Introduction to Databases

What is a database?

A database is an organized collection of structured data that can be easily accessed, managed, and updated.

It serves as a centralized repository for storing and managing data.

Advantages of using databases:

Data consistency and integrity
Data security and access control
Efficient data management and retrieval
Scalability and concurrency control

Overview of Relational Database Management Systems (RDBMS)

RDBMS is a database management system based on the relational model.
Key concepts in RDBMS:
Tables (relations)
Rows (records/tuples)
Columns (fields/attributes)
Primary keys and foreign keys
SQL (Structured Query Language) for data manipulation and querying

Examples of popular RDBMS: MySQL, Oracle, SQL Server, PostgreSQL, SQLite

Normalization

Normalization is the process of organizing data in a database to reduce redundancy and improve data integrity. Normalization rules (1NF, 2NF, 3NF, BCNF)

Benefits of normalization:

- Eliminate data redundancy
- Ensure data integrity
- Improve data consistency

Overview of MySQL

MySQL is an opensource RDBMS widely used for web applications and datadriven projects.

Key features of MySQL:

- Crossplatform compatibility
- High performance and scalability
- Reliable and secure
- Support for SQL and NoSQL capabilities

Overview of MySQL Workbench

MySQL Workbench is an integrated development environment (IDE) for MySQL.

Key features of MySQL Workbench:

- Visual database design and modeling
- SQL development and execution
- Database administration and management
- Migration wizard and data export/import

Tables and Terminologies

- **Table:** A collection of related data organized in rows and columns.
- **Row (Record/Tuple)**: A horizontal entry in a table representing a single instance or entity.
- **Column (Field/Attribute):** A vertical entry in a table representing a specific characteristic or property.
- **Primary Key:** A unique identifier for each row in a table.
- **Foreign Key:** A column (or set of columns) that references the primary key of another table, establishing a relationship between tables.
- **Schema:** The structure or blueprint of the database, defining tables, fields, relationships, and constraints.
- **Query:** A request for data retrieval or manipulation using SQL.
  Special data structures that improve the performance of data retrieval operations.

- **Transactions:** A sequence of operations performed as a single logical unit of work, ensuring data integrity and consistency.
- **Constraints:** Rules or restrictions imposed on data to maintain data integrity and consistency (e.g., NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY).