Part 1: Understanding SQL

Question 1. Research

1.1. **Summary of Findings:** SQL (Structured Query Language) is essential for managing and manipulating relational databases in web applications. In an online store, SQL handles product information, user accounts, and order details by allowing the system to store, retrieve, update, and delete data efficiently. SQL ensures that the website can dynamically interact with the database, enabling real-time updates and data integrity across different users and transactions (Elmasri & Avathe, 2008).

1.2. **Role of SQL in Web Applications:** SQL plays a crucial role in web applications by enabling the interaction between the application and the database. It allows for the execution of queries to retrieve and manipulate data, ensuring that information such as product details, user profiles, and transaction records are accurately stored and readily accessible. This ensures the smooth functioning of dynamic websites where data consistency and quick retrieval are paramount.

1.3. **Benefits of Using SQL for Web Applications:**

i. **Efficiency in creation, read, update and deletion of data.**
ii. **Logical and structured data Organization**
iii. **Maintains data integrity**

1.4. **Explanation of Benefits:**

- **Efficiency:** SQL's powerful querying capabilities allow for quick data retrieval and updates, enhancing the performance of web applications.
- **Data Organization:** By organizing data into tables with predefined schemas, SQL helps maintain a clean and logical data structure, simplifying data management.
- **Data Integrity:** SQL supports constraints and transactions, ensuring that all data operations are performed correctly and consistently, preventing data anomalies.

1.5. **Database Management Systems:**

- MySQL

- PostgreSQL
- Microsoft SQL Server

Part 2: Database Fundamentals

Question 2.1: Tables A database table is a collection of related data organized in rows and columns, where each row represents a record and each column represents a field within the record. Tables in databases are similar to spreadsheets as both organize data in a tabular format in rows and columns, allowing for easy access and manipulation of individual data elements (Lake & Crowther, 2013).

Question 2.2: Columns Columns in a database table define the data categories or fields that the table will store. For example, a "Users" table might have columns like "user_id" (integer), "username" (text), and "created_at" (date). Columns ensure that each piece of data within a table is correctly categorized and consistently formatted.

Data Types: Data types are essential in databases to ensure data integrity and efficient storage. Common data types include:

- **Text:** Stores alphanumeric characters, e.g., names or descriptions.
- **Number:** Stores numerical values, e.g., quantities or prices.
- **Date:** Stores date and time information, e.g., timestamps or birthdates.

Question 2.3: Data Types Data types are crucial in a database to maintain data integrity, optimize storage, and ensure efficient data retrieval. They define the kind of data that can be stored in each column, preventing invalid data entries.

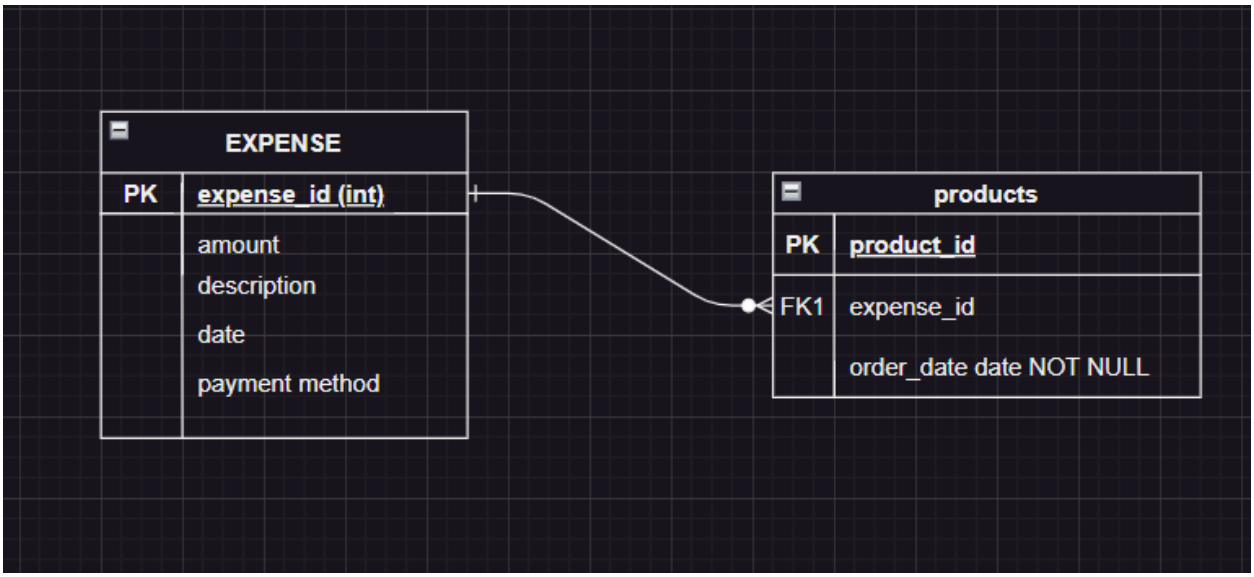
- **Text:** Used for storing strings or characters, such as names or descriptions. Example: `VARCHAR(255)` for product names.
- **Number:** Used for storing numerical values, such as prices or quantities. Example: `INT` for counting items.
- **Date:** Used for storing date and time values. Example: `DATE` for recording transaction dates.

Part 3: Expense Tracker Database Design

3.1. **Planning** For an Expense Tracker application, we need to track the following data points:

- Expense amount
- Date of expense
- Category of expense
- Description of expense
- Payment method

3.2. **Tables** Based on the identified data points, the main table for our database schema will be named "Expenses."



References:

Elmasri, R., & Avathe, S. B. N. (2008). Fundamentals of Database Systems. In *Engineering, Department of Computer Science University of Texas at Arlington* (Fourth). https://doi.org/10.1007/978-1-4020-6754-9_4159

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