### **COMPUTER SCIENCE**



Database Management System

FD's & Normalization

Lecture\_09

Vijay Agarwal sir





Lossy and Lossless Join

Dependency Preserving





RDBMS Concept FD Concept & its type Attoribute closure Keys Concept 43 Supel Key 1 Candidate lay Bromaly key

members hip set Equality b/w 2 FD Set Minimal Cavel. finding # Suber kug FD CROSURE.



# Properties of Decomposition

- (1) Lossless Join Decomposition.
- 2) Dependency Preserving Decomposition

# Lossless Join Decomposition :

(I) BASIC CONCEPT

The Binary Method (Successive)

3 CHASE TEST



## Lossless Join Decomposition :

let R be the Relational Schema with Instances 0,02... on is decomposed into Sub Relation Ri Re Rs. .. . Rn

IR RINREMRS.... MRn = R Lossles Join Decomposition.

IB RIMRZMR3...MRn DR -> Subunious (Extra)

Tople. LOSSY Join Decomposition.



# Netwal Join. (M) RMS

Stepl Cross fooduct of R&S.

R

niTuple naTuple

C1 Attribute C2 Attribute

 $RXS = C_1 + C_2$  Attribute

Select the Tubles which Satisfy Equality Condition on All Common Attribute (FROM PXS) of RXS.

Steps: Projection of Distinct Attribute.

# $\begin{array}{c} \left( \begin{array}{c} R_{1}(ABCD) \\ R_{2}(CDEFG) \end{array} \right) \\ \left( \begin{array}{c} R_{3}(GDEFG) \\ R_{3}(GDEFG) \end{array} \right) \\ \left( \begin{array}{c} R_{1}(CEDEFG) \\ R_{3}(GDEFG) \end{array} \right) \\ \left( \begin{array}{c} R_{1}(CEDEFG) \\ R_{3}(GDEFG) \end{array} \right) \\ \left( \begin{array}{c} R_{1}(CEDEFG) \\ R_{3}(GDEFG) \end{array} \right) \\ \left( \begin{array}{c} R_{3}(GDEFG) \\ R_{3}(GDEFG) \\ R_{3}(GDEFG) \end{array} \right) \\ \left( \begin{array}{c} R_{3}(GDEFG) \\ R_{3}($

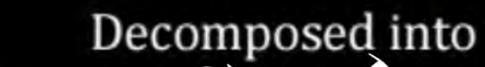


#### R(ABC)

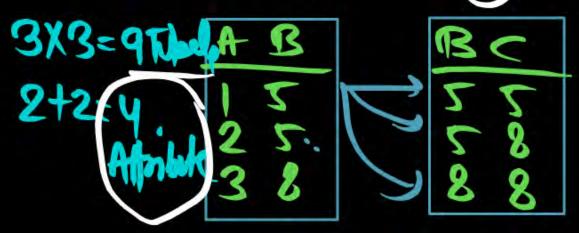
A	В	С
1	5	5
2	5	8
3	8	8



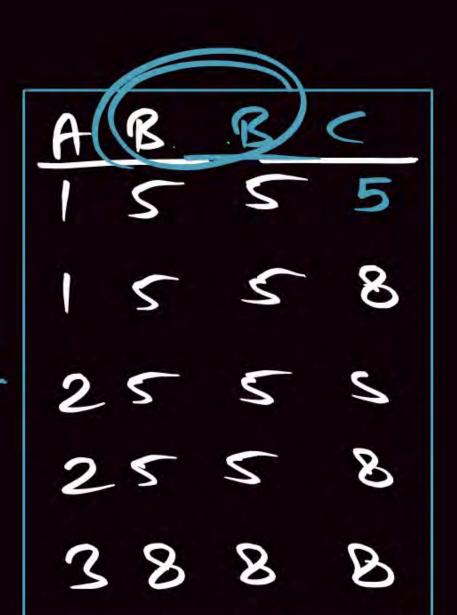




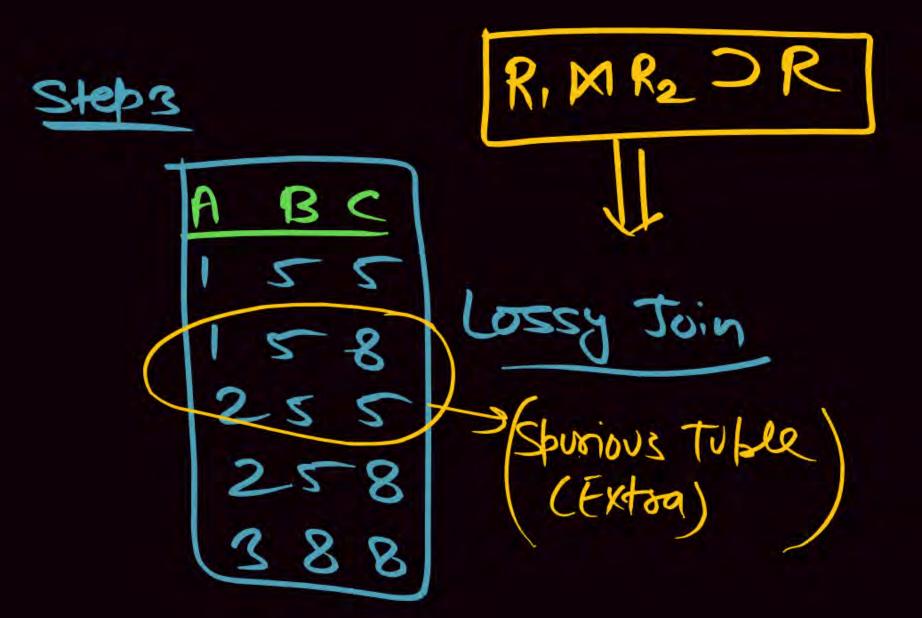
Q.1  $R_1(AB) & R_2(BC)$ 







Stop



.



#### R(ABC)

A	1	B
	-	

A	В	С
1	5	5
2	5	8
3	. 8	8

Decomposed into

 $Q.1 R_1(AB) & R_2(BC)$ 

Q.2 RILAB) & R2 (AC)

P(ABC) (A-B)

(D) RI(AB) U R2(BC) = ABC

RI(AB) 1 R2(RC) = B

Lossy Join

RI(AB) U R2(AC) = ABC

RI(AB) NB(AC) = A

[AJt= [AB] Super Kun of R,

Lossless Join



#### R(ABC)

	A	В	C
A>B	1	5	5
A->C	2	5	8
	3	. 8	8

Decomposed into

 $Q.1 R_1(AB) & R_2(BC)$ 

Q.2 RILAR) & R. (AC)

R(ABC) [A>B] (1) RI(AB) UR2(BC) = ABC

R(ABC) (A-)R. A->C)

(P2) R1(AB) U R2(AC) - ABC RI(AR) MB(AC) = A (A) = (ABC) Supon Kuy of RILR2

Lossles Join

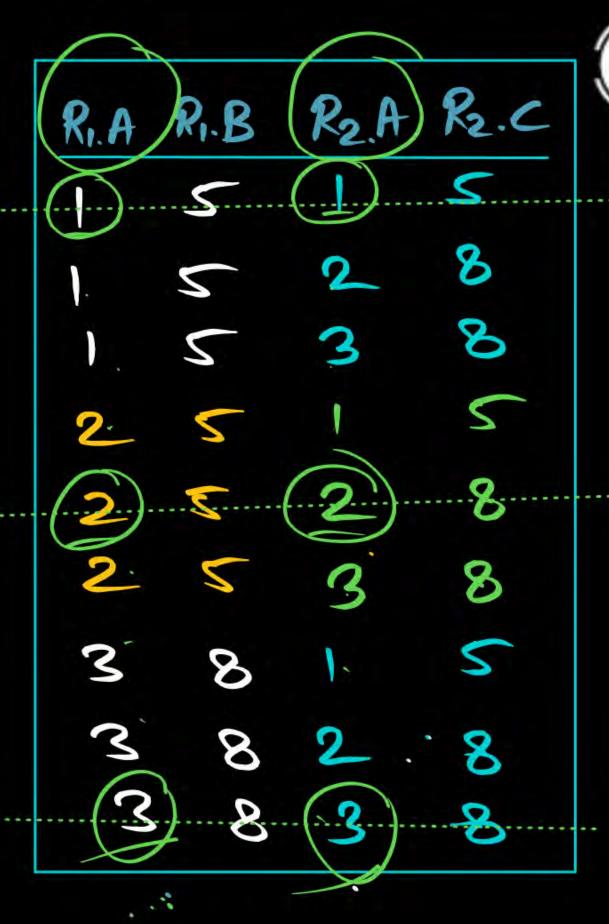


# R(ABC) BHA

A	В	(c)
1	5	5
2	5	8
3	8	8



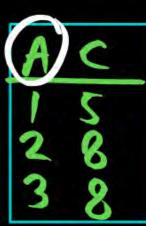
RIXR2 =



Decomposed into

Q.2  $R_1(AB) \& R_2(AC)$ 

A	B	
1 2	24	
3	8	



Steloz

Projection of Distinct Attorbute

Steps

RILAB) MRZ(AC)=R

Lossless Join Decomposition.

# BASIC CONCEPT





#### Lossless - Join Decomposition

For the case of  $R = (R_1, R_2)$ , we require that for all possible relations r on schema R

$$r=\pi_{R_1}(r)\bowtie \pi_{R_2}(r)$$

A decomposition of R into R<sub>1</sub> and R<sub>2</sub> is lossless join if at least one of the following dependencies is in F+:

$$R_1 \cap R_2 \to R_1$$

$$R_1 \cap R_2 \to R_2$$

#### Lossless JOIN

A Relational Schema R with FD Set F is decomposed into Subrelation R, & R2.

# Lossy Join Decomposition

R, MR2 18 Lossy iff

O If Common Attribute of R, 2 R2

neither a subserkuy of R1 (R, 1 R2) -+> R,

mor key of Re

**②** 

(R. 1823++> R2.

R(ABCD) LOSSY Join
R(AB) R2(CD) Rez No Common
Attribute

B) R(ARCDE)

R(ARC)

R2(RCD)

LOSSY BCZ Attribute & Missing.



 $R(ABCDEFG) \{AB \rightarrow CD, D \rightarrow E, E \rightarrow FG\}$ 



Decomposed into R<sub>1</sub>(ABCD) and R<sub>2</sub>(DEFG)

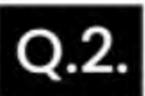


Lossless Join



R(ABCDEFG) {AB  $\rightarrow$  CD, D  $\rightarrow$  E, E  $\rightarrow$  FG} Decomposed into R<sub>1</sub>(ABCD) and R<sub>2</sub>(DEFG) By CHASE TEST.





# Q.2. R(ABCDEFG) {AB $\rightarrow$ C, C $\rightarrow$ D, D $\rightarrow$ EFG}



Decomposed into R<sub>1</sub>(ABCE) and R<sub>2</sub>(DEFG)



R(ABCDEFG) {AB  $\rightarrow$  C, C  $\rightarrow$  D, D  $\rightarrow$  EFG} Decomposed into R<sub>1</sub>(ABCE) and R<sub>2</sub>(DEFG) By CHASE TEST.





#### R(ABCDE G) {AB $\rightarrow$ C, AC $\rightarrow$ B, AD $\rightarrow$ E, B $\rightarrow$ D, BC $\rightarrow$ A, E $\rightarrow$ G} Decomposed into R<sub>1</sub>(ABC) R<sub>2</sub>(ACDE) and R<sub>3</sub>(ADG)







- 1. Decomposed into R<sub>1</sub>(AB) R<sub>2</sub>(BC) R<sub>3</sub>(ABDE) and R<sub>4</sub>(EG)
- 2. Decomposed into R<sub>1</sub>(AB) R<sub>2</sub>(BC) R<sub>3</sub>(ABDE) and R<sub>4</sub>(ECG)

