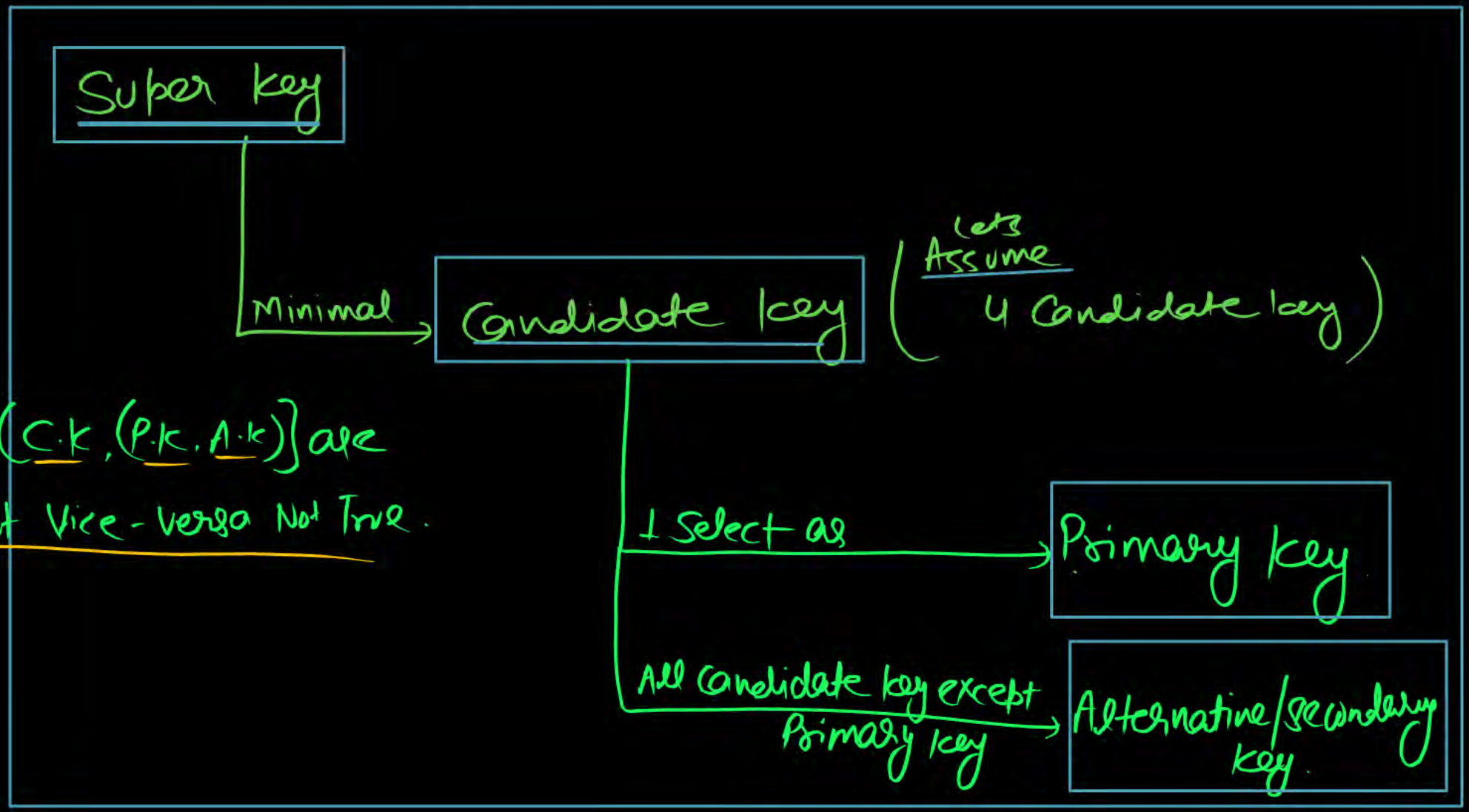
if A is Super key then.

Any Super Set of A is also Super key.

Attribute closure $[X]^+$: Set of All possible Attributes which is determined (logically / functionally determined) by attribute X is called Attribute closure of X $[X]^+$.

Sid → CGPA
Sid → branch
Sid → Sname

Keys Concept



$(ABCDEF)^+ = [ABCDEF]$

$R(ABCDEF)$ $[AB \to C,\ C \to D,\ D \to E,\ E \to F]$

$[A]^+ = [A]$

$[B]^+ = [B]$

$[AB]^+ = [ABCDEF]$

AB is super key.

Any super set of super key (AB) is also super key.

AB

ABC

ABD

ABEF

⋮

ABCDEF

all are super keys.

Candidate key : Minimal of Super key

(OR)

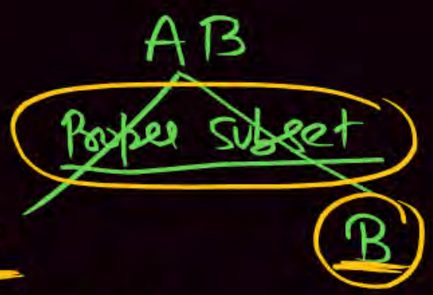
If Any Proper Subset of Super key is also Super key then that Proper Subset is called Candidate key & so on

R(ABCDE) [AB→C, C→D, B→EA]

Sol

$(AB)^+ = [ABCDE]$

AB is super key



Prime / key Attribute = [B]

Non Prime / Non key Attribute = [A, C, D, E]

$(A)^+ = [A]$

$(B)^+ = [BEACD]$

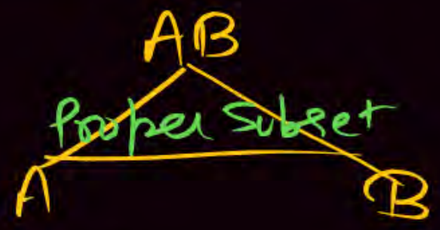
B is Candidate key

But AB is Not C.K

R(ABCDE) [AB→C, C→D, B→E]

$(AB)^+ = [ABCDE]$

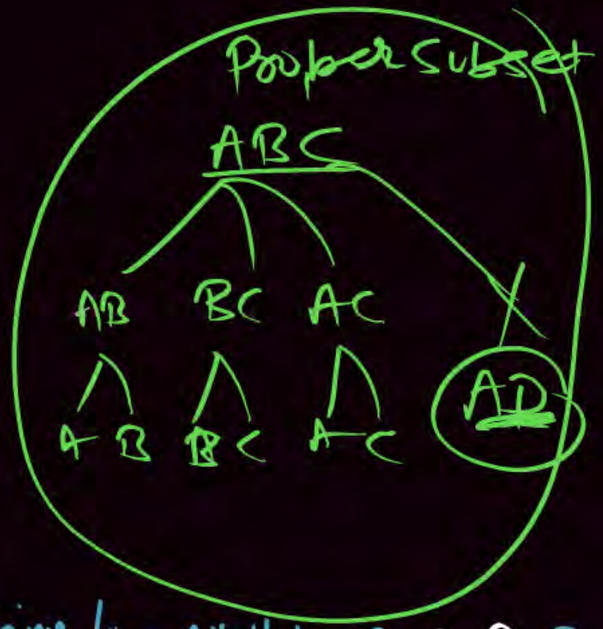
AB is super key



$(A)^+ = [A]$

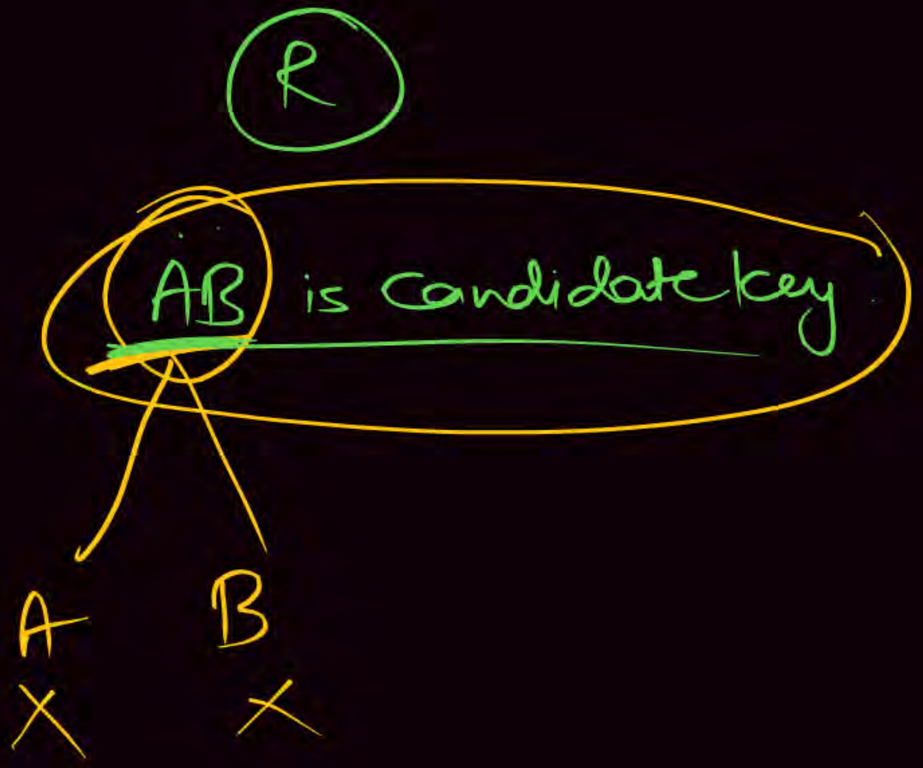
$(B)^+ = [BE]$

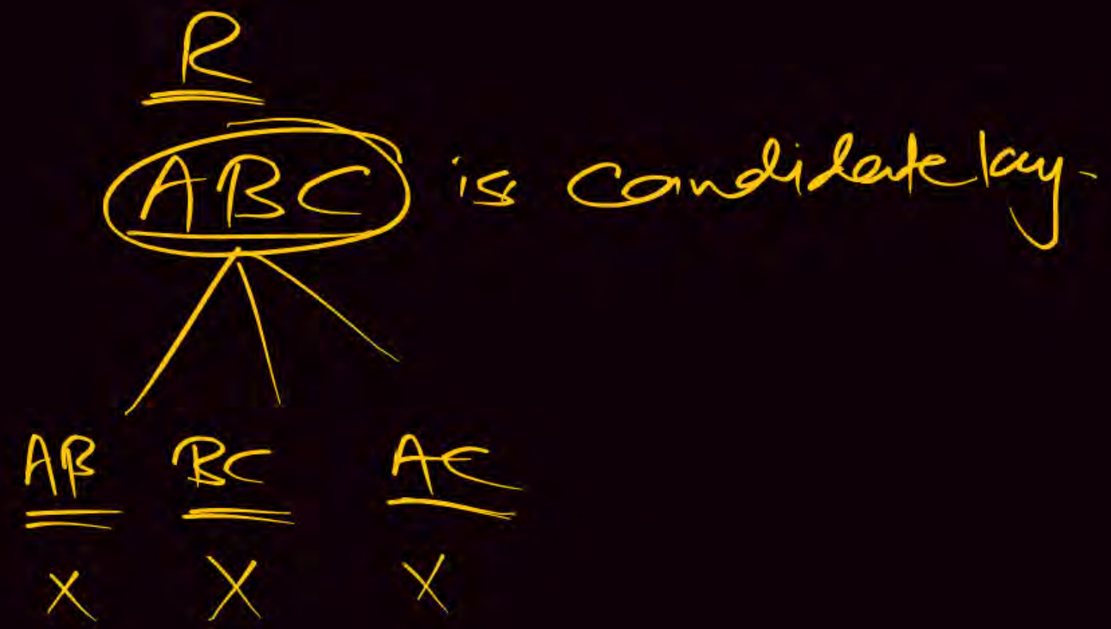
AB is Candidate key



Prime / key Attribute = [A, B]

Non key / Non Prime Attribute = [C, D, E]


R
AB is candidate key
A
X
B
X


R
ABC
is candidate key.
AB
X
BC
X
AC
X

Note Every Candidate key is a Super key But Every Super key is Not Candidate key.

Note Candidate key must be Minimal of Super key.

key / Prime Attribute : Set of Attributes that belongs (or) Present in Any of the Candidate key is called Prime / key Attribute.

Non key / Non Prime Attribute : Set of Attributes that Not belongs (or) Not Present in Any of the Candidate key, is called Non key / Non Prime Attribute.

Finding Multiple candidate key :

Procedure: First Find Any One Candidate key. & that Attribute (Present in the Candidate key) is called Prime/key Attribute.

If $X_{Attribute} \longrightarrow$ [Prime Attribute]

then Multiple Candidate are possible

(e) If B is Candidate key, then B is Prime Attribute.

If $X_{Attribute} \longrightarrow$ [Prime Attribute] Prime Attribute [B]

D → B

D → BC

A, D → AD → B

AD → BC

then Multiple Candidate keys are there.

Q. 1

R(ABCDEF) {A → B, B → C, D → CEF}

Find candidate keys for the relation R ?

Q.2

R(ABCDE) {AB → C, C → D, D → E, B → A, C → B}

Find candidate keys for the relation R ?

Soln

R(ABCDE) [AB→C, C→D, D→E, B→A, C→B]

Prime Attribute = [B, C]

$(AB)^+ = [ABCDE]$

A, B → AB is super key.

$[A]^+ = [A]$

$[B]^+ = [BACDE]$

B is Candidate key. —(1)

If X Attribute → [Prime Attribute]

C → B

$[C]^+ = [CBADE]$

C is Candidate key. —(2)

2 Candidate key

B, C } Ans

AB → C

$[AB]^+ = [ABCDE]$

$[A]^+ = [A]$

$[B]^+ = [BACDE]$ already taken

Q. 3

R(ABCD) {A → B, B → C, C → D, D → A}

Find candidate keys for the relation R ?

Q.4

R(ABCDEF) {A → BCDE, BC → AD, D → EF}

Find candidate keys for the relation R ?

R(ABCDEF) [A→BCDE, BC→AD, D→EF]

Prime Attribute = [A, B, C]

$[A]^+ = [ABCDEF]$

A is candidate key — ①

$\frac{A \rightarrow BCDE}{(A)^+ = (ABCDEF)}$

But A is already taken

If $X_{Attribute} \longrightarrow$ [Prime Attribute]

$BC \rightarrow AD$

$[BC]^+ = [BCADEF]$

BC is Super key ∴ BC is Candidate key — ②

$[B]^+ = [B]$

$[C]^+ = [C]$

2 Candidate keys

① A

② BC

Q.5

R(ABCD) F: {AB → C, B→ D, C → B, D → B}

Find all candidate key of R?

Q. 6

Consider the following relational schema R(ABCDEF) with functional dependency {AB → C, C → D, D → E, E → F, F → B}
The number of candidate keys for relation R ?

Any Doubt ?

THANK YOU!