Database

What is normalization?
It is a technique to reduce redundancy from the table.

Normalization Form	Definition	Key Requirements	Purpose	Example
1NF	A relation is in 1NF if it has only atomic (indivisible) values and each column contains unique values for that attribute.	- Each column has atomic values.- Rows are uniquely identifiable (with a primary key).	Eliminates duplicate rows and ensures data is organized in tabular format.	A table storing customer data where each cell contains a single value (e.g., one phone number per customer).
2NF	A relation is in 2NF if it is in 1NF and all non-prime attributes are fully functionally dependent on the entire primary key.	- Must be in 1NF.- Non-prime attributes must depend on the entire primary key (eliminates partial dependency).	Removes partial dependency.	Splitting a table into two to ensure that attributes related to only part of a composite key are stored in a separate table.
3NF	A relation is in 3NF if it is in 2NF and there are no transitive dependencies (non-prime attributes depend only on the primary key).	- Must be in 2NF.- No transitive dependency (no non-prime attribute depends on another non-prime attribute).	Removes transitive dependency.	Creating a separate table for department names if they indirectly determine an employee's address via a department ID.
BCNF (Boyce-Codd)	A stricter version of 3NF where every determinant is a candidate key.	- Must be in 3NF.- Every determinant must be a candidate key (eliminates dependency anomalies).	Ensures minimal redundancy and dependency.	A table that contains attributes for professors and courses split into two to prevent a non-candidate key determining another attribute.
4NF	A relation is in 4NF if it is in BCNF and has no multi-valued dependencies (MVDs).	- Must be in BCNF.- No multi-valued dependencies (MVDs).	Removes multi-valued dependency.	Splitting a table with attributes for students and hobbies into separate tables, one for hobbies and another for skills, to eliminate MVDs.
5NF	A relation is in 5NF if it is in 4NF and cannot be further decomposed into smaller tables without losing data (removes join dependency).	- Must be in 4NF.- No join dependency (JD).	Prevents loss of data during recombination.	Decomposing a table to separate supplier, part, and project relationships into individual tables to preserve information during recombination operations.