CS 450 Fall 2023 Project 1

Project Description

The goal of this assignment is to design a conceptual schema using an EER data model, incorporating this schema into a RDBMS and running queries on this database.

Part 1: Design an EER data model (30 points)
Due: 9/15/2023 by 11:59 PM

Draw an EER diagram according to the notations discussed in class to accurately represent the design specification below. You can use any tools (e.g., draw.io) to draw the EER diagram or simply draw it by hand. In your diagram, indicate all the super classes, subclasses, constraints of specialization/generalization, entity sets, relationship sets, cardinality ratios, participations, attributes, and primary keys. Clearly specify any reasonable assumptions if they are not specified in the design specification. **Submit your EER diagram and assumptions in a PDF file.**

Design Specification:

The following is a description of a database system that keeps track of various information on campus including measurements obtained from sensors deployed inside different buildings. These sensors monitor values such as temperature and light in the room (how illuminated the room is). Your job is to design a database schema to store the data, and to provide specific queries on the database.

The database must represent the following information:

Department Information

A department has a unique name, a web address, a phone number, an email address, and a mailing address. The mailing address consists of street_address, city, state, and zip_code. The individual components of the mailing address can be accessed separately, and the entire address can also be retrieved as a unit.

Building Information

A building on campus has a unique name, a number of rooms, and a number of floors.

Room Information

Each room in every building has a number, an area (square feet), and one or more phone numbers. The room number is unique for a given building, but a room in a different building may have the same number. A room can be used as a lab, an office or a conference room. A room can be used for more than one purpose. For example, a room can be a lab and an office. Each conference room has a maximum capacity attribute. One building has several rooms while

each room is associated with only one building. There cannot exist any room with which no building is associated.

Employee Information

Each employee has a unique id number, a name, a year of birth, and one or more email addresses. Each employee works in one or more rooms. Each room is assigned 0 or more employees. Each employee works for one or more departments. Each department has one or more employees.

Measurement Information

A measurement record is a summarized record generated by sensor nodes deployed in every room. Each measurement includes a date, a time, and numeric values for sound, temperature and light of the corresponding room.

Part 2: Map the EER diagram from part 1 into relation schemas (20 points)
Due: 10/6/2023 by 11:59PM

Convert your EER diagram from part 1 into relation schemas. In a PDF file, specify the followings for each relation:
(i) the name of the relation,
(ii) the names of its attributes,
(iii) the domain of each attribute,
(iv) the primary key, and
(v) the foreign key(s), if any.

If needed, you can update your EER diagram from part 1 before mapping. There is no required format of your relation schemas. **Submit your PDF file that has all the components listed above for each relation and the EER diagram that your relation schemas are mapped from.**

Part 3: Create a relational database based on part 2 and query the database (50 points)
Due: 10/27/2023 by 11:59 PM

Now, you are ready for implementation. Use appropriate naming conventions for all of your tables and attributes. Write SQL commands to create tables and all other structures from part 2. For each table in your database, specify the primary key and indicate all reasonable foreign key constraints, if any. Please populate the database with sufficient data to ensure your queries will produce reasonable results.

Write the following queries in SQL and execute them on the database you created.

1. List the phone number, department name, and street address for each department.

2. Find the name of each building that has less than four floors.

3. Find the building name and the room number of each lab that is also used as office.

4. Count the number of rooms for each building.

5. Find the average temperature for each room.

6. Find the id of each employee who has exactly two email addresses.

7. Find the area of each room that hasn't had any temperature recorded yet.

8. Find the phone number of the brightest room based on the daily average of the measured light values.

Include all your SQL commands (create, insert, and query statements) in a single script file (.sql). Please make sure that your script runs on sqlplus or SQL developer by connecting to the Oracle server on-campus. **Submit your script file and a log file showing the output of running the script including the query results.**

Some Tips:

1) At the beginning of your script, drop all tables that you are about to create. For example:

   drop table products cascade constraints;

2) If you have trouble creating a particular table, try a different name. A name (like order, group, user, etc.) may be a **reserved word**.
3) When creating tables that contain foreign keys, make sure the tables that are referenced have already been created.
4) In order to run your script and capture the output of your script, you will need to use **@** command and ***spool*** command in sqlplus. For example:

   spool logname.txt
   @scriptname.sql

5) In order to run your script on Zeus, you can transfer files to Zeus. For example:

   scp scriptname.sql netid@zeus.vse.gmu.edu:.
   Transfer files back to your local machine:
   scp netid@zeus.vse.gmu.edu:filename .

   More information: https://labs.vse.gmu.edu/index.php/FAQ/SSH

Instructions for connecting to Oracle

https://labs.vse.gmu.edu/index.php/Services/Oracle
Follow the link on the instructions page to activate your account to gain access.

Three ways to access Oracle on-campus:

1) Access Oracle on VSE LAB machines.
2) SSH to zeus.vse.gmu.edu by **ssh netid@zeus.vse.gmu.edu**
   Run the command **sqlplus** once you are connected and enter your Oracle username and password when prompted.
3) Install SQL Developer and make a connection.
   More information: https://labs.vse.gmu.edu/index.php/Services/Oracle#sqldeveloper

Two ways to access Oracle off-campus:

1) Connect to VPN and then SSH to zeus.vse.gmu.edu by following the steps above.
2) Connect to VPN and then create a connection from SQL Developer GUI.