Final Project (40 Points)

Due: Friday 6th December, 11:59 pm

The final project is the highlight of this course. Since software development is usually a team effort, you may team up with two or three classmates for this project. Everyone in the group is expected to contribute equally to the design and implementation.

Idea: Creating a Database from Scratch

Project overview: A business owner approached you for help in creating a new database from scratch to streamline their company's operations. The existing business data is stored in an Excel file, which can be downloaded from Canvas. The dataset contains 31 columns and 1,000 rows. You need to design a robust and customized database solution tailored to their specific needs. For this project, you will use MySQL (MySQL Workbench) as the Database Management System (DBMS).

Final output: The output of each phase should be in ".sql" format. Also, you need to export code's output and upload it as a separate file. For example, you might name the files "db_view.sql" and "db_view.csv".

Furthermore, please create a one-page document that outlines and explains the tasks assigned to each group member. This document should include a table detailing the specific tasks completed by each member

Hint and specifications: After analyzing the data structure and identifying the necessary actions to assist the business, you should have outlined the process into the following steps:

- **Phase1: Database Creation & Data Loading (4 points):** Before creating the database, the data in the Excel file should be thoroughly reviewed, cleaned, and then saved in CSV format. Then, the next step is to create a database and import the data into it. This can be done in two ways:

    1. Use an import tool available in MySQL Workbench (or in another SQL tool with a similar import capability) to add the data to your database.
    2. Load the data directly into a table by running a specific command in MySQL Shell.

    To use the second method, start by cleaning the data in the Excel file and saving it as a CSV file. The cleaning process includes:

    1. Ensuring date formats are in "yyyy-mm-dd."
    2. Ensuring that numbers have the correct format, free from any symbols like currency signs, commas, or extra characters

- **Phase2: Normalization and Denormalization (5 points):** Once you've reviewed the imported data, you may observe that it lacks proper structure or is "denormalized." This brings us to the next phase: Data Normalization. Normalization involves structuring the data by grouping related attributes within a larger data model. The main objectives of normalization are to remove redundant data, reduce the risk of data modification errors, and simplify the querying process. To achieve normalization in SQL, consider using the CTAS (CREATE TABLE AS SELECT) approach.

- **Phase3: Database Diagram Design (ER) (5 points):** The next step is to create an ER (Entity-Relationship) Diagram, which uses symbols to represent entities, attributes, and relationships, providing a clear view of how different parts of the database are connected. You can create your ER diagram in any way that suits you, but here are a few suggestions!

    - If you're the pencil-and-paper type, you can draw your diagram, take a picture, and upload it as a separate file.
    - If you're digitally inclined, you can use a tool such as the Mermaid.js live editor. Mermaid.js is a toolkit via which you can create and export diagrams (including entity relationship diagrams!).
    - Or you can use Reverse Engineer feature of MySQL to create the ER Diagram.
    - You're also welcome to use any other software that helps you draw the types of shapes you'd like to draw.

- **Phase4: Table Alterations (5 points):** After creating the ER Diagram and defining the table constraints, you need to modify the tables to align with the constraints outlined in the diagram. This section will focus on table alterations. You should use ALTER TABLE to align each table's structure with the constraints (such as primary keys, unique constraints, and data types) outlined in their ER diagram, ensuring consistency and data integrity.

- **Phase5: Views, Triggers, and Stored Procedures (15 points):** At this stage, the database for the business should be set up, and the business owner has three requests:

    - **5.1 Create a view** that shows the quantity sold and revenue generated by each employee.
    - **5.2 Implement a trigger** on the products table that automatically reduces the stock quantity after an order is placed.
    - **5.3 Develop a procedure** to check for products that need to be restocked and generate a list of those requiring replenishment.

- **Phase6: User Management and Privileges (6 points):** The business owner has requested the creation of two users— a Database Administrator and a Data Analyst—with specific privileges on the database. Your task is to create these users and grant them appropriate access to the database:
    - **6.1 Database Administrator**: Create a user, such as "AlexSmith" (or a name of your choice), with full database administrator privileges. This user should be able to perform all actions on the database.
    - **6.2 Data Analyst:** Create a user, like "JamieLee" (or a different name), with read-only access, allowing them to view data without making changes.

      Managing users and their permissions is an essential part of database design. To assign these permissions, use SQL commands like GRANT to give access and REVOKE to remove it as needed.

- **Phase7: Database Backup:** The primary purpose of backing up a database is to create a duplicate of its data and structure at a specific point in time. This process involves capturing a snapshot of the entire database or selected portions of it and securely storing that copy. Some possible locations for backing up your database include:
    - Local Servers
    - External hard drives or USB drives
    - Network Attached Storage (NAS)
    - Cloud storage services: Utilizing cloud-based solutions such as Amazon S3, Google Cloud Storage, Microsoft Azure Blob Storage, or similar services. Cloud storage provides advantages like scalability, accessibility, and disaster recovery.

  Additionally, there are many other options for backup storage.

Example 3-Person Division of Labor	
Member1	Phase1, Phase2, Phase3, Phase6
Member2	Phase2, Phase 3, Phase 4, Phase 5-1
Member3	Phase2, Phase3, Phase 5-2, Phase 5-3

Example 4-Person Division of Labor	
Member1	Phase 1, Phase 6
Member2	Phase 2, Phase 4
Member3	Phase 3, Phase 5-1
Member4	Phase 5-2, Phase 5-3

Good luck with your project!