SQL Project Report ON E-Commerce Sales

**1. Project Overview**

The E-Commerce Sales is a relational database designed to manage online retail data and generate meaningful business insights.

It tracks customers, orders, products, payments, and sales performance, providing analytical queries to support decision-making and strategy development.

**2. Database Design**

| **Table** | **Description** |
| --- | --- |
| Customers | Stores customer information (name, email, location) |
| Products | Details of products including price, category, and stock |
| Categories | Classifies products into logical groups |
| Orders | Main sales transactions containing customer and date info |
| OrderItems | Line-item details of each product within an order |
| Payments | Records payment details (mode, amount, status, date) |

**3. Design Choices**

* Normalization  
  The database follows 3rd Normal Form (3NF) to avoid redundancy.
  + Product details are separated from categories.
  + Orders and OrderItems store transaction data efficiently.
* Primary & Foreign Keys  
  Every table uses unique primary keys (e.g., CustomerID, OrderID) and proper foreign keys to maintain referential integrity.
* Indexes for Optimization  
  Frequently joined or searched columns are indexed:

CREATE INDEX idx\_customer\_id ON Orders(CustomerID);

CREATE INDEX idx\_product\_id ON OrderItems(ProductID);

CREATE INDEX idx\_order\_date ON Orders(OrderDate);

CREATE INDEX idx\_category\_id ON Products(CategoryID);

* Data Integrity & Constraints
  + CHECK constraints for valid prices and quantities
  + ENUM or CHECK for payment status and mode
  + ON DELETE CASCADE for dependent records

**4. Performance Optimization**

* Indexes: Added on key join and filter columns (CustomerID, OrderDate, ProductID).
* Query Optimization:
  + Used JOIN instead of subqueries for better performance.
  + Applied window functions (LAG, RANK) for advanced analytics.
* Partitioning Possibility:
  + Large Orders table can be partitioned by month or year for scalability.

**5. Summary**

This SQL-based E-Commerce project demonstrates how data normalization, analytical queries, and performance tuning come together to form a practical, business-ready database system.

It provides clear visibility into sales performance, customer value, and growth trends — essential for data-driven decision-making in a retail environment**.**