Project

Purpose
To analyze the requirements, design, implement, document and test a database application for Pluto Realty, Inc. The User Requirements of the database application are given in **Appendix A** below.

Materials to submit
You will be asked to submit reports at various milestones as major phases of the project are completed. Further, you will also need to demonstrate the database application you designed and developed. Details about the milestones of the project, the phases they include and their due dates will be posted on the class webpage.

Project Report/Phases
The project consists of the following phases. In addition, you will develop and maintain a Project Report. Your Project report should consist of a section for each phase, as well as an executive summary, introduction, and conclusion.

A. Analysis of the requirements of the project and a high-level description of the tasks involved.

B. Conceptual Design.
   This stage involves the following
   - Develop an Entity-Relationship model detailing the relations involved.
   - Identify the attributes of the entities and the relations along with the primary key for each entity.
   - List the constraints for each relation and entity.
   - You should be able to explain the reasons for the particular design approach you have chosen.

C. Logical Design
   This stage involves the mapping of your conceptual design above onto the relational data model. In this stage, you will design the tables for all your entities and relations. You should apply all normalizations you find useful and/or necessary. Ensure that your design still satisfies the user requirements. Justify your design choices.

D. Physical Design
   This stage involves the following:
   - Design a MySQL database based on the design developed in section B.
   - Implement tables for the relations and the constraints. Maintain scripts for the creation and deletion of tables.
   - Maintain scripts for loading data into your tables.
   - Design the user interfaces for your application.
   - Ensure that your design still satisfies the user requirements.
   - Justify your design choices.

E. Prototype, Development, and Testing.
This consists of the following:
- Develop a Jupyter notebook with code to access, populate, update, and administer the SQL tables made.
- Develop (an) appropriate user interface(s), using Python Jupyter Notebook, which satisfy all functional user requirements.
- SQL scripts for creating indices for the database application. Justify the reasons for creating any such indices.

Your notebooks should have appropriate cells acquiring input from the user and providing output to the user (as needed).

F. Make a user's guide for the database application. The user guide could be integrated with your Jupyter notebook.

Project Demonstration

- Populate the tables with data as described in the Appendix.
- Default values for each query/report demonstrating the corresponding functionality.

Miscellaneous
The final project report should document all the activities with appropriate E-R diagrams, relation schema, etc. It should also give a list of the limitations of the application and give possibilities for improvement.
Features and functions other than specified in the document can also be added but should be documented clearly and demonstrated as well.

Appendix A

Pluto Realty
User Requirements

Pluto Realty, Inc. (aka Pluto) is interested in developing a database application to help it in managing the rental of real estate properties across the country.

System Scope

The users of the application are the employees of Pluto. It is assumed that all users have network computers capable of running Web browsers.

Data Requirements

Employees

The information stored on each employee includes an employee number, name (first and last), hired date, address (street, city, state, zipcode, and unit#), telephone number (work, mobile, and home), and one or more email addresses. The employee number is unique across Pluto. There are two kinds of employees at Pluto: partners and associates. Further, each employee (but one) is assigned a supervisor leading to a rooted tree management hierarchy in Pluto.

Rental properties

Pluto offers a range of properties for rent. The information stored on each property includes a property number, address (street, city, state, zipcode, and unit#), property type (residential, commercial, industrial), number of bedrooms and bathrooms (for residential properties only), area square footage, monthly asking rent, the monthly management fee (as a percentage of the monthly rent), and the property owner. The property number is unique across Pluto. The management of a property is assigned to an associate whenever it is rented or it is required to be rented out. An associate may be assigned a maximum of 12 properties. Each property is owned by exactly one owner.

Pluto maintains for each rental property a Boolean flag indicating whether or not the property has currently an active advertisement posted on some realty-related websites.

Property owners

Property owners are people that own properties. The information on property owners that is stored is similar to that for employees. For incorporated owners, the name of their corporation is also stored. Each owner is assigned a partner for managing the owner's properties.

Clients

Clients are people interested in renting property. The information stored on clients is similar to that for employees, and it includes the client's property preferences and maximum monthly rent is willing to pay.

Property viewings

An associate may show a property assigned to them to a client to view. Information for such viewings include the associate, the client, and the property viewed as well as the viewing's date and time. A client may view the same property only once on any given date.

Leases

When a property is rented out, a partner writes a lease contract for the property and the client. The contract binds the client, property, and its owner (via partner representing the owner). The information on a lease includes a lease number and date, the monthly rent, deposit amount (if any), duration of the lease, the start and the finish date of the lease. Further, information identifying the partner, property, and client is also maintained. Each lease has a minimum duration of three months and a maximum of 36 months. Lease numbers are unique across any single property managed by Pluto.

Functional Requirements

Enter, update, and delete the details of

- Employees, clients, and property owners
- Properties, property viewings, and leases

Populate your database with at least

- 6 employees
- 12 clients
- 6 private owners
- 6 rental properties of each type (residential, commercial, industrial)
- 12 property viewings
- 6 leases

and appropriate relationship instances among them.

Queries and reports

1. List the names of all the unique clients.
2. Find the unique names of owners and total square footage of all the properties they own.
3. Find the properties shown by each associate in a given month.
4. Find the most popular properties (in terms of number of viewings in a given year).
5. Find the total rent due to each property owner.
6. Find the unique names of associates supervised (directly or indirectly) by a given employee.
7. Find the unique names of owners that have a residential property in every city where Pat Doe owns a commercial property.
8. Find the top-3 partners with respect to number of properties leased in the current year.
9. Write a SQL function to compute the total management fees due to Pluto in the last 3 months.
10. Create a SQL trigger to automatically set to FALSE the advertisement flag of a property when it is leased.