1   Preliminaries

Before starting on this assignment, please be sure to read the General Instructions that are on Piazza (under Resources->General Resources).   If you did Lab1, you should already know how to log in to the class PostgreSQL server.   You'll get help on Lab2 in your Lab Section, not the Lectures, so *be sure to attend Lab Sections*.

2   Goal

The goal of the second assignment is to create a PostgreSQL data schema with 6 tables that are very similar to the tables that you created in Lab1.   The tables have the same names, attributes and data types as the tables of Lab1, and the same primary keys but there are some UNIQUE constraints and some restrictions on NULLs.

After you create the data schema with the 6 tables, you will be required to write some SQL statements that use those tables.   Under Resources→Lab2, we will soon provide you with data that you can load into your tables so that you can test the results of your queries.   Testing can prove that a query is wrong, but not that it is right, so be careful.

Lab2 is due in two weeks, so you will have an opportunity to discuss the assignment during the Discussion Section in the first week of the assignment, and to discuss issues you have had in writing a solution to the assignment during the Discussion Section of the second week.   Instructions for submitting the assignment appear at the end of this document.

3   Lab2 Description

3.1 Create PostgreSQL Schema Lab2

You will create a Lab2 schema to set apart the database tables created in this lab from ones you will create in future, as well as from tables (and other objects) in the default (public) schema.   Note that the meaning of schema here is specific to PostgreSQL and different from the general meaning.   See here for more details on PostgreSQL schemas.   You create the Lab2 schema like this:

        CREATE SCHEMA Lab2;

Now that you have created the schema, you want to set Lab2 to be your default schema when you use psql.   If you do not set Lab2 as the default schema, then you will have to qualify your table names with the schema name (e.g. Lab2.Customers). To set the default schema, you modify your search path. (For more details, see here.)

        ALTER ROLE username SET SEARCH_PATH to Lab2;

You will need to log out and log back in to the server for this default schema change to take effect. (Students often forget to do this.)

You do not have to include the CREATE SCHEMA or ALTER ROLE statements in your solution.

3.2 Create tables

You will create tables in schema Lab2 for the tables customer, menuItem, dinnerTable, visit, server and billEntry. The attributes of the 6 tables are the same as the tables of Lab1. Data types for the attribute names in these tables are also the same as the ones specified for the tables of Lab1. The Primary Keys are also the same. However, the tables must have the additional constraints described in the next section.

3.2.1 Constraints

The following attributes <u>cannot</u> be NULL. All other attributes can be (but remember that attributes in Primary Keys also cannot be NULL).

- In customer: name
- In menuItem: name
- In dinnerTable: numSeats

Also, the following must be unique for the specified table. That is, there cannot be identical rows in that table that have exactly the same (non-NULL) values for <u>all</u> of those attributes (composite unique constraint).

- In customer: the 2 attributes name and address
- In menuItem: the attribute name
- In visit: the 2 attributes custID and custArrive

For example, the third constraint says that there can't be two rows in visit that have the same values for both custID and custArrive (if both custID and custArrive are not NULL). Think of this as saying that there can't be two different visits by the same customer that have the same customer arrival timestamp.

You will write a CREATE TABLE command for each of the 6 tables. Save the commands in the file create.sql

4 SQL Queries

Below are English descriptions of the five SQL queries that you need to write for this assignment, which you will include in files queryX.sql, where X is the number of the query, e.g., your SQL statement for Query 1 will be in the file query1.sql, and so forth. Follow the directions as given. You will lose points if you give extra tuples or attributes in your results, if you give attributes in with the wrong names or in the wrong order, or if you have missing or wrong results. You will also lose points if your queries are unnecessarily complex, even if they are correct.

Remember the Referential Integrity constraints from Lab1, which should be retained for Lab2. For example, if a dinnerTableID appears in visit tuple, then there must be a tuple in dinnerTable that has that dinnerTableID.

4.1 Query 1

Find the name and address for all customers whose status is 'H' (uppercase H) and whose name ends with the letter 'n' (lowercase n). No duplicates should appear in your result.

4.2 Query 2

Output the name, description and price of each menuItem that appears on at least one billEntry. The attributes in your result should appear as theName, theDescription and thePrice. No duplicates should appear in your result.

4.3 Query 3

Find the custID and name for each customer who had at least two different visits that were between December 18, 2018 at 8am and December 21, 2018 at 11pm. No duplicates should appear in your result.

4.4 Query 4

The billEntry table has attributes visitID, menuItemID and quantity. The totalItemCost of a billEntry (which is not an attribute) is the price of the billEntry's menuItem multiplied by its quantity.

For each billEntry, output its visitID, menuItemID, the name of that menuItem, and the billEntry's totalItemCost. The attributes in your result should appear as visitID, menuItemID, menuItemName and totalItemCost. No duplicates should appear in your result.

4.5 Query 5

For each visit in which all of the following are true:

     a) the cost is greater than or equal to two hundred,
     b) the server for the visit has a level that is not NULL, and
     c) the number of people (numPeople) for the visit is equal to the number of seats (numSeats) at the dinner table.

output the visitID the name of the customer and the name of the server. The customer's name should appears as custName and the server's name should appear as serverName in your result. No duplicates should appear in your result.

5 Testing

While your solution is still a work in progress, it is a good idea to drop all objects from the database every time you run the script, so you can start fresh. Of course, dropping each object may be tedious, and sometimes there may be a particular order in which objects must be dropped. The following commands (which you can put at the top of create.sql if you want, but you don't have to), will drop your Lab2 schema (and all objects within it), and then create the (empty) schema again:

DROP SCHEMA Lab2 CASCADE;
CREATE SCHEMA Lab2;

Before you submit, login to your database via psql and execute your script. As you've learned already, the command to execute a script is: \i <filename>.

Under Resources→Lab2 on Piazza, we will soon provide a load script named *lab2_data_loading.sql* that loads data into the 6 tables of the database. You can execute that script with the command:

\i *lab2_data_loading.sql*.

You can test your 5 queries using that data, but you will have to figure out on your own whether your query results are correct. We won't provide answers, and <u>students should not share answers with other students</u>. Also, your queries must be correct on any database instance, not just on the data that we provide. You may want to test your SQL statements on your own data as well.

6 Submitting

1. Save your scripts for table creations and query statements as create.sql and query1.sql through query5.sql   You may add informative comments inside your scripts if you want (the server interprets lines that start with two hyphens as comment lines).

2. Zip the file(s) to a single file with name Lab2_XXXXXXX.zip where XXXXXXX is your 7-digit student ID. For example, if a student's ID is 1234567, then the file that this student submits for Lab2 should be named Lab2_1234567.zip

   To generate the zip file you can use the Unix command:

   zip Lab2_1234567 create.sql query1.sql query2.sql query3.sql query4.sql query5.sql

   (Of course, you use your own student ID, not 1234567.)

3. You should already know how to transfer the files from the UNIX timeshare to your local machine before submitting to Canvas. If you are still not familiar with the process, use the instructions we provided at the Lab1 assignment.

4. Lab2 is due by 11:59pm on Sunday, October 27. Late submissions will <u>not</u> be accepted, and there will be no make-up Lab assignments.

5. You may lose credit if your queries are unnecessarily complex, even if they are correct. For example, if you use DISTINCT but it's not needed, you might lose half a point. Of course, you will also lose credit if DISTINCT is needed and you omit it.

6. Be sure to follow directions about Academic Integrity that are in the Syllabus. If you have any questions about those directions, please speak to the instructor as soon as possible.