ISYS 464, Section 2, Fall 2023, Database Project, Due Date: Wednesday, 12/13

The project is to design and implement a database that is able to support a business application that will meet the requirements of a particular business or organization, real or hypothetical. Be creative and innovative in identifying new business operations, services that can be enabled by database. Today's web, mobile and IoT technologies offer many opportunity for new services to gain competitive advantages for a business. It will be great to use your imagination to figure out one such application and design a database to support it. You are to work in teams of up to two students on this project. Each team will have to identify an application for an organization (real or hypothetical), analyze the organization's data requirements and create a data model, design and implement the database using MySQL, and use SQL to retrieve useful information from the database.

This project consists of four parts:

Part 1: Project introduction

Describe the business for which you design the application.
Describe the part of business operation your database supports.
Describe the advantages of automating this operation.

Part 2: Database analysis

Describe the data requirements
Draw the ERD based on the data requirements
You should verify your analysis with ChatGPT

Requirements: The ERD must have at least four entity types and at least one entity type consists of a supertype with subtypes. It should also have at least one multi-valued attribute and have at least one example of attribute of a relationship.

Part 3: Database design and implementation

3a: Design the database based on the ERD:
You should verify your design with ChatGPT

3b: Use MySQL to implement the database design. Each table should have reasonable number of fields and have around 7 records enough for testing SQL Select statements. The database should implement the following integrity constraints:
a. Primary key constraints: All tables must have a primary key.

b. Default value for a field: Define one field of your choice with a default value.

c. Enforcing domain constraint using CHECK: define one domain constraint and test it by inserting an invalid record to trigger the error message.

d. Enforcing referential integrity: define two referential integrity constraints and test them by inserting an invalid record to trigger the error message.

Part 4: Querying database

Based on the database, define queries to produce meaningful information to support management decisions that meet following requirements:

1. Define a query that uses the Natural Join command to join three tables to produce useful information.

2. Define a query that uses the Inner Join or traditional join method (the one that use the WHERE clause to specify the key and foreign equal) to join two or three tables).

3. Define a query to perform an Outer Join. It is your choice to do a Full, Left, or Right Outer.

4. Define a query that computes useful subtotals from the results of join multiple tables.

5. Define a query that uses the HAVING clause to check the subtotals.

6. Define a query that uses the IN (or NOT IN) to check keys returned by a subquery.

7. Define a query that uses the EXISTS (or NOT EXISTS) to check whether any records are returned by a correlated subquery.

8. Define a query that uses the IF() or CASE function to create a calculated field.

9. Create a useful database view and a SQL statement to query the view.

10. Create a Common Table Expression with a SQL statement to produce some useful information.

Project progress report: You must submit a progress report that includes your works for Part 1 and Part 2 by Wednesday, 11/1 to prove you are working on the project on schedule. I will grade this report Acceptable if your project looks reasonable and meets requirements, or Not Acceptable if your project needs improvements.

Final project report: The report should organize as follows:

Part 1: Introduction

Describe the business for which you design the application.
Describe the part of business operation your database supports.
Describe the advantages of automating this operation.

Part 2: Database analysis and ERD

Describe the data requirements and draw the ERD accordingly.

Part 3: Database design and implementation

Submit the screenshot of every table's design view.

Submit the screenshots of error message due to violating constraints c and d of
Part 3b.

(Note: The requirements of a and b will show on the table design view
automatically.)

Part 4: Querying database

For each query, briefly document the purpose of the query, and submit the SQL
statement with the results. **You should verify at least five of your SQL
statements with ChatGPT, and you may ask ChatGPT to generate the other
SQL statements for you.**