05696110 Database Programming In Practice (2025/2)

Solo Project 3 - Logical Database Design

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Introduction

> *This assignment is not autograded. You will be graded during the check-out session.*

The goal of this solo project is to evaluate whether you can **design** a relational database schema from requirements. There will be 3 tasks. For each task, you need to do:

- Identify key entities
- Identify relationships between key entities
- Draw an entity-relationship diagram to illustrate those entities and relationships
- Reduce the diagram to a relational database schema
- Identify functional dependencies (if any)
- Normalize the relational database schema based on the functional dependencies (if any)
- Write `SELECT` queries for each relational database schema based on the requirements

Submission

You may write this down on physical papers or tablets. Once done, submit this on BigGrade as a PDF file. You must name a PDF file in the following format:

```
SP-03_[STUDENT_ID].pdf
```

Then zip it as a zipfile.

1 Jae Lung

An apartment complex nearby KMITL, namely Jae Lung, would like to create a database for tracking tenants in her apartment. She would like to see the following information:

- A list of rooms in her apartment.
  - Her apartment has multiple buildings. These buildings only belong to Jae Lung. Each building can be uniquely identified with its building code in the format XYY, where X is a character and Y is a number. For example, A05.
  - Each building has exactly 4 floors.
  - Each floor has exactly 15 rooms. The room can be uniquely identified with its building number, its floor (from 1 to 4), and its room number (from 1 to 15).
- A list of tenants along with their information. Their information includes their first name, last name, and birth date.
- A contract between rooms and tenants.
  - Each contract is active for 1 year.
  - The contract for each room allows up to 2 tenants to live.
  - One tenant must hold only one active contract.

Queries

Mock some data and write SQL statements to retrieve the following information.

- List all contracts that is currently active.
- List all rooms along with the names of the tenants holding the active contract.
- Count the available rooms (i.e., do not have active contracts) for each floor in all the buildings.

2 The Messenger

A messenger application, namely YouChat, would like to create a database for storing and retrieving information in their application. The important information are as follows:

- A list of users in the application.
  - For each user, the application must store their unique identifier (as UUID), their username, their hashed password (SHA-512), their email, and their latest visited date/time.
  - Users are classified into two groups: normal user and administrator. A user can be in only one group.
- A list of posts that each user posted.
  - For each post, the application must store their unique post identifier, their timestamp, their post content.
  - Each post can be posted by only one user. One user can post multiple posts.
  - Each post may contain multiple comments. The application must store their comment identifier, their comment timestamp, and their comment content.
    - Each comment must be created by one user. Users may make zero or more comments on a post.
    - Each comment may contain multiple comments as well.

Queries

Mock some data and write SQL statements to retrieve the following information.

- Count the number of normal users and administrators.
- List all the users who visit the application in the last 24 hours.
- Register a normal user. List the latest post along with their comments (including nested comments) of the user. (Hint: You may need to use Recursive CTE)

3 Your Choice

In this task, you need to write requirements by yourself. The requirements must eventually lead to a relational database schema that has at least 5 tables.

Queries

Think about 3 queries that span across at least 2 tables.