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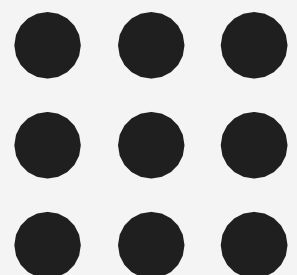
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Department of Artificial Intelligence and Data Science

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 R into sub-relations R_1 and R_2 is considered lossless if the natural join of R_1 and R_2 produces exactly the original relation R . 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 Y is a set of attributes in R 2 , then at least one of the following must hold:

$X \rightarrow Y$

$Y \rightarrow X$

$X \cap Y$ is a super key for either R 1 or R 2 .



Example Consider a relation $R(A,B,C)$ with functional dependencies $A \rightarrow B$ and $A \rightarrow C$.

you can decompose R into: $R_1(A,B)$ $R_2(A,C)$. 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 R_2 , you can reconstruct the original relation R without losing any information.

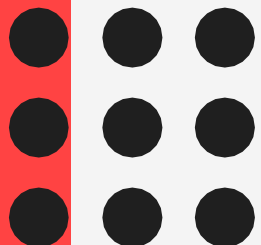


Importance of Lossless Decomposition

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

