**Part 1: Understanding SQL**

**Question 1. Research**

1. *Product Information:*

**Storage:** Product details such as name, description, price, and inventory are stored in a database table

**Access:** SQL queries are used to retrieve product information based on various criteria such as category, price range, or availability

1. *Order Details:*

**Storage:** When a user places an order, the order details such as the products purchased, quantities, total price, and shipping information are stored in the database.

**Access:** SQL queries are used to manage user accounts, including creating new accounts, authenticating users during login, and updating user details.

1. *User Accounts:*

**Storage:** User accounts, including details like username, email, password (usually hashed for security), and shipping address, are stored in a dedicated table in the database.

**Access:** SQL queries are used to manage user accounts, including creating new accounts, authenticating users during login, and updating user details.

**1.2.** Write a short explanation (3-5 sentences) in your document about the role of SQL in web applications.

In the past, websites only displayed texts and images using static HTML. However, today’s websites focus more on engaging users by incorporating and reflecting their unique data and information. Through data management most websites and web applications today have to deal with a ton of data every day. This could be emails, user details, and many more. To ensure optimal user experience, these tons of data need to be stored carefully in places where the system can access them.

**1.3.** List 3 benefits of using SQL for web applications.

* Integration with modern technologies.
* Wide adoption and community support.
* Cost-effectiveness.

**1.4.** Think about efficiency, data organization, and data retrieval capabilities. Briefly explain each benefit in your document (1-2 sentences per benefit)

* SQL Database Efficiency

SQL databases are efficient in managing large volumes of data due to their ability to handle complex queries and transactions. They optimize storage by eliminating data redundancy through normalization, reducing storage requirements and improving performance.

* Data Organization

SQL databases offer a structured way to organize data through tables, ensuring data integrity and consistency. This organization facilitates easy data management, retrieval, and maintenance.

* Data Retrieval Capabilities

SQL databases provide powerful data retrieval capabilities through the use of structured query language (SQL). This allows users to retrieve specific data based on various criteria, perform complex aggregations, and generate reports efficiently.

**1.5.** List any 3 Database Management Systems.

MySQL

Oracle

PostgreSQL

**Part 2: Database Fundamentals**

**Question 2.1: Tables**

**Think about how data is organized in rows and columns. In your document, define a database table and explain its similarity to a spreadsheet (2-3 sentences).**

**A** table is **a collection of related data organized in table format**; consisting of columns and rows. Both spreadsheets and databases can store data in a tabular format,  numeric and textual values are arranged across columns/fields and rows/records.

**Question 2.2: Columns**

**Consider different types of data like text, numbers, and dates. Define "columns" and provide an example with an explanation (2-3 sentences) in your document. Data Types: Why are data types important in a database? Briefly explain 3 common data types (e.g., Text, Number, Date).**

In the context of databases, a "column" is a vertical entity in a table that contains all the information associated with a specific field. The table has the following columns:

1. EmployeeID: An integer column that uniquely identifies each employee.
2. FirstName: A string column that stores the first name of each employee.
3. LastName: A string column that stores the last name of each employee.

Data types are crucial in a database because they define the kind of data that can be stored in each column of a table. They ensure data integrity, optimize storage, and improve query performance.

**String:**

* **Description:** Used to store alphanumeric data (letters, numbers, and special characters).

**Number (Integer, Decimal):**

* **Description:** Used to store numeric values. There are various subtypes for integers (whole numbers) and decimals (numbers with fractional parts).

**Date (Date, Time, DateTime):**

* **Description:** Used to store date and time values.

**Question 2.3: Data Types**

Think about how data types ensure data integrity and efficient storage. Explain the importance of data types and provide brief explanations of 3 common types (2-3 sentences each) in your document.

**Importance of Data Types**

Data types are crucial in a database because they define the kind of data that can be stored in each column, ensuring data integrity, optimizing storage, and enhancing query performance.

**3 common types**

**String:**

Used to store alphanumeric characters, such as names, addresses, and descriptions.

* Importance: Text data types allow for flexible input of characters and are essential for storing any non-numeric information.

**Number (Integer, Decimal):**

Used to store numeric values, with integers representing whole numbers and decimals representing numbers with fractional parts.

* **Importance:** Numeric data types are vital for performing mathematical calculations and ensuring numeric data is stored accurately and efficiently.

**Date (Date, Time, DateTime):**

Used to store dates and times, with formats for just dates, just times, or both combined.

* **Importance:** Date data types allow for consistent storage and manipulation of date and time information, enabling time-based data analysis and operations.

**Part 3: Expense Tracker Database Design**

**3.1. Planning:** We'll be building an Expense Tracker application. What kind of data do you think we'll need to track? List at least 5 data points relevant to our project.

Consider information like expense amount, date, and category.

List your identified data points in your document.

* Amount
* Date of Expense
* Category
* Description
* Payment Method

**3.2. Tables:** Considering the data points you listed, design a basic database schema with one main table (likely named "Expenses").

* Define the columns needed for this table.
* Assign appropriate data types to each column based on the kind of data it will hold. (e.g., amount: number, date: date, category: text)

In your document, create a table structure that includes:

* Table name (e.g., Expenses)
* Column names (e.g., expense\_id, amount, date, category)

Data type for each column (e.g., INT, DECIMAL, DATE, TEXT)

1. **ExpenseID (INT):** This is the primary key for the table, providing a unique identifier for each expense entry.
2. **Amount (DECIMAL(10, 2)):** Stores the monetary value of the expense, allowing up to 10 digits, including 2 decimal places for cents.
3. **Date (DATE):** Stores the date on which the expense was incurred.
4. **Category (VARCHAR(50)):** Stores the category of the expense, with a maximum length of 50 characters.
5. **Description (VARCHAR(255)):** Stores additional details or notes about the expense, with a maximum length of 255 characters.
6. **PaymentMethod (VARCHAR(50)):** Stores the method used for payment, with a maximum length of 50 characters.

**Table Name: Expenses**

| **Column Name** | **Data Type** | **Description** |
| --- | --- | --- |
| ExpenseID | INT | Unique identifier for each expense (Primary Key) |
| Amount | DECIMAL(10, 2) | Total amount of the expense |
| Date | DATE | Date when the expense was incurred |
| Category | VARCHAR(50) | Category of the expense (e.g., Food, Transportation) |
| Description | VARCHAR(255) | Brief description or note about the expense |
| PaymentMethod | VARCHAR(50) | Method used for payment (e.g., Cash, Credit Card) |