SNS COLLEGE OF ENGINEERING

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Department of Artificial Intelligence and Data Science

COURSE NAME : 23ITB204 - MODERN DATABASE MANAGEMENT SYSTEMS

II YEAR / III SEMESTER

Unit 2- Database Design

Topic : Non Loss Decomposition

Non Loss Decomposition

- Database management systems (DBMS), **non-loss decomposition** (also known as **lossless decomposition**) is a technique used in database normalization. It ensures that when a relation (table) is divided into two or more smaller relations, the original data can be perfectly reconstructed from those smaller relations without any loss of information.

Decomposition: This is the process of breaking down a relation into two or more relations. This is typically done to reduce redundancy and improve data integrity.

Lossless Join Property: A decomposition of a relation RR into sub-relations R1R 1 and R2R 2 is considered lossless if the natural join of R1R 1 and R2R 2 produces exactly the original relation RR. This means no spurious tuples are created during the join operation.

Functional Dependency: To ensure lossless decomposition, the decomposition must respect the functional dependencies of the original relation. If a functional dependency exists in the original relation, it should be preserved in the decomposed relations.

Conditions for Lossless Decomposition

For a decomposition of relation R into R 1 and R 2 :

Common Attribute: There must be at least one attribute that is common to both R 1 and R 2 .

Functional Dependency: If X is a set of attributes in R 1 and YY is a set of attributes in R 2 , then at least one of the following must hold:$X \rightarrow Y$X→Y$Y \rightarrow X$

Y→X

$X \cap Y$

X∩Y is a super key for either R 1 or R 2 .

Example Consider a relation $R(A,B,C)$R(A,B,C) with functional dependencies $A \rightarrow B$A→B and $A \rightarrow C$A→C.Y
you can decompose R into:$R1(A,B)$ $R2(A,C)$. This decomposition is lossless because the attribute A (which is a superkey) is common to both relations. When you perform a natural join on R 1 and $R2$, you can reconstruct the original relation R without losing any information.

Importance of Lossless Decomposition

Data Integrity: Ensures that the data remains consistent and accurate across decomposed tables.

Reduction of Redundancy: Helps eliminate duplicate data, thus saving storage and reducing update anomalies.

Improved Efficiency: Smaller, well-structured tables can lead to more efficient querying and data management.

Thank You