SQL Practice Assignment: Logistics and Supply Chain Management

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Assignment Overview

This assignment is designed to enhance your SQL skills in the context of given domain. It includes a database schema with Data Definition Language (DDL) and Data Manipulation Language (DML) scripts, followed by 50 practice questions covering SQL concepts such as DDL, DML, DQL, functions, joins, self-joins, aggregation, and subqueries. Write SQL queries for each question based on the provided schema and sample data. Submit your solutions in a single `.sql` file, labeling each query with its question number (e.g., `-- Q1`).

Database Context

The database represents a logistics and supply chain system, managing warehouses, suppliers, products, inventory, and shipments. It includes five tables: `Warehouses`, `Suppliers`, `Products`, `Inventory`, and `Shipments`. Below are the DDL scripts to create these tables and DML scripts to insert sample data.

DDL Setup: Create Tables

```sql
DROP TABLE IF EXISTS Shipments;
DROP TABLE IF EXISTS Inventory;
DROP TABLE IF EXISTS Products;
DROP TABLE IF EXISTS Suppliers;
DROP TABLE IF EXISTS Warehouses;

CREATE TABLE Warehouses (
    warehouse_id INTEGER PRIMARY KEY,
    warehouse_name VARCHAR(100) NOT NULL,
    city VARCHAR(50) NOT NULL,
    capacity_sqft INTEGER, -- Capacity in Square Feet
    manager_name VARCHAR(100)
);

CREATE TABLE Suppliers (
    supplier_id INTEGER PRIMARY KEY,
    supplier_name VARCHAR(100) NOT NULL,
    contact_person VARCHAR(100),
```

```
    registration_city VARCHAR(50)
);

CREATE TABLE Products (
    product_id INTEGER PRIMARY KEY,
    product_name VARCHAR(100) NOT NULL,
    category VARCHAR(50),
    unit_cost DECIMAL(10, 2) NOT NULL,
    hs_code VARCHAR(20) UNIQUE -- Harmonized System Code
);

CREATE TABLE Inventory (
    inventory_id INTEGER PRIMARY KEY,
    warehouse_id INTEGER NOT NULL,
    product_id INTEGER NOT NULL,
    stock_quantity INTEGER,
    reorder_level INTEGER,
    FOREIGN KEY (warehouse_id) REFERENCES Warehouses(warehouse_id),
    FOREIGN KEY (product_id) REFERENCES Products(product_id)
);

CREATE TABLE Shipments (
    shipment_id INTEGER PRIMARY KEY,
    product_id INTEGER NOT NULL,
    supplier_id INTEGER,
    origin_warehouse_id INTEGER NOT NULL,
    destination_city VARCHAR(50) NOT NULL,
    shipment_date DATE NOT NULL,
    expected_delivery_date DATE,
    actual_delivery_date DATE,
    shipping_cost DECIMAL(10, 2) NOT NULL,
    status VARCHAR(20), -- 'In Transit', 'Delivered', 'Delayed'
    FOREIGN KEY (product_id) REFERENCES Products(product_id),
    FOREIGN KEY (supplier_id) REFERENCES Suppliers(supplier_id),
    FOREIGN KEY (origin_warehouse_id) REFERENCES Warehouses(warehouse_id)
);
```

DML Setup: Insert Sample Data

```
INSERT INTO Warehouses (warehouse_id, warehouse_name, city, capacity_sqft,
    manager_name) VALUES
(1, 'Reliance Logistics Hub', 'Mumbai', 50000, 'Vivek Kulkarni'),
(2, 'Gati Cargo Depot', 'Delhi', 75000, 'Sneha Tandon'),
(3, 'TVS Supply Chain Point', 'Chennai', 40000, 'Gopal Iyer'),
(4, 'Amazon Fulfillment Center', 'Bangalore', 100000, 'Prabha Shetty');

INSERT INTO Suppliers (supplier_id, supplier_name, contact_person,
    registration_city) VALUES
(10, 'Lakshmi Textiles', 'Ramesh Kumar', 'Coimbatore'),
(20, 'Bharat Pharma Corp', 'Dr. Shanti Rao', 'Hyderabad'),
(30, 'Tata Motors Ancillaries', 'Pankaj Varma', 'Pune'),
(40, 'Amul Dairy Goods', 'Kiran Patel', 'Ahmedabad');

INSERT INTO Products (product_id, product_name, category, unit_cost,
    hs_code) VALUES
(100, 'Basmati Rice (50kg)', 'Food Grain', 3500.00, '1006.30'),
```

```sql
(101, 'Auto Gearbox Unit', 'Automotive', 45000.00, '8708.40'),
(102, 'Cotton Fabric Roll', 'Textile', 8500.00, '5209.11'),
(103, 'Tablet Salt (Bulk)', 'Pharma Raw', 15000.00, '2501.00'),
(104, 'E-commerce Box (L)', 'Packaging', 50.00, '4819.10');

INSERT INTO Inventory (inventory_id, warehouse_id, product_id,
    stock_quantity, reorder_level) VALUES
(1000, 1, 100, 500, 100),
(1001, 1, 104, 15000, 5000),
(1002, 2, 101, 250, 50),
(1003, 3, 102, 300, 75),
(1004, 4, 100, 1000, 200),
(1005, 4, 103, 150, 100);

INSERT INTO Shipments (shipment_id, product_id, supplier_id,
    origin_warehouse_id, destination_city, shipment_date,
    expected_delivery_date, actual_delivery_date, shipping_cost, status)
    VALUES
(5001, 101, 30, 2, 'Chennai', '2024-06-01', '2024-06-07', '2024-06-08',
    12500.00, 'Delayed'),
(5002, 104, NULL, 1, 'Pune', '2024-06-05', '2024-06-07', '2024-06-07',
    3500.00, 'Delivered'),
(5003, 102, 10, 3, 'Mumbai', '2024-06-10', '2024-06-15', '2024-06-15',
    8900.00, 'Delivered'),
(5004, 103, 20, 4, 'Hyderabad', '2024-06-12', '2024-06-14', NULL, 6000.00,
    'In Transit'),
(5005, 100, 40, 1, 'Kolkata', '2024-06-15', '2024-06-22', NULL, 15000.00,
    'In Transit'),
(5006, 100, 40, 4, 'Delhi', '2024-06-18', '2024-06-20', '2024-06-20',
    4200.00, 'Delivered');
```

Practice Questions (50 Total)

Write SQL queries for each of the following 50 questions based on the provided schema and data. Label each query with its question number (e.g., – Q1) in your submission file. Submit all queries in a single `.sql` file.

I. DDL (Data Definition Language) - 4 Questions

Q1 Add a new column 'contact_email' (VARCHAR 100, unique constraint) to the Suppliers table.

Q2 Rename the column 'unit_cost' in the Products table to 'base_price'.

Q3 Create a non-unique index named 'idx_shipment_status' on the 'status' column of the Shipments table.

Q4 Modify the 'capacity_sqft' column in the Warehouses table to allow a larger capacity (e.g., BIGINT).

II. DML (Data Manipulation Language - CRUD) - 6 Questions

Q5 Insert a new product: ID 105, 'Solar Panel Unit', category 'Renewable', cost 25000.00, HS code '8541.40'.

Q6 Update the stock quantity of 'Basmati Rice (50kg)' (Product ID 100) in the Mumbai warehouse (ID 1) to 600 units.

Q7 Update the status of Shipment ID 5004 to 'Delayed' and set the 'actual_delivery_date' to '2024-06-17'.

Q8 Insert a new warehouse: ID 5, 'Adani Logistics Park', 'Ahmedabad', 60000 sqft, managed by 'Anil Singh'.

Q9 Delete all inventory records for products belonging to the 'Pharma Raw' category.

Q10 Delete the supplier named 'Amul Dairy Goods' (ID 40).

III. DQL - Basic SELECT (Data Query Language) - 7 Questions

Q11 Select the warehouse name, city, and manager name for all warehouses in 'Mumbai' or 'Bangalore'.

Q12 Select the product name and HS code for all products whose category is NOT 'Food Grain'.

Q13 Find all unique registration cities of suppliers.

Q14 List all shipments with a shipping cost between 5000.00 and 10000.00 (inclusive), ordered by cost descending.

Q15 Select all products whose product name contains the word 'Unit' or 'Roll'.

Q16 List the top 2 highest capacity warehouses.

Q17 Select all shipments that do not have an associated supplier (supplier_id is NULL).

IV. Functions (String, Numeric, Date) - 8 Questions

Q18 Concatenate the product name and category into a single string: "NAME [CATEGORY]".

Q19 Display the supplier name, replacing all occurrences of 'Corp' with 'Corporation'.

Q20 Select the shipment date, and the date that is 45 days after the shipment date, labeled 'PaymentDue_Date'.

Q21 Calculate the difference in days between 'expected_delivery_date' and 'actual_delivery_date' for all shipments, labeled 'DeliveryDelayInDays'.

Q22 Display the warehouse name, converting it to all lowercase letters.

Q23 Calculate the total stock quantity of all products, rounded up to the nearest thousand.

Q24 Extract the year from the 'shipment_date' for all shipments.

Q25 Select the supplier name and the first three characters of their contact person's name.

V. Basic Joins - 8 Questions

Q26 List the product name, its current stock quantity, and the warehouse name where it is stored. (3-table INNER JOIN)

Q27 List all shipments, showing the Shipment ID, the Supplier Name, and the destination city. (INNER JOIN)

Q28 List all warehouses and the products they hold in stock (show warehouses even if they hold no stock). (LEFT JOIN)

Q29 Find all products that are currently NOT in stock in any warehouse. (LEFT JOIN with WHERE IS NULL)

Q30 List all suppliers and their corresponding shipment IDs (show NULL for suppliers with no shipments). (LEFT JOIN)

Q31 List the product name and the name of the supplier who supplied the product for Shipment ID 5001.

Q32 List the product name, its category, and the name of the warehouse that stores it, only for products with stock below their reorder level.

Q33 Combine all suppliers and all warehouses, listing every possible supplier-warehouse pair. (CROSS JOIN)

VI. Self-Joins - 3 Questions

Q34 Find pairs of warehouses located in the same city, but with different warehouse IDs.

Q35 List all inventory items that have a lower stock quantity than another item stored in the same warehouse.

Q36 Find the names of managers who manage a warehouse in the same city as the 'Reliance Logistics Hub' (ID 1).

VII. Advanced DQL - Aggregation and Grouping - 8 Questions

Q37 Calculate the total number of unique products currently in inventory.

Q38 Find the average shipping cost for shipments with a status of 'Delivered'.

Q39 List the total stock quantity for each product category (Category and Total Stock).

Q40 Find the number of shipments originated from each warehouse (Warehouse Name and Shipment Count).

Q41 Determine the maximum and minimum capacity of the warehouses.

Q42 List the total stock value (stock_quantity * unit_cost) for each product name.

Q43 Find the cities where the average warehouse capacity is greater than 60000 sqft. (HAVING AVG)

Q44 Find the supplier (name) that has supplied products for the highest number of distinct shipments.

VIII. Subqueries - 9 Questions

Q45 Find the names of all products that have been part of a shipment. (Subquery with EXISTS)

Q46 Find the warehouse names where the stock quantity of any product is below the overall minimum reorder level across all inventory items. (Scalar Subquery)

Q47 List the names of suppliers whose registration city is the same as the city of the 'TVS Supply Chain Point' warehouse. (Scalar Subquery)

Q48 Find the shipments where the 'shipping_cost' is higher than the average shipping cost for ALL shipments. (Scalar Subquery)

Q49 List the product names whose total stock quantity (sum of stock across all warehouses) is greater than 1200. (Subquery in HAVING)

Q50 Find the products (names) that have never been shipped. (Subquery with NOT IN)

Submission Instructions

- Submit all queries in a single `.sql` file.
- Label each query with its question number (e.g., `-- Q1`).
- Ensure queries are compatible with standard SQL (e.g., PostgreSQL, MySQL).
- Test your queries against the provided schema and data for correctness.
- Submit by the deadline specified by your instructor via the course portal.