Lecture 1. 1. What is a Database?

What is a Database?

Definition:

> A database is a collection of information that is organized so that it can be easily accessed, managed, and updated.

Key idea: it's not just random data – it's structured, meaningful, and created for a purpose.

Properties of a Database:

1. Represents some aspect of the real world. It models a real domain: university, hospital, shop, airline, etc.
2. Logically coherent collection of data with inherent meaning. Data is related and makes sense together.
3. Designed, built, and populated for a specific purpose. Has:
    a. Intended group of users.
    b. Predefined applications/queries those users are interested in.

Database Management System (DBMS)

Definition:

> A Database Management System (DBMS) is system software for creating and managing databases.

It allows end users to:

- Create data
- Read data
- Update data
- Delete data(“CRUD” operations)
- Protect data (security, access control)

DBMS = software, Database = data.

Purpose of Database Systems. What problems do DBMSs solve?

Data Management

- Efficiently:
  - Store
  - Retrieve
  - Manage large amounts of data
- Ensure:
  - Data integrity (data is correct, valid, obeys rules)
  - Security (only authorized access)

Data Abstraction

- Hides the complexity of how data is stored physically.
- Users interact with logical structure (tables, rows, columns), not files/blocks.

Reducing Redundancy and Inconsistency

- Reduces data redundancy (unnecessary duplicate data).
- Ensures consistency through normalization (details later in other lectures).
- If data is stored once and shared, fewer conflicts/contradictions.

Users in a DBMS Environment

Database administrators (DBA) – manage the DB, security, backups, tuning.
Developers – write applications that use the DB.
End users – run queries, use forms, reports.
Designers/analysts – design the schema, ER diagrams.

PostgreSQL

What is PostgreSQL?

> Powerful, open-source, object-relational database system, uses and extends SQL.
> Designed to safely store and scale complex data workloads.

Highly extensible:

- You can define your own data types
- Build custom functions
- Write code in different programming languages without recompiling the DB

Possible exam questions (MCQ / open)

MCQ: “Which of the following is NOT a property of a database?”
Open: “Explain why a random collection of unrelated data cannot be called a database.”

MCQ: “Which file in the example stores information about the grades students receive?”
Open: “Describe the purpose of the PREREQUISITE file in the given database example.”

MCQ: “Which of the following is NOT a purpose of a database system?”
Open: “Explain how database systems help reduce data redundancy and inconsistency.”

MCQ: “PostgreSQL is best described as:A) Hierarchical DBMSB) Network DBMSC) Object-relational DBMSD) File system”
Open: “List two features that make PostgreSQL highly extensible.”