**Assignment 1**

1. **What is a relational database management system (RDBMS)? What are the advantages of a database management system over a file system?**

A Database Management System (DBMS) is a application software that allows users to efficiently define, create, maintain and share databases. Defining a database involves specifying the data types, structures and constraints of the data to be stored in the database. Creating a database involves storing the data on some storage medium that is controlled by DBMS.

Advantages of DBMS

**Data redundancy and inconsistency –**

 Redundancy is the concept of repetition of data i.e. each data may have more than a single copy. The file system cannot control redundancy of data as each user defines and maintains the needed files for a specific application to run. There may be a possibility that two users are maintaining same files data for different applications. Hence changes made by one user does not reflect in files used by second users, which leads to inconsistency of data. Whereas DBMS controls redundancy by maintaining a single repository of data that is defined once and is accessed by many users. As there is no or less redundancy, data remains consistent.

* **Data sharing** –   
  File system does not allow sharing of data or sharing is too complex. Whereas in DBMS, data can be shared easily due to centralized system.
* **Data concurrency** –   
  Concurrent access to data means more than one user is accessing the same data at the same time. Anomalies occur when changes made by one user gets lost because of changes made by other user. File system does not provide any procedure to stop anomalies. Whereas DBMS provides a locking system to stop anomalies to occur.
* **Data searching –**   
  For every search operation performed on file system, a different application program has to be written. While DBMS provides inbuilt searching operations. User only have to write a small query to retrieve data from database.
* **Data integrity –**There may be cases when some constraints need to be applied on the data before inserting it in database. The file system does not provide any procedure to check these constraints automatically. Whereas DBMS maintains data integrity by enforcing user defined constraints on data by itself.
* **System crashing –**   
  In some cases,systems might have crashes due to various reasons. It is a bane in case of file systems because once the system crashes, there will be no recovery of the data that’s been lost. A DBMS will have the recovery manager which retrieves the data making it another advantage over file systems.
* **Data security –**   
  A file system provides a password mechanism to protect the database but how longer can the password be protected?No one can guarantee that. This doesn’t happen in the case of DBMS. DBMS has specialized features that help provide shielding to its data.

1. **In a database management system, explain the ACID properties.**

ACID Properties are used for maintaining the integrity of database during transaction processing. ACID in DBMS stands for Atomicity, Consistency, Isolation, and Durability.

* + Atomicity: A transaction is a single unit of operation. You either execute it entirely or do not execute it at all. There cannot be partial execution.
* Consistency: Once the transaction is executed, it should move from one consistent state to another.
* Isolation: Transaction should be executed in isolation from other transactions (no Locks). During concurrent transaction execution, intermediate transaction results from simultaneously executed transactions should not be made available to each other. (Level 0,1,2,3)
* Durability: · After successful completion of a transaction, the changes in the database should persist. Even in the case of system failures.

1. **Explain the concept of normalization.**

Normalization is the process of reorganizing data in a database so that it meets two basic requirements:

1. There is no redundancy of data, all data is stored in only one place.
2. Data dependencies are logical, all related data items are stored together.

1. **Explain the many types of query languages used in relational databases. DQL, DML, DCL, and DDL are some examples.**

DDL - Data Definition Language helps you to define the database structure or schema. It contains syntax like create, drop, alter, truncate.

DML - Data Manipulation Language (DML) allows you to modify the database instance by inserting, modifying, and deleting its data. It is responsible for performing all types of data modification in a database.

It contains syntax like insert, update, delete.

DCL - DCL (Data Control Language) includes commands like GRANT and REVOKE, which are useful to give “rights & permissions.” Other permission controls parameters of the database system.

DQL - Data Query Language (DQL) is used to fetch the data from the database. It uses only one command: SELECT

1. **What is the difference between the main key and a composite key? Give instances of how primary key and composite are used.**

PRIMARY KEY - a primary key uniquely identifies each record in a database table. Any individual key that does this can be called a candidate key, but only one can be chosen by database engineers as a primary key.

COMPOSITE KEY - the composite key is composed of two or more attributes that collectively uniquely identify each record.

EXAMPLE - An example would be a list of homes on a real estate market. In a well-ordered database, there should be a primary key that uniquely identifies each record.

How this works may have to do with the sophistication of the database.

* In some cases, the homes may only be uniquely identified by a mortgage number — all other data (towns, streets, house numbers) is not unique to each record. The mortgage number would be the primary key. Suppose, however, that an MLS realtor’s listing technology assigns its own unique numbers to the records in the table. The mortgage number.
* The MLS number.

One of them will qualify as the “primary key” in what some would consider an arbitrary way.

A composite key, then, would be the combination of two keys.

For example: the combination of house number and street might qualify as a composite key, given that the market listings are local. If so, then when someone searches using both the house number and the street, they should only get one single record returned.

1. **Create a table with a primary key, a column default value, and a column unique constraint in SQL.**