**Assignment - 17th April**

Q1. what is database ? explain with example on why we need a database?

A database is a structured collection of data that is organized and stored in a manner that allows for efficient storage, retrieval, and manipulation of the data. It is designed to provide a central repository for managing and organizing data in a structured and consistent manner.

Here's an example to illustrate why we need a database:

Consider a company that sells products and maintains information about its customers, orders, and inventory. Without a database, the company would need to store data in separate files or spreadsheets. For example, customer information might be stored in one file, order details in another, and inventory data in yet another file. This approach would quickly become challenging to manage and maintain as the amount of data grows.

We need a database for the following scenario:

* Data Centralization
* Data Consistency
* Efficient Data Retrieval
* Data Security and Access Control
* Data Scalability
* Data Integrity and Recovery

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, also known as a file system, is a method of organizing and storing data on a computer's file system. It involves storing data in individual files that are organized within directories or folders. Each file contains its own data and metadata, such as file attributes and file permissions. Here's a short note on file-based storage systems and their major challenges:

A file-based storage system is a traditional approach to data storage and has been widely used for many years. It provides a simple and intuitive way to organize and access files. In this system, data is stored in separate files, and the relationships between files are generally not defined or enforced by the file system itself.

Challenges of a file-based storage system include:

* Data Redundancy
* Lack of Data Integrity
* Limited Data Sharing and Collaboration
* Lack of Scalability
* Difficulty in Data Access and Retrieval
* Backup and Recovery Challenges

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

A DBMS (Database Management System) is a software system that efficiently stores, manages, and manipulates large amounts of data. It acts as an interface between users or applications and the database, providing structured and organized data access.

The need for DBMS arises due to various reasons. Firstly, traditional file systems lack the capability to handle extensive data management effectively. DBMS offers a centralized approach to data storage using tables, relationships, and other constructs, enabling efficient organization.

Secondly, DBMS ensures data consistency and integrity by reducing redundancy and enforcing constraints, minimizing data discrepancies and errors. It also provides data security features like access controls and permissions to restrict unauthorized access.

Thirdly, DBMS manages concurrent access to data by implementing locking mechanisms and transaction management, preventing conflicts and ensuring data consistency when multiple users modify data simultaneously.

Furthermore, DBMS offers data abstraction and independence, separating the physical data storage from users and applications. This allows users to interact with the data at a higher level, shielding them from implementation details and accommodating changes in the data structure without impacting applications.

Overall, a DBMS is crucial for efficient data management, providing organization, consistency, security, and concurrency control, while offering data abstraction, independence, and recovery mechanisms.

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

The file-based storage system posed several challenges that were effectively addressed by DBMS:

1. Data Redundancy: File systems often resulted in data duplication and inconsistency. DBMS introduced data normalization techniques to minimize redundancy and ensure data consistency.

2. Data Inconsistency: File systems allowed multiple copies of the same data, making it challenging to maintain consistency. DBMS implemented ACID (Atomicity, Consistency, Isolation, Durability) properties to ensure data integrity and eliminate inconsistencies.

3. Lack of Data Security: File systems lacked robust security mechanisms, making data vulnerable to unauthorized access. DBMS introduced access control mechanisms, user authentication, and encryption to ensure data security.

4. Data Isolation and Integrity: In file systems, concurrent access by multiple users often led to data isolation issues and conflicts. DBMS implemented concurrency control mechanisms like locking and transaction management to maintain data integrity during simultaneous access.

5. Limited Data Querying and Manipulation: File systems required custom programming for data querying and manipulation. DBMS introduced structured query language (SQL) and provided a user-friendly interface for efficient data retrieval, manipulation, and reporting.

Q5. List out the different types of classification in DBMS and explain in depth ?

In DBMS, data classification can be done based on different criteria:

1. Hierarchical: This classification organizes data in a tree-like structure with a parent-child relationship, where each child has only one parent. It is suitable for representing one-to-many relationships but lacks flexibility.

2. Network: Similar to hierarchical, this classification allows a child to have multiple parents, forming a more complex network structure. It improves flexibility but increases complexity.

3. Relational: It organizes data into tables with rows and columns, establishing relationships through primary and foreign keys. It provides a simple and flexible structure, enabling efficient querying and manipulation.

4. Object-oriented: This classification stores data as objects with attributes and methods, offering better representation of real-world entities and supporting inheritance and encapsulation.

5. Object-relational: It combines the features of relational and object-oriented databases, allowing complex data types, inheritance, and better support for multimedia and spatial data.

Each classification has its strengths and weaknesses, and the choice depends on the nature of data, relationships, and specific requirements of the application.

Q6. What is the significance of Data Modelling and explain the types of data modeling ?

Data modeling is significant in database management as it helps to understand, analyze, and design the structure and relationships of data in a database system. It provides a visual representation of data entities, attributes, and their associations, aiding in efficient data storage, retrieval, and manipulation.

The types of data modeling include:

1. Conceptual Data Modeling: Focuses on understanding the high-level business requirements and entities, representing them in a conceptual model.

2. Logical Data Modeling: Defines the logical structure of data, including entities, attributes, and relationships, without considering the implementation details.

3. Physical Data Modeling: Translates the logical data model into a physical implementation, considering storage, indexing, and optimization aspects.

Q7. Explain 3 schema architecture along with its advantages ?

The three-schema architecture consists of three levels: the external schema, conceptual schema, and internal schema.

1. External Schema: Represents the view of the database for individual users or applications, providing a customized and tailored view of the data.

2. Conceptual Schema: Represents the overall logical structure of the entire database, serving as an intermediate level between the external and internal schemas.

3. Internal Schema: Describes the physical storage structure of the database.

Advantages: Data independence, efficient design modifications, security and access control at different levels, customization for different user requirements.