HYDERABAD INSTITUTE OF ARTS, SCIENCE, AND TECHNOLOGY

Database Systems – Lab 13 Manual
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Topic: Working with Aggregate & Analytical Functions in SQL

Objective: To understand and apply aggregate and analytical SQL functions for data analysis, including SUM, AVG, COUNT, GROUP BY, HAVING, and window functions like RANK, ROW_NUMBER, and DENSE_RANK.

1. Introduction

This lab introduces the concept of analytical processing in SQL, enabling students to derive insights from large datasets. Aggregate and analytical functions are widely used in business intelligence, data science, and reporting systems to analyze data trends, calculate metrics, and rank records efficiently.

2. Why It's Important

SQL analytics bridges the gap between traditional databases and modern data analytics. Aggregate functions summarize data (like total sales), while analytical functions help identify patterns, rank records, and calculate running totals—all without using external tools.

3. Creating and Populating a Table

Use the following SQL statements to create and insert data into a table named 'sales'.

```
CREATE TABLE sales (
  id INT AUTO_INCREMENT PRIMARY KEY,
  product_name VARCHAR(50),
  category VARCHAR(30),
  price DECIMAL(10,2),
  quantity INT,
  sale_date DATE
);
```

```
INSERT INTO sales (product_name, category, price, quantity, sale_date) VALUES
('Laptop', 'Electronics', 1200.00, 3, '2025-09-01'),
('Headphones', 'Electronics', 150.00, 10, '2025-09-03'),
('Shirt', 'Apparel', 40.00, 8, '2025-09-05'),
('Shoes', 'Apparel', 75.00, 5, '2025-09-06'),
('Watch', 'Accessories', 250.00, 4, '2025-09-07'),
('Laptop', 'Electronics', 1200.00, 2, '2025-09-08');
```

4. Aggregate Functions

```
-- Total Sales Amount
SELECT SUM(price * quantity) AS total_sales FROM sales;

-- Average Product Price
SELECT category, AVG(price) AS avg_price FROM sales GROUP BY category;

-- Number of Items Sold per Category
SELECT category, COUNT(*) AS total_items FROM sales GROUP BY category;
```

5. Filtering Aggregates

```
-- Show only categories with total sales above 500
SELECT category, SUM(price * quantity) AS total_sales
FROM sales
GROUP BY category
HAVING total_sales > 500;
```

6. Analytical (Window) Functions

```
-- Ranking Products by Sales
SELECT
  product_name,
  SUM(price * quantity) AS total_sales,
  RANK() OVER (ORDER BY SUM(price * quantity) DESC) AS sales_rank
FROM sales
GROUP BY product_name;

-- Running Total Example
SELECT
  sale_date,
  SUM(price * quantity) OVER (ORDER BY sale_date) AS running_total
```

```
FROM sales;
```

8. Lab Outcomes

After completing this lab, students will be able to:

- Use SQL aggregate and window functions for data analytics.
- Write queries to rank, group, and summarize data.
- Understand the basis of analytical processing used in BI tools and dashboards.

9. Task

Export the results to Power BI, Excel, or Python (Pandas) to visualize your SQL analysis. This step connects your database work directly with data science applications.