What is anomalies? Explain Update anomaly in SQL.

anomalies are problems that can occur in a poorly designed database, specifically when data is inserted, updated, or deleted. These issues lead to data inconsistencies and redundancies. The three main types of anomalies are **update anomalies**, **insert anomalies**, and **delete anomalies**.

Update Anomaly

An **update anomaly** occurs when data redundancy requires multiple records to be updated for a single change. If the update is not applied to all related records, it results in inconsistent data.

Example: Imagine a table where the address of a supplier is repeated for each product they supply. If the supplier's address changes, every record with that supplier's information needs to be updated. If only some rows are updated, the database ends up with inconsistent addresses for the same supplier.

What is Normalization? State the types of Normalization.

Normalization is a database design process used to organize data to reduce redundancy and improve data integrity. It involves dividing a database into multiple related tables and structuring them according to certain rules, or **normal forms**, to minimize data duplication and prevent anomalies.

Types of Normalization (Normal Forms)

1. **First Normal Form (1NF)**: Ensures each column has atomic (indivisible) values, with no repeating groups of data within a single table.

2. **Second Normal Form (2NF)**: Achieved when the table is in 1NF and all non-key attributes are fully dependent on the primary key (eliminating partial dependencies).

3. **Third Normal Form (3NF)**: Achieved when the table is in 2NF and all non-key attributes are only dependent on the primary key (eliminating transitive dependencies).

4. **Boyce-Codd Normal Form (BCNF)**: A stricter version of 3NF where every determinant is a candidate key, providing additional clarity in relational dependency.

5. **Fourth Normal Form (4NF)**: Ensures no multi-valued dependencies exist, achieved when the table is in BCNF and each attribute has a single value for each entity.

6. **Fifth Normal Form (5NF)**: Ensures data redundancy is completely minimized, dealing with complex join dependencies by decomposing the table further.