**SQL Assignment 1**

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

Answer :

**The software used to store, manage, query, and retrieve data stored in a relational database** is called a relational database management system (RDBMS). The RDBMS provides an interface between users and applications and the database, as well as administrative functions for managing data storage, access, and performance.

A File Management system is a DBMS that allows access to single files or tables at a time. In a File System, data is directly stored in set of files.

**Advantages of DBMS over File system :**

* **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.

Answer :

# **ACID Properties in DBMS**

A [**transaction**](https://www.geeksforgeeks.org/sql-transactions/) is a single logical unit of work which accesses and possibly modifies the contents of a database. Transactions access data using read and write operations.

In order to maintain consistency in a database, before and after the transaction, certain properties are followed. These are called **ACID** properties.

**Atomicity**

By this, we mean that either the entire transaction takes place at once or doesn’t happen at all. There is no midway i.e. transactions do not occur partially. Each transaction is considered as one unit and either runs to completion or is not executed at all.

**Consistency**

This means that integrity constraints must be maintained so that the database is consistent before and after the transaction. It refers to the correctness of a database.

**Isolation**

This property ensures that multiple transactions can occur concurrently without leading to the inconsistency of database state. Transactions occur independently without interference.

**Durability:**

This property ensures that once the transaction has completed execution, the updates and modifications to the database are stored in and written to disk and they persist even if a system failure occurs. These updates now become permanent and are stored in non-volatile memory. The effects of the transaction, thus, are never lost.

1. Explain the concept of normalization.

Answer :

Normalization is **the process of reducing a complex data structure into its simplest, most stable structure to minimize redundancy**.

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

Answer :

Structured Query Language(SQL) as we all know is the database language by the use of which we can perform certain operations on the existing database and also we can use this language to create a database. [SQL](https://www.geeksforgeeks.org/structured-query-language/) uses certain commands like Create, Drop, Insert, etc. to carry out the required tasks.

These [SQL](https://www.geeksforgeeks.org/sql-concepts-and-queries/) commands are mainly categorized into four categories as:

1. DDL – Data Definition Language
2. DQl – Data Query Language
3. DML – Data Manipulation Language
4. DCL – Data Control Language

### **DDL (Data Definition Language):**

[DDL](https://www.geeksforgeeks.org/features-of-structured-query-language-sql/) or Data Definition Language actually consists of the SQL commands that can be used to define the database schema. It simply deals with descriptions of the database schema and is used to create and modify the structure of database objects in the database.DDL is a set of SQL commands used to create, modify, and delete database structures but not data. These commands are normally not used by a general user, who should be accessing the database via an application.

List of DDL commands:

* [**CREATE**](https://www.geeksforgeeks.org/sql-create/): This command is used to create the database or its objects (like table, index, function, views, store procedure, and triggers).
* [**DROP**](https://www.geeksforgeeks.org/sql-drop-truncate/): This command is used to delete objects from the database.
* [**ALTER**](https://www.geeksforgeeks.org/sql-alter-add-drop-modify/)**:** This is used to alter the structure of the database.
* [**TRUNCATE**](https://www.geeksforgeeks.org/sql-drop-truncate/)**:** This is used to remove all records from a table, including all spaces allocated for the records are removed.
* [**COMMENT**](https://www.geeksforgeeks.org/sql-comments/): This is used to add comments to the data dictionary.
* [**RENAME**](https://www.geeksforgeeks.org/sql-alter-rename/)**:** This is used to rename an object existing in the database.

### **DQL (Data Query Language):**

**DQL** statements are used for performing queries on the data within schema objects. The purpose of the DQL Command is to get some schema relation based on the query passed to it. We can define DQL as follows it is a component of SQL statement that allows getting data from the database and imposing order upon it. It includes the SELECT statement. This command allows getting the data out of the database to perform operations with it. When a SELECT is fired against a table or tables the result is compiled into a further temporary table, which is displayed or perhaps received by the program i.e. a front-end.

List of DQL:

* [**SELECT**](https://www.geeksforgeeks.org/sql-select-clause/)**:** It is used to retrieve data from the database.

### **DML(Data Manipulation Language):**

The SQL commands that deals with the manipulation of data present in the database belong to DML or Data Manipulation Language and this includes most of the SQL statements. It is the component of the SQL statement that controls access to data and to the database. Basically, DCL statements are grouped with DML statements.

List of DML commands:

* [**INSERT**](https://www.geeksforgeeks.org/sql-insert-statement/) : It is used to insert data into a table.
* [**UPDATE**](https://www.geeksforgeeks.org/sql-update-statement/)**:** It is used to update existing data within a table.
* [**DELETE**](https://www.geeksforgeeks.org/sql-delete-statement/) : It is used to delete records from a database table.
* [**LOCK:**](https://www.geeksforgeeks.org/sql-lock-table/) Table control concurrency.
* **CALL:** Call a PL/SQL or JAVA subprogram.
* **EXPLAIN PLAN:** It describes the access path to data.

### **DCL (Data Control Language):**

DCL includes commands such as GRANT and REVOKE which mainly deal with the rights, permissions, and other controls of the database system.

List of DCL commands:

* [**GRANT:**](https://www.geeksforgeeks.org/mysql-grant-revoke-privileges/) This commandgives users access privileges to the database.
* [**REVOKE:**](https://www.geeksforgeeks.org/difference-between-grant-and-revoke/)This command withdraws the user’s access privileges given by using the GRANT command.

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

Answer : While a primary key and a composite key might do the same things, **the primary key will consist of one column, where the composite key will consist of two or more columns**.

A composite key is made by the combination of two or more columns in a table that can be used to uniquely identify each row in the table when the columns are combined uniqueness of a row is guaranteed, but when it is taken individually it does not guarantee uniqueness, or it can also be understood as a primary key made by the combination of two or more attributes to uniquely identify every row in a table.

CREATE TABLE student

(rollNumber INT,

name VARCHAR(30),

class VARCHAR(30),

section VARCHAR(1),

mobile VARCHAR(10),

PRIMARY KEY (rollNumber, mobile));

here we have made composite key is combination of rollNumber and mobile.

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

**Answer :**

CREATE TABLE student

(rollNumber INT,

name VARCHAR(30),

class VARCHAR(30) DEFAULT ‘1’,

section VARCHAR(1),

mobile VARCHAR(10) NOT NULL UNIQUE,

PRIMARY KEY (rollNumber));