COMPUTER SCIENCE



Database Management System

FD's & Normalization





Lecture_07

Vijay Agarwal sir





Minimal Cover

Closure of FD Set



Membership set

Equality between 2FD Set

F:[] G:[

Favor G: True / F=G

Gaver F: True / F=G



Minimal Cover. AB 3C, A3C

Redundant Attorbute

Split the PD such that R.M.S Contain Single
Attribute

Step : Bind the Redundant Attornt boom L.H.S. & Delak them

Steps: Flimination of R.F.D.

(A) = (... R) Rextag (R) = (... A) A (xtra



- @ cc with Enjoying Concept
- (b) CC
- (C) C
- (a) Doubt

P. C.

Canonical Cover

- Sets of functional dependencies may have redundant dependencies that can be inferred from the others
 - For example: $A \rightarrow C$ is redundant in: $\{A \rightarrow B, B \rightarrow C, A \rightarrow C\}$



Procedure to find minimal set

Step (1)

Split the FD such that RHS contain single Attribute.

Ex.
$$A \rightarrow BC$$
, \Rightarrow $A \rightarrow B$ and $A \rightarrow C$

Step (2)

Find the redundant attribute on L.H.S and delete them.

Ex.
$$AB \rightarrow C$$
,

B can be delete if
$$A^+$$
 contain 'B' $[A]^+=[...B]$





(3)

Find the redundant FD and delete them from the set

Ex.
$$\{A \rightarrow B, B \rightarrow C, A \rightarrow C\}$$

 $\{A \rightarrow B, B \rightarrow C\}$

Example 4:



 $[A \rightarrow BC, CD \rightarrow E, E \rightarrow C, D \rightarrow AEH, ABH \rightarrow BD, DH \rightarrow BC]$

ANB. ANC, DAA, DAE, DAY, ENC. AHAD

OR

A -BC D-AEH

E>C, AH>D.

Example 4:



 $[A \rightarrow BC, CD \rightarrow E, E \rightarrow C, D \rightarrow AEH, ABH \rightarrow BD, DH \rightarrow BC]$

City (C)

B (M)= (H)
H is extra

B is extra.

(AH -> Dy T= CH) A is Not

(AB) = [ABC] - (BH)

[AHB)

Example 4:

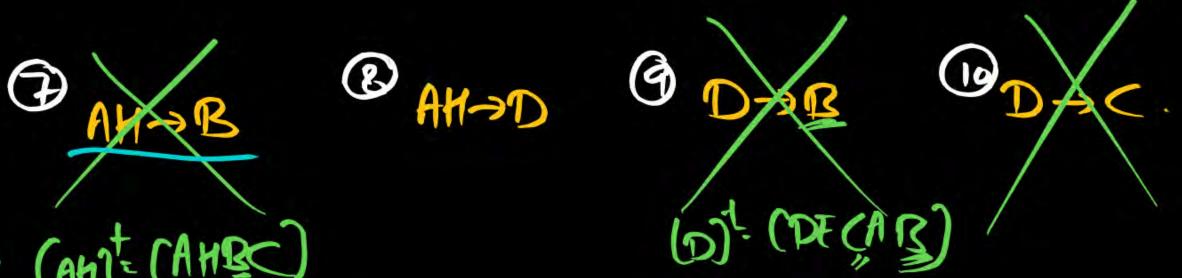




 $[A \rightarrow BC, CD \rightarrow E, E \rightarrow C, D \rightarrow AEH, (ABH \rightarrow BD) DH \rightarrow BC]$











Given the following two statements:



- S1: Every table with two single-valued attributes is in 1NF, 2NF, 3NF and BCNF.
- S2: AB → C, D → E, E → C is a minimal cover for the set of functional dependencies AB → C, D → E, AB → E, E → C.
 Which one of the following is CORRECT? [MCQ: 2014: 2M]

- A S1 is TRUE and S2 is FALSE.
- B Both S1 and S2 are TRUE.
- C S1 is FALSE and S2 is TRUE.
- Both S1 and S2 are FALSE.

F: CAB >C D>E, AB >E, E>C)

G: CAB-C D-E, E-C)

(2) Gover F

(1) FCover G

AB->C

Not miniment Orien.

XABHE (AB) = (AB)

Alternateran

Find Minimal Cover.

F: CAB-C D-E, AB-E, E-C)

Stepl: AB>C, D>EI AB>E, E>C

Stete AR -> C

(A) t = CA)

(B) t = (B)

(B) t = (B)

SKES COASEC) (D) + CD3 (AR) + CAB

(AB) (AB)

G: [AB -> (D-) E. E-)

D-JE, AR-JE, E-SC



(Y) E>C

(F) [E)

Test

F: CAB > C D > E, AB > E E > C)

Minimal Cover [D > E, AR > E, E > C)

FCover G

VD→E

JAB→ €

/ E + C

True

Gover F

LARS (AR) = (ARES)

NOTE

LABJE

LESC

True

F= 9 So above 18
Minimal

Q.

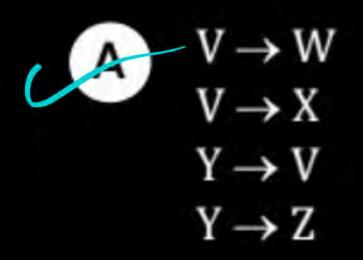
The following functional dependencies hold true for the relational schema R{V, W, X, Y, Z}:



$$V \rightarrow W$$
 $V \rightarrow X$
 $Y \rightarrow VX$
 $Y \rightarrow Z$

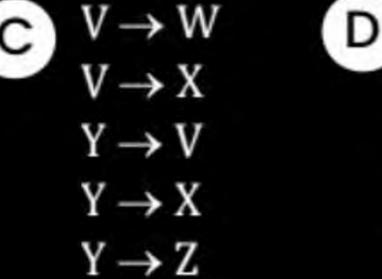
Which of the following is irreducible equivalent for this set of functional dependencies?

[MCQ:2017]



B
$$V \rightarrow W$$

 $W \rightarrow X$
 $Y \rightarrow V$
 $Y \rightarrow Z$



$$D V \rightarrow W$$

$$W \rightarrow X$$

$$Y \rightarrow V$$

$$Y \rightarrow X$$

 $Y \rightarrow Z$

Consider the following FD Set:

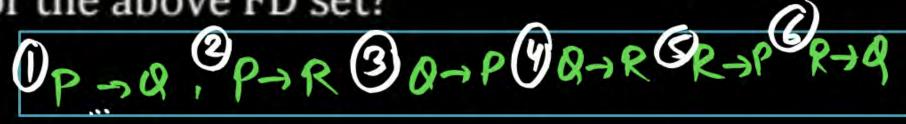


 $\{P \rightarrow QR, Q \rightarrow PR, R \rightarrow PQ\}$ which of the following

is/are the minimal cover for the above FD set?



$$P \rightarrow Q, Q \rightarrow R, R \rightarrow P$$





$$P \to R$$
, $Q \to R$, $R \to PQ$



$$Q \rightarrow P, P \rightarrow R, R \rightarrow Q$$



$$P \rightarrow QR, Q \rightarrow P, R \rightarrow P$$





Home Work

DP-JAR, A-PR, R-PA (P)= [PRQ] (P)= [P] (Q)= (QP) (Q)= (QP) (P)= (RQ) (P)= (RP)

P-PR Q-PR R-PQ Option(b).

**

P-JAR, B-PR, R-JPB SIGHT 3 P-9 OPER 30-P BR-P GRAG. (P)=(P) (P)=(PQR) (Q)=(QRP) (Q)=(Q) (R)=(RQ) (R)=(RQ)

 $P \rightarrow 9$, $Q \rightarrow R$, $R \rightarrow P$ option (a)

P-JAR, A-PR, R-JPA 3 PSQ BPR BQPP GARR DRPPPRAG. (P)=(PRQ) (P)=(P) (Q)=(QR) (Q)=(QPR) (R)=(PQP) (R)=(R)

PAR QAP RAG Option(C)

P-QR, Q-PR, R-PQ

SMALL

PAR PAR QAP RAP.

P-Jar, O-P, R-P.

Option (d)

Attribute closure : [x] t : Set al ALL Possible Attributes which is Logically Determined by Attribute X. CXIt

closure of FD set: [F]: Set as ALL Possible FD's

Which can be logically (Delived)
Determined is called closure of FD Set.

70 When FD Set is Not given than Find (F)^t

Closure of FD set:

12 When FD Set is given then Find (F)t.

I) When FD Set is Not Given.

@ R(AB) Find (F)+

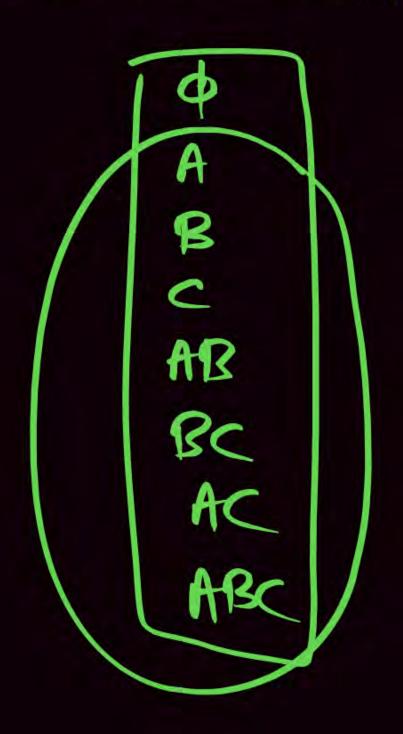
(F) = 13 Avg

$$(n-1)*n+1$$

 $3xy+1=(3)$ Any

(I) When FD Set is Not Given.

@R(ABC), Find (F)



(I) When FD Set is Not Given.

Closure of FD Set [F]+

Set of all possible FD's which can be derived from given FD set is called closure of FD set. [F]⁺

[F]+ Closure of FD



$$\phi \rightarrow \phi A \rightarrow \phi$$
 $B \rightarrow \phi$ $AB \rightarrow \phi$

$$A \rightarrow A \qquad B \rightarrow A \qquad AB \rightarrow A$$

$$B \qquad A \to B \qquad B \to B \qquad AB \to B$$

AB
$$A \rightarrow AB$$
 $B \rightarrow AB$ $AB \rightarrow AB$ (3)

ABC

R(ABC)

III(IIDC)		
Φ)	$A \to \varphi$	$B \rightarrow \varphi$
Α	$A \rightarrow A$	$B \rightarrow A$
В	$A \rightarrow B$	$B \rightarrow B$
C	$A \rightarrow C$	$B \rightarrow C$
AB	$A \rightarrow AB$	$B \rightarrow AB$
BC	$A \rightarrow BC$	$B \rightarrow AC$
AC	$A \rightarrow AC$ $A \rightarrow ABC$	$B \rightarrow BC$
ABC	$A \rightarrow ABC$	$B \rightarrow ABC$

$$(n-1)*n+1$$
 $7x8+1$
 $(F)^{+}=57$

R(ABC) Find(F)+

ABC > ¢ ACOD BC > 0 AB- 4 ABC > A C-> 4 B-> 4 A>¢ AC +A BCJA AB->A C-> A ABCTB B-> A ATA AROB BCOB AC -> B B CAB B>B ABCTC A-)B AB -> C BC -> C ACOC C (70 ABC - AB A >C AB) AB BC-AB AC-) AB AR BYNS CYAB ABC -> BC A > AB BIBC CIBC ABIBC BCIBC ACIBC ABCHAC BC A -> BC B) AC C) AC AB) AC BC) AC AC) AC A+AC AC A TARC BY ABC CY ARC ARTARC BCTARC ACTABC ABCTABC ABG

(F) = 57 Mg

I've Post

D When FD Set is given then Find (F)^t.

When FD set is given then Find (F)t >2" (n: # Attribute R(AB) [A->B] them Find [F]+ 0 Attribute 4 [A > \$, A > A, A > B, A > AB (A)+= (AB) = 2 1 Attribute A $(B)^{\dagger} = (B) \Rightarrow 2^{\perp}$ B 2 [B > 4, B > B] AB 2 Attribute 4 [AB+A, AB+A, AB+B, (AB) = 2 When FD Set Not RIAB)

3X4+1 given AR -> AB (F) = (11) Ang

.

(B) R(ABC) [A+B, B+c] then Find (F) ? OAttribute 0-0 ф (A) = (ABC) ABC 1 Attribute 8 22 $(R)^{\dagger} = (RC)$ 2 $(c)^{+} = (c)$ AB (AR) = (ARC) 23 BC (BC)+-(BC) 22 AC 23 ABC (AC)+- (ABC) (ABC)+= [ABC) 23

R(ABC)
$$[A \rightarrow B, B \rightarrow C]$$
 $[F]^+ = \underline{43 \text{ Ans}}.$
 ϕ 0 attribute = $\phi \rightarrow \phi$

A 1Attribute = $[A]^+ = [ABC] = 2^3$

B $[B]^+ = [BC] = 2^2$

C $[C]^+ = [C] = 2^1$

AB 2Attribute = $[AB]^+ = [ABC] = 2^3$

BC $[BC]^+ = [BC] = 2^2$

AC $[AC]^+ = [ABC] = 2^3$

ABC 3 Attribute = $[ABC]^+ = [ABC] = 2^3$

$R(AB)[A \rightarrow B]$

$$\phi$$
 0 attribute = 1

A 1 Attribute =
$$[A]^+$$
 $[AB] = 2^2$

B
$$[B]^+ = [B] = 2^1$$

AB
$$2 \text{ Attribute} = [AB]^+ = [AB] = 2^2$$

$$(A \rightarrow \phi, A \rightarrow A, A \rightarrow B, A \rightarrow AB)$$

$$_2 \mid (B \rightarrow \phi, B \rightarrow B)$$

$$\begin{pmatrix} AB \rightarrow \phi, AB \rightarrow A \\ AB \rightarrow B, AB \rightarrow AB \end{pmatrix}$$



R(AB) [A > B. B > A]

A

BAB

O Attribute
$$\Rightarrow \phi \rightarrow \phi \perp \qquad \perp$$

I Attribute $(A)^{\dagger} = (AB) = 2^2 = 4$
 $(R)^{\dagger} = (AB) = 2^2 = 4$

2 Attribute
$$(AR)^{\dagger} = (AR) = 2 = 4$$

