SQL Training

1-4 Basics

1. Introduction to Databases

- History and evolution of databases
- Types of databases: Relational vs. Non-relational
- Database Management Systems (DBMS) overview
- SQL vs. NoSQL databases

2. Relational Database Fundamentals

- Database design concepts
- Entity-Relationship (ER) model
- Tables, rows, and columns
- Primary keys and foreign keys
- Normalization (1NF, 2NF, 3NF, BCNF)
- Denormalization and when to use it

3. Basic SQL Commands

- Data Definition Language (DDL): `CREATE`, `ALTER`, `DROP`
- Data Manipulation Language (DML): `SELECT`, `INSERT`, `UPDATE`, `DELETE`
- Data Control Language (DCL): `GRANT`, `REVOKE`
- Transaction Control Language (TCL): `BEGIN`, `COMMIT`, `ROLLBACK`

4. Advanced SQL Queries

- Joins: Inner, Outer (Left, Right, Full), Cross joins
- Subqueries and correlated subqueries
- Set operations: `UNION`, `INTERSECT`, `EXCEPT`
- Window functions: `ROW_NUMBER()`, `RANK()`, `DENSE_RANK()`, `NTILE()`, `LAG()`, `LEAD()`
- Common Table Expressions (CTEs) and recursive queries
- Pivoting and unpivoting data.

5. Database Design and Optimization

- Indexing: clustered vs. non-clustered indexes, covering indexes
- Query optimization techniques

- Explain plans and query execution analysis
- Partitioning and sharding strategies
- Concurrency control and isolation levels
- Deadlocks and how to handle them

6. Stored Procedures and Functions

- Creating and managing stored procedures
- User-defined functions
- Triggers and their uses
- Error handling and transaction management within stored procedures

7. Database Security

- Authentication and authorization
- Role-based access control (RBAC)
- Encryption: data-at-rest, data-in-transit
- SQL injection and how to prevent it
- Auditing and compliance

8. Advanced Topics in SQL

- Full-text search
- Temporal tables
- JSON and XML data handling
- Dynamic SQL and metaprogramming
- Spatial data and GIS functions

9. Big Data and NoSQL Databases

- Introduction to Big Data concepts
- Differences between SQL and NoSQL
- Popular NoSQL databases: MongoDB, Cassandra, Redis
- Integrating SQL databases with Big Data technologies (Hadoop, Spark)