Database Course Documentation

1. Flat File Systems vs. Relational Databases

Flat File Systems:

- Data is stored in plain text files (e.g., CSV, Excel).

- High data redundancy due to lack of structured relationships.

- No direct links between data records.

- **Example**: Manual employee records saved in Excel.

- **Drawbacks**: Difficult to search, sort, update, or enforce security.

Relational Databases:

- Data is organized into related tables using primary and foreign keys.

- Low redundancy due to normalization and table relations.

- Direct support for complex relationships (1:1, 1:M, M:M).

- **Example**: University student management system built using MySQL.

- **Drawbacks**: Requires careful schema design and knowledge of SQL.

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2. Advantages of DBMS – Mind Map

- **Security**: Controls access and permissions.

- **Integrity**: Ensures accuracy and consistency of data.

- **Backup**: Enables safe storage and recovery of data.

- **Redundancy**: Reduces data repetition and inconsistency.

- **Concurrency**: Supports multiple users accessing data simultaneously.

- **Data Sharing**: Facilitates data access across teams and systems.

3. Roles in a Database System

Role	Responsibility
System Analyst	Gathers and analyzes system requirements from users and stakeholders.
Database Designer	Designs the logical structure of the database using tools like ERD.
Database Developer	Builds the actual database, writes SQL queries and implements schema.
Database Administrator	Manages security, backups, performance, and database availability.
Application Developer	Develops applications that connect to and interact with the database.
BI (Business Intelligence) Developer	Works on data analysis, dashboards, reporting, and extracting insights.

4. Types of Databases

Relational vs. Non-Relational

- **Relational Databases**:
    - Structured and organized in tables.
    - Supports SQL for querying.
    - Examples: MySQL, PostgreSQL, SQL Server.

- **Non-Relational Databases**:
    - Store data in flexible formats like documents, key-value pairs, or graphs.
    - Ideal for unstructured or semi-structured data.
    - Examples: MongoDB, Cassandra.

Centralized vs. Distributed vs. Cloud Databases

Type	Description	Example Use Case
Centralized	All data stored in a single physical location.	Internal payroll system in one office.
Distributed	Data is distributed across multiple physical sites.	Global banking systems.
CloudBased	Hosted on cloud platforms with scalable access and tools.	Amazon RDS, Azure SQL, Google Spanner.

5. Cloud Storage and Databases

What is Cloud Storage?

Cloud storage allows data to be stored remotely on internet-based servers, enabling accessibility, scalability, and integration with database solutions.

Benefits of Cloud-Based Databases:

- Access from anywhere

- Easy scalability (up/down)

- Managed maintenance and updates

- Pay-as-you-go pricing **Challenges:**
- Requires reliable internet connectivity

- Data privacy and security concerns

- Vendor lock-in or service dependency