**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?**

A **Relational Database Management System (RDBMS)** is a type of database management system that stores data in structured formats using rows and columns within tables. Each table represents a different entity, and relationships between these tables are established using keys (like primary and foreign keys). SQL is commonly used to manage and query data in RDBMS.

Advantages of DBMS over a file system:

1. Reduces data redundancy
2. Ensures data consistency and integrity
3. Offers better security controls
4. Supports concurrent data access
5. Provides automatic backup and recovery
6. Allows data independence, making structure changes easier

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

1. Atomicity ensures that if any part of a transaction fails, the entire transaction is rolled back, preserving the database's integrity.

2. Consistency ensures that rules (like constraints) are followed, keeping the database valid before and after transactions.

3. Isolation prevents transactions from affecting each other by ensuring that intermediate states aren't visible to other transactions.

4. Durability guarantees that even in case of system failure, committed data remains intact, typically through mechanisms like logging and backups.

**3) Explain the concept of normalization.**

Normalization is the process of organizing data in a database to reduce redundancy and improve data integrity. It involves dividing large tables into smaller ones and establishing relationships between them. The goal is to minimize duplicate data and ensure that data dependencies are logical and efficient.

1. 1NF : Eliminates duplicate columns, ensures atomic values in each cell.

2. 2NF : Ensures all non-key attributes are fully dependent on the primary key.

3. 3NF : Removes transitive dependencies (i.e., non-key attributes depending on other non-key attributes).

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

**Data Query Language (DQL)**: DQL is used to retrieve data from the database, primarily through the SELECT statement. It allows filtering and sorting of data without making any changes to the database.

**Data Manipulation Language (DML)**: DML modifies the data in the database, using commands like INSERT, UPDATE, and DELETE. These operations are typically part of transactions to ensure data consistency.

**Data Control Language (DCL)**: DCL manages user access and permissions with commands like GRANT and REVOKE. It ensures that only authorized users can perform certain operations on the database.

**Data Definition Language (DDL)**: DDL defines and modifies the structure of database objects like tables and schemas using commands like CREATE, ALTER, and DROP. It impacts the database's schema but doesn't manipulate the actual data.

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

A primary key and a composite key are both used to uniquely identify records in a database table, but they differ in scope and usage:

1. Primary Key:
   * Definition: A primary key is a single column that uniquely identifies each record in a table. It must be unique for each row and cannot be null.
   * Instance: In a Customer table, a CustomerID might be used as a primary key. Each customer has a unique CustomerID, ensuring that each record can be uniquely identified.
2. Composite Key:
   * Definition: A composite key consists of two or more columns used together to uniquely identify a record in a table. It is used when a single column is not sufficient to ensure uniqueness.
   * Instance: In an OrderDetails table, a combination of OrderID and ProductID can be used as a composite key. This combination ensures that each record is unique in the context of both the order and the product, preventing duplicate entries for the same product within a single order.

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

CREATE TABLE Employees (

EmployeeID INT PRIMARY KEY,

FirstName VARCHAR(50) NOT NULL,

LastName VARCHAR(50) NOT NULL,

HireDate DATE DEFAULT CURRENT\_DATE,

Email VARCHAR(100) UNIQUE );