DATABASE and SQL

**Learning Objectives**

* Understand different types of databases i.e relational, non relation, sql and non sql databases
* Understand **ACID** properties of the database
* Understand types of transactions in the database i.e Begin, End and Rollback Transactions
* Understand how the **Select** query works to fetch records from the database
* Understand how the **Where** clause works in sql
* Understand how the **DISTINCT** clause works in sql
* Understand how the SQL Operators work i.e **And, Or, Not**
* Understand how the **Order By** clause works in sql
* Understand how the **Insert Into** command works in sql
* Understand Sql **Update and Delete** commands
* Understand how **Select Top** command works in sql
* Understand how **Aggregate functions** work in sql for ex. Min, Max, Avg, Count, Sum
* Understand how **Like** keyword works in sql
* Understand how **Wildcard characters** work in sql
* Understand how **In and Between** keywords work in SQL
* Understand how SQL Joins work like **Left Join, Right Join, Outer Full Join**
* Understand how **Union** works in sql
* Understand how **Group By** and **Having** works in Sql
* Understand DDL **Drop Table, Alter Table, Create Table, SQL Constraints, Not Null, Unique, Primary Key, Foreign Key, Check, Default**

**Answers:**

1. **Understand different types of databases i.e relational, non relation, sql and non sql databases**

**Ans.**

**Relational Database** – It is a collection of data items with pre-defined relationships to each other. They are organized as a set of tables with rows and columns and a unique key for each row in a table. Each table contains the data items and each column contains each kind of information and each row contains the collection of information about one object. This data can be accessed in multiple ways without reorganizing the tables. Eg. SQL database.

**Non-relational Database –** It is a collection of various data items in a non-tabular form. Instead it is based on data structures like a document. A document can contain highly detailed information in different formats. It is more flexible that the relational database. It is often called a NOSQL database.

1. **Understand ACID properties of the database**

**Ans.**

ACID stands for Atomicity,Consistency,Isolation and Durable. These are a set of properties of a database transactions that ensures data integrity inspite of errors, system failures, power failures etc.

Atomicity – It means that each transaction is either a success or a fail. Multiple steps are required for each transaction but they are treated as a single transaction. So if the transaction fails before all the multiple steps are executed then the entire transaction reverts back to its original state.

Consistency – Data updating is done for each transaction in order to follow other rules or constraints to keep data consistent. For eg, If Alice has $50 in her account. She cannot transfer $100 to Bob.

Isolation – Isolation allows concurrency transactions. So that one transaction does not affect the other.

Durability – Transactions and database modifications are not stored in a volatile memory, instead its written to a disk. So power failures will not affect it.

1. **Understand types of transactions in the database i.e Begin, End and Rollback Transactions**

**Ans.**

Begin Transaction – It marks the beginning of an explicit transaction and puts a lock on the table in the database till a commit or rollback transaction is issued. It is easier to catch an error before it is committed if we start each transaction with a BEGIN TRAN. Any other transaction trying to access the same database table is blocked till the end of the transaction.

Commit Transaction – It marks the successful end of an implicit or explicit transaction.It makes the changes in the transaction permanent and saves it in the disk. It also frees the resources held by the transaction.

Rollback Transaction – It rolls back and implicit or explicit transaction to the beginning of the transaction or to a savepoint inside the transaction. It also frees the resources being held by the transaction.

1. **Understand how the Select query works to fetch records from the database**

**Ans**.

The **select** query follows 6 steps.

* **Getting data (FROM,JOIN)** – Execute the FROM clause and then the JOIN clause and get a cartesian product of the two tables. From this result the ON clause is executed which gives us a subset of the cartesian product.
* **Row Filter (WHERE)**
* **Grouping (GROUP BY)**
* **Group Filter (HAVING)**
* **Return Expressions (SELECT)**
* **Order by & Paging (ORDER BY & LIMIT/OFFSET)**

1. **Understand how the Where clause works in sql**

**Ans.**

The WHERE clause is used to specify a condition while fetching data from a table or joining multiple tables.

1. **Understand how the DISTINCT clause works in sql**

**Ans**.

DISTINCT clause is used to remove duplicates from the result set of a SELECT statement.

1. Understand how the SQL Operators work i.e **And, Or, Not**

Ans.