Q1 - What is a database? Explain with an example on why should we need a database.

A database is an organized collection of data that allows easy access, management, and updating.

Example:
Imagine a school keeps student records in Excel sheets. As the number of students grows, managing records manually becomes difficult and error-prone.

Why we need a database:
Using a database like MySQL or PostgreSQL helps:

- Store large amounts of data efficiently

- Search and update records quickly (e.g., find all students in Grade 10)

- Prevent data duplication and maintain consistency

- Allow multiple users to access data securely

Database helps manage and use data effectively in any growing system

Q2 - Write a short note on file based storage system. Explain the major challenges of a file based storage system□

A file-based storage system stores data in separate files, typically on a local disk. Each application manages its own data using flat files (like .txt, .csv, or binary files), without a central system to organize or relate the data.

Example:
An accounting software stores customer details in one text file and transactions in another file.

Major Challenges of File-Based Storage Systems:

1. Data Redundancy:
   Duplicate data is often stored across multiple files, wasting storage and causing inconsistency.

2. Data Inconsistency:
   Changes made in one file may not be reflected in others, leading to conflicting information.

3. Difficult Data Access:
   Retrieving specific or related data requires writing custom, complex code.

4. Lack of Security:
   File systems offer limited control over who can access or modify data.

5. Poor Scalability:
   As data grows, managing, organizing, and retrieving information becomes slow and inefficient.

6. No Concurrent Access Control:
   Difficult to manage simultaneous data access by multiple users, increasing the risk of corruption.

Q3 - What is DBMS? What was the need for DBMS

A DBMS (Database Management System) is software that allows users to create, store, manage, and retrieve data from a database in an organized way.

Need for DBMS:

- To avoid problems of file-based systems like data redundancy and inconsistency

- To ensure data security and access control

- To support multi-user access and data sharing

- To make data retrieval efficient with query languages (like SQL)

- To ensure data integrity and consistency

Q4 - Explain 5 challenges of file-based storage system which was tackled by DBMS

1. Data Redundancy – DBMS avoids duplicate data through normalization.
2. Data Inconsistency – Ensures consistency with centralized control.
3. Limited Security – DBMS provides access control and user permissions.
4. Difficult Data Access – DBMS uses query languages (e.g., SQL) for easy access.
5. No Concurrent Access – DBMS manages multi-user access safely.

Q5 - List Out the different types of classification in DBMS and explain

Explanation of DBMS classification types:

1. Based on Data Model:
- Hierarchical DBMS: Data arranged in tree-like structure.
- Network DBMS: Data organized as records connected via links.
- Relational DBMS (RDBMS): Data stored in tables (rows & columns).
- Object-Oriented DBMS: Data stored as objects (like in OOP).

2. Based on Number of Users:
- Single-user DBMS: Used by one user at a time.
- Multi-user DBMS: Supports multiple users accessing data concurrently.

3. Based on Number of Sites:
- Centralized DBMS: All data stored at one location.
- Distributed DBMS: Data stored across multiple locations but managed as one system.

4. Based on Cost/source:
- Open-source DBMS: Free (e.g., MySQL, PostgreSQL).
- Commercial DBMS: Paid (e.g., Oracle, SQL Server).

Q6 - What is the significance of Data Modelling and explain the types of Data Modelling

Significance of Data Modelling:
It defines how data is structured, stored, and related. Helps in designing efficient, consistent, and understandable databases.

Types of Data Modelling:

1. Conceptual Model – High-level view; defines what data is needed (e.g., entities & relationships).
2. Logical Model – Detailed structure; defines how data is organized (e.g., tables, attributes, keys).
3. Physical Model – Low-level view; shows how data is stored in the system (e.g., indexes, storage paths).

Q7 - Explain 3 schema architecture along with its advantages

3-Schema Architecture in DBMS: This model separates the database system into three levels to provide data abstraction and independence.

1. External Schema (View Level):

- User-specific view of the data

- Hides complexities from end-users

- Advantage: Custom views for different users, better security

2. Conceptual Schema (Logical Level):

- Describes what data is stored and relationships

- Independent of physical storage

- Advantage: Data consistency and centralized design

3. ◆ Internal Schema (Physical Level):

- Describes how data is stored physically

- Includes indexes, storage paths

- Advantage: Optimized storage and performance

This architecture supports data abstraction and data independence (logical & physical), improving flexibility and maintainability.