Assignment 1

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Data Base Models or Types

Following are the some types or models of **DataBase**:

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1. Centralized Database

A centralized database is a type of database that is stored, managed, and maintained in a single central location, such as one server or a mainframe computer. All users and applications that need to access the data must do so through this central point.

Example

A university with a centralized database stores all student records, course registrations, and exam results on a single server.

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2. Decentralized Database

A decentralized database is a type of database system where data is stored across multiple locations or devices, and no single central authority controls the entire database. Each location (or node) operates independently and may have its own processing power and storage.

Example

Blockchain technology (e.g., Bitcoin, Ethereum) uses a decentralized database model where each participant (node) has a copy of the ledger and validates transactions without relying on a central authority.

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3. Relational Database

A Relational Database (RDB) is a type of database that stores data in tables (also called relations). Each table consists of rows (records) and columns (fields). It uses Structured Query Language (SQL) for querying and managing data.

Example

MySQL, PostgreSQL etc.

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4. NO SQL

NoSQL stands for "Not Only SQL", and refers to a broad class of non-relational databases designed to handle large volumes of unstructured, semi-structured, or rapidly changing data. Unlike relational databases, NoSQL databases do not use fixed schemas or SQL as their primary query language.

Example

MongoDB is one the best example of NO SQL.

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5. Cloud Database

A Cloud Database is a database that runs on a cloud computing platform rather than on-premises infrastructure. It can be hosted, managed, and accessed remotely via the internet. Cloud databases can be either SQL (relational) or NoSQL (non-relational), and they are designed to offer scalability, reliability, and flexibility.

Example

Amazon, Google Cloud, Microsoft etc.

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6. Object-Oriented Database (OODB)

An Object-Oriented Database (OODB) is a type of database that integrates object-oriented programming principles with database technology. Instead of storing data in tables (like in relational databases), it stores data as objects, just like how data is represented in object-oriented programming languages (e.g., C++, Java, Python).

Example

db4o (Database for Objects), ObjectDB, Versant Object Database, InterSystems Caché, GemStone/S

7. Hierarchical Database

A Hierarchical Database is a type of database that organizes data in a tree-like structure. Data is stored in records (nodes), and each record is connected to its parent and children in a parent-child relationship. This structure is similar to a family tree or a folder directory in a computer.

Example

Early IBM Information Management System (IMS)

8. Network Database

The Network Database Model is a type of database model that represents data in a graph structure rather than a strict hierarchy. Unlike the hierarchical model, in the network model, a record (child node) can have multiple parent nodes, allowing for many-to-many relationships..

Example

IDMS (Integrated Database Management System), Raima Database Manager, TurboIMAGE

9. Personal Database

A Personal Database is a database system designed for use by a single user on a personal device, such as a PC or laptop. It is typically lightweight, easy to set up, and used for managing small amounts of data like contacts, budgets, projects, or personal collections.

Example

Microsoft Access, SQLite, MySQL

10. Operational Database

An Operational Database (also called an OLTP database, which stands for Online Transaction Processing) is a database that is used to manage and store real-time data generated from daily business operations. It supports fast read/write operations and is optimized for high-performance transactional tasks like insertions, updates, and deletions.

Example

PostgreSQL, MySQL, Microsoft SQL Server.

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11. Enterprise Database

An Enterprise Database is a large-scale, robust, and secure database system designed to handle the complex and massive data needs of an entire organization or enterprise. These databases support thousands to millions of transactions, users, and applications across multiple departments, often in real-time.

Example

Oracle, SAP HANA etc.

ACID Properties

ACID is an acronym that represents the **four key properties** that ensure reliable processing of **database transactions**. These properties are essential for maintaining **data integrity**, especially in systems that support **concurrent access** and **unexpected failures** (like power loss or crashes).

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1. A – Atomicity

> Ensures that a **transaction is all-or-nothing**.

Example:
In a banking app, if you transfer money from Account A to Account B:

- Deducting from A and adding to B **must both succeed**.
- If one fails, the other **must be undone**.

2. C – Consistency

> Ensures that a transaction **leaves the database in a valid state**.

Example:
If there's a rule that no account balance can be negative, the system will **reject any transaction** that violates this.

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3. I – Isolation

> Ensures that **concurrent transactions** do not interfere with each other.

Example:
Two users booking the last seat in a movie theater:

- Only one should succeed. Isolation ensures proper handling.

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4. D – Durability

> Ensures that **once a transaction is committed**, it is **permanently saved**, even in case of power failure or crash.

Example:
If a bank confirms your transaction, it **must not be lost**, even if the system crashes right after.