Project

Purpose
To analyze the requirements, design, implement, document and test a database application for Vaccination Department of the country of Wonderland. 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 core requirements 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.
   • Ensure that your design still satisfies the user requirements.
   • Justify your design choices.

E. Prototype, Development, and Testing.
This consists of the following:

- Develop (an) appropriate applications and/or user interface(s), using Python Jupyter Notebooks, 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

DIVOC-91 Vaccination Campaign
User Requirements

Due to a recent outbreak of a DIVOC-91 viral epidemic in the country of Wonderland, its Health Department is interested in developing a database application to help it in managing the vaccination of its folks across the country.

System Scope

The users of the application are the folks residing in Wonderland and staff of the Health department. It is assumed that all users have network computers capable of running Web browsers.

Data Requirements

Folks
The information stored on each individual in Wonderland includes a 16-digit personal identification number, name (first and last), date of birth, 10-digit telephone numbers (work, mobile, and home), and one or more email addresses. Identification numbers are unique across Wonderland. All folks of Wonderland reside at a place, and some folks may share a place.

Health Staff
Some folks are staff members of the Health Department. The Department is managed by one of its staff members, referred to as the Chief. The Chief dispatches staff to Health Centers, which are places.

Places
Each place in Wonderland has an address (street number and name, city, state, zipcode) and XY-coordinates (see below). The coordinates and addresses of places in Wonderland are both unique (i.e. no vertical stacking of places). Places can be either residences or Health Centers.

The geographic extent of Wonderland is a flat plane. Wonderland uses a standard XY Cartesian 2D orthogonal system of axes with the origin at its capital city, Megapolis, and units of miles. Distances between places are computed using the standard Pythagorean Theorem.

Vaccination Registry
Wonderland forks register with the Health Department to receive the DIVOC-91 vaccine by entering their personal identifier, and desired date and health center that they wish to get vaccinated at. In order to choose their desired health center, folks ask to first see the number of folks already registered at each health center in their city on their desired date,
and then they quickly complete their registration. An individual may register or modify their registration up to the day prior of their desired date.

Staff Dispatch
At a certain time every day, the Chief dispatches department staff to health centers for the following date, based on the number of folks registered to get vaccinated. Due to staff shortages, a staff may be dispatched to multiple health centers, while some health centers may not be assigned a staff for a date. Further, due to variable population densities in Wonderland, some health centers may be dispatched multiple staff.

Vaccine Orders
Upon dispatching staff to a health center by the Chief, sufficient vaccine doses are ordered for the center to vaccinate all the folks registered at that center and date. Each registrant needs one vaccine dose. The vaccine order for a center is to be kept continuously up-to-date (during the time period from staff dispatch to start of the vaccination date at the health center). The information for an order includes the destination health center, number of doses, delivery date, and timestamp of (last modification of) the order.

Functional Requirements

Populate your database with at least
- 6 staff
- 12 folks
- 6 places, distributed among 2 cities and 2 states.
- 6 daily dispatches, distributed among 3 staff and 3 centers
- 12 registrations

and appropriate relationship instances among them.

Develop an app for the following activities
1. staff can enter the information for a new health center.
2. staff can modify their personal identifier of an existing individual.
3. folks can register for their vaccination (ensure ACID).
4. staff can delete an existing health center (and any other associated information automatically).
5. staff can update the coordinates of a place.

Develop an app for the following queries/reports:
1. List the name and age of all folks.
2. List the city, state, and the number of residents of each city in Wonderland (skip cities with no residents) in decreasing order of number of residents.
3. List each state together with its number of currently inhabited places (include states with no inhabited places) in increasing alphabetical order.
4. Find the unique identifiers of folks registered to a given health center for a certain range of dates.
5. Find for a given month, the number of unique staff dispatched to any center which is within 5 miles of the center of Megapolis except for centers in a given list of locations.

6. Find the most popular health center(s) (in terms of number of registrations) in a given month among those in a given city.

7. Find the unique staff that have been dispatched to every health center in a given state.

8. Find folks that registered to a health center that is farther away than the health center closest to their residence.

9. Write a SQL function to compute the total unique folks registered for the vaccine for a given month that reside within 10 miles of a certain location.

10. Create a SQL trigger to automatically maintain vaccine orders up-to-date.

Populate your database with sufficient data to demonstrate successfully execution of the queries/reports above.