**Day 5 – Lab Document**

**Track**: Advanced SQL & Data Modeling  
**Focus**: CTEs, Views, Transactions, Star Schema, Dimensional Design

**Lab 1: CTEs and Materialized Views**

**Objective**

Learn how to use Common Table Expressions (CTEs) and materialized views to simplify and optimize complex SQL queries.

**Dataset**

* orders (order\_id, customer\_id, order\_date, amount)
* customers (customer\_id, name, region\_id)
* regions (region\_id, region\_name)

**Tasks**

1. Write a CTE to calculate total order value per region.
2. Use another CTE to get average order value per customer.
3. Create a **materialized view** that stores the monthly total sales per region.
4. Query the view to find top 3 regions in terms of monthly revenue.

**Expected Output**

Materialized summaries for quick reporting.

**Lab 2: Star Schema Design and Implementation**

**Objective**

Understand and apply dimensional modeling concepts using the Star Schema.

**Dataset Scenario**

A retail sales system with the following facts and dimensions:

* Sales Fact: sales (sale\_id, customer\_id, product\_id, date\_id, quantity, amount)
* Dimensions:
  + customers (customer\_id, name, city)
  + products (product\_id, name, category)
  + dates (date\_id, date, month, year)

**Tasks**

1. Design and create dimension tables.
2. Load sample records into dimension tables.
3. Design and create the fact table.
4. Write a query to calculate:
   * Monthly revenue per product category
   * Year-over-year growth per customer

**Expected Output**

Structured star schema with correctly joined queries for analytics.

**Lab 3: Denormalized Tables and Fact-Dimension Relationships**

**Objective**

Build and query denormalized tables for data lake scenarios, understand trade-offs between normalization and performance.

**Tasks**

1. Flatten sales data to a single denormalized table:
   * Include customer name, product name, city, month, and revenue.
2. Write SQL queries to:
   * Filter all sales from a specific city and month.
   * Group by city and product category to get total revenue.
3. Discuss pros and cons of using this format in analytics vs normalized schema.

**Expected Output**

Queryable denormalized sales view with simplified filters.

| **File/Query Name** | **Description** |
| --- | --- |
| lab1\_cte\_views.sql | CTEs and materialized views for reporting |
| lab2\_star\_schema.sql | Star schema design and sample analytics |
| lab3\_denormalized\_view.sql | Flattened table structure and summary queries |