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Normalization for Relational Database Part-1

Content :-
1. Functional Dependency
2. Candidate Key
3. Super Key
4. Prime Attribute

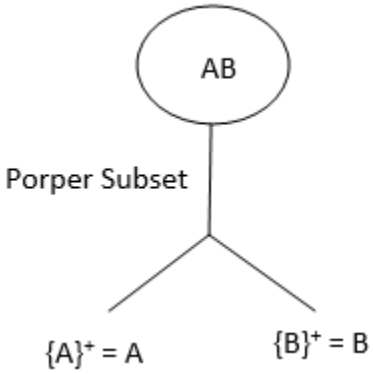
Functional Dependency :- A functional dependency (FD) is a relationship between two attributes, typically between the PK and other non-key attributes within a table . For any relation R, attribute N is functionally dependent on attribute M (usually the PK) , if for every valid instance of X, that value of M uniquely determines the value of N . The relationship is indicated by the representation below:
M ------> N

The left side of the above FD diagram is called determinant, and the right side is the dependent.

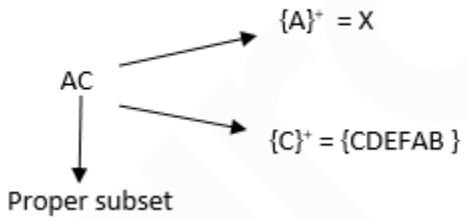
Candidate Key:- A super Key, whose no proper subset forms a Super Key is called candidate key. Thus candidate key is a minimal super key (i.e. a Super Key having no extraneous attributes).A entity set may have more than one candidate Keys.

Q. R(A,B,C,D,E,F)
Functional Dependencies :-
AB → c
C→ DE
E → F
D → A
C → B
Super Key:- **$\{ABCDEF\}^+ = \{ABCDEF\}$**
$\{ABDEF\}^+ \neq \{ABCDEF\}$
$\{ABF\}^+ = \{ABCDEF\}$
$\{AB\}^+ = \{ABCDEF\}$
Eliminate F here :
C→ DE

Means c → D , c→ E, & E→ F



Proper set of SK should be a Super key But here no proper set of super key AB is a super key i.e. AB is a CK.
Prime Attribute :- Attributes that are making candidate key .
Till now we just have 2 attributes AB which are prime.
If Prime attributes are present on RHS of any FD then definitely you have more candidate key present .
FD is D→ A
Now replace A with D in Candidate key DB
We can not say definitely that DB is a CK but we can say definitely that DB is a SK .
No proper subset of DB is SK i.e. DB is a CK
Now rpime attributes are {A,B,D} B is present on RHS of FD C→ B
So replace B with C in AB .
So we will get AC (this is definitely a SK but not sure if it is a CK)



AC is not a CK i.e. proper subset of AC i.e. C can determine all the attributes :. AC is a SK not CK .
C is a SK . Proper subset of C is O cannot be SK therefore C is a CK therefore no proper subset of C is SK . Till now candidate keys are AB,DB,C
Prime attribute = {A,B,D,C}
Now replacing D in AB
DB is a SK proper subset of DB is
{D} = D X
{B} = B X
So DB is a CK .
Now C is also present on RHS of FD AB → C so replace C with AB

AB we have already discussed is a CK
3 Candidate keys = AB, DB, C
Prime attribute = A,B,D,C
Non-prime = E,F

Q. {A,B,C,D,E}
FD: {A→B, D→E}
ABCDE will be a SK
$\{ABCDE\}^+ = ABCDE$
CK is a SK whose proper subset is not a SK .
ABCDE = {ABCDE}

SK ← ACD = ABCDE

Can this SK be CK proper subset of this is

AC^+

CD^+

AD^+ = All of them are not SK therefore ACD is CK

A^+

C^+

D^+

If closure of any of those contain all the attributes then it ACD SK is not a CK

Prime attributes are those attributes where are part of CK so till now ACD are prime .
Prime attributes present in RHS of FD
A ------ not present
C ------ not present
D ------not present
Therefore in the relation there is only one CK = ACD
If no prime attribute is present on RHS of any FD's then there is no CK .

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