CS504 Fall 2019 Homework 1

DUE: 10/11/2019 by 11:59PM

Project Description

The goal of this assignment is to design a conceptual schema using the (E)ER data model, incorporating this schema into a RDBMS and running queries on this database.

Part 1: (E)ER data model (30 points)

You will design an (E)ER data model that incorporates the specification described below as efficiently as possible. Using the notation given in the class, you can simply draw an (E)ER diagram by hand, or use any drawing software. In your diagram, indicate all the classes, subclasses, entity sets, relationship sets, cardinality ratios, participations, attributes, and primary keys. In your design, carefully read the required queries in part 3 so you can make and state reasonable assumptions if they are not specified in the specification.

Design Specification:

The following is a description of the information required for a database system that processes information obtained from a campus monitoring system. The sensors deployed inside different buildings of the campus monitor values such as temperature and light. Your job is to design a database schema to store the data and provide specific queries on the database.
The database must represent the following information:

Department Information

A department has a name, a web address, a main phone number, an email address and a main mailing address. The address contains street number, street name, city, zip code and state. The entire department address can also be retrieved as a unit.

Building Information

A building of a campus has a name, number of rooms, number of floors, and a mailing address (similar in format to department address).

Room Information

Each room in each building has a number, area (square feet), one or more phone numbers. The room number is unique for a given building but it may be redundant across several buildings. A room can be used as a lab, an office or a conference room. A room can be a lab AND an office. One building can have 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, one or more email addresses and an address (similar in format to department address). Each employee works in one or more rooms for one or more departments. Each department can have one or more employees.

Measurement Information

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

Part 2: Map the (E)ER diagram into relational schema (20 points)

Convert your (E)ER diagram into relations. In a PDF file, list all relations. For each relation, state
(i) the name of the relation,
(ii) the names of its attributes,
(iii) the domain (or data type) of each attribute,
(iv) the primary key, and
(v) the foreign key(s) if any.

Part 3: Create a relational database based on part 2 and query the database (50 points)

Write SQL commands to create tables and all other structures from the relational schema defined from part 2. In your implementation, specify primary keys for each table and indicate all reasonable referential integrity constraints. Populate each table you created with a handful of instances. Write the following queries in SQL and execute them on the database you created. Include all your SQL commands in one script file. Make sure that your script runs on sqlplus(Oracle) or mysql on zeus. Turn in the script file (file with all the SQL commands including create, insert and query statements) and the log file showing the output of running the script including the query results. Please populate sufficient data into the database so that your query can produce some results.

1. List the phone number and department name for each department.

2. Find the names of the buildings that have less than 4 floors.

3. Find the ids of the employees that work in any labs.

4. Find the average temperature for each room.

5. Count the number of employees for each department.

6. Find the room number of the brightest room. (based on daily average of measured light value)

Some Tips:

1) In the beginning of your script, drop all tables that you are about to create:
   For example:
   sqlplus: **drop table department cascade constraints;**
   mysql: **drop table department cascade;**
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, you will need to use sqlplus with the **@** command or mysql utilizing the ***source*** command.
5) Use the ***spool*** command in sqlplus or ***tee*** in mysql to capture the output of your scripts.
   For example:
   sqlplus: spool yourlogname.txt
   @yourscriptname.sql
   mysql: tee yourlogname.txt
   source yourscriptname.sql
6) In order to run your script on zeus, you can transfer files to zeus:
   For example:
   scp yourscriptname.sql yourusrname@zeus.vse.gmu.edu:.
   Transfer files back to your local machine:
   scp yourusrname@zeus.vse.gmu.edu:yourfilename .
   More information: https://labs.vse.gmu.edu/index.php/FAQ/SSH

Instructions for connecting to Oracle/MySQL

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

Three ways to access Oracle/MySQL on-campus:

1) You can access Oracle/MySQL on VSE LAB machines.
2) You can SSH to zeus.vse.gmu.edu by **ssh yourusrname@zeus.vse.gmu.edu**
   Oracle: run the command **sqlplus** once you are connected and enter your Oracle username and password when prompted.
   MySQL: **mysql -h helios.vse.gmu.edu -u YOUR_USER_NAME -p**
3) You can install SQL Developer and make a connection.
   More information: https://labs.vse.gmu.edu/index.php/Services/Oracle#sqldeveloper

Two ways to access Oracle/MySQL off-campus:

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