**Database Management Systems (COP 5725)**

Fall 2019

Instructor: Dr. Markus Schneider TA: Kyuseo Park

Homework 3

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Pledge (Must be signed according to UF Honor Code)

On my honor, I have neither given nor received unauthorized aid in doing this assignment.

Weibin Sun

Signature

For scoring use only:

|  |  |  |
| --- | --- | --- |
|  | Maximum | Received |
| Exercise 1 | 85 |  |
| Exercise 2 | 15 |  |
| Total | 100 |  |

**Exercise 1 (SQL Queries) [85 points]**

We are given a geostatistical database about countries, continents, rivers, etc. The following information is available in Canvas together with this homework assignment for download:

* An ER diagram of the geostatistical database in PDF format (*HW3Ex1geostatistical-database-ER-diagram.pdf*).
* An informal description of the database schema in PDF format (*HW3Ex1geostatistical-database-schema-explanation.pdf*).
* A text file that contains *create table* commands to create the database schema (*HW3Ex1-geostatistical-database-schema.sql*).
* A text file hat contains *insert* commands for about 47,800 tuples to fill the database tables (*HW3Ex1-geostatistical-database-input-data.sql*).
* A text file that contains *drop table* commands to delete the database schema and the data in the database (*HW3Ex1-geostatistical-database-drop-tables.sql*).

In a first step, use the CISE Oracle DBMS and the Oracle SQL Developer software to create the database schema and fill the database with data. This will also help you learn about the system environment for your group project. In particular, the use of MySQL, PostgreSQL, and other database systems is not allowed.

In a second step, look at the database schema in the file *HW3Ex1-geostatistical- databaseschema.sql*. From lines 38 to 52 you will find the following lines:

ALTER TABLE Country

ADD CONSTRAINT FK\_CountryREFCity FOREIGN KEY (Code, Capital, Province)

REFERENCES City(Country, Name, Province) INITIALLY DEFERRED DEFERRABLE;

ALTER TABLE City

ADD CONSTRAINT FK\_CityREFProvince FOREIGN KEY (Country, Province) REFERENCES Province(Country, Name) INITIALLY DEFERRED DEFERRABLE;

ALTER TABLE Province

ADD CONSTRAINT FK\_ProvinceREFCountry FOREIGN KEY (Country)

REFERENCES Country(Code) INITIALLY DEFERRED DEFERRABLE;

ALTER TABLE Province

ADD CONSTRAINT FK\_ProvinceREFCity FOREIGN KEY (Capital, Country, CapProv) REFERENCES City(Name, Country, Province)

INITIALLY DEFERRED DEFERRABLE;

Your task is to explore this scenario by using the Internet. The keywords INITIALLY DEFERRED DEFERRABLE are non-standard SQL. They are supported by several database systems such as Oracle and PostgreSQL. Answer the following questions:

1. [4 points] What is the meaning of these keywords?

*Constraints*:It is a rule that restricts the illegal values in a database.

*Foreign key*: A foreign key is a way to enforce referential integrity within your Oracle database. A foreign key means that values in one table must also appear in another table.

*Reference*: The REFERENCES keyword is part of a [foreign key constraint](http://dev.mysql.com/doc/refman/5.1/en/innodb-foreign-key-constraints.html) and it causes database to require that the values in the specified columns of the referencing table are also present in the specified column(s) of the referenced table.

Initially Deferred Deferrable: In subsequent transactions, constraint checking can be deferred until the end of the transaction using the SET CONSTRAINT(S) statement.

1. [6 points] Why is the action indicated by the keyword INITIALLY DEFERRED DEFERRABLE needed in the scenario above? What is the problem? How is the problem solved?

We use initially deferred deferrable in this scenario, because some operations such as insert may violate constraints and people want to deal with them after all operations are finished.

The problem: For example, we add constraints for primary key(id), but when we insert data, we insert two data which contains two same id. At this moment, system should report error. Also, people may have many operations besides error operation, so error report may appear after all operations are completed.

If we use initially deferred deferrable in this scenario, it will let you disable the constraint temporarily while making changes to the database that might violate the constraint until all the changes are complete.

In a third step, write SQL queries for the colloquial queries below and **show the results by providing screenshots for both your SQL queries and query results**. The screenshots must be embedded (as images) into the PDF file that contains your solutions to this whole

assignment. In order to increase readability, the SQL queries should be written in a structured manner, all SQL keywords should be fully capitalized, and the table and attribute names should be written in the same way as in the schema file.

1. [1 point] Find the names of countries where agriculture takes more than 50% of its gross domestic product (GPD).

图片包含 屏幕截图

描述已自动生成

1. [3 points] List the top five countries that will have the largest population after five years. [Assume that the population in five years is equal to the population this year \* (1 + growth rate)5. The population growth in the database schema is in percentage and should be divided by 100. Use the new attributes *Country*, *Population after 5 years*, and *Rank* for the resulting table schema.

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描述已自动生成

1. [4 points] Find the country c1 that *used to* have the maximum number n1 of countries/areas depending on it. Further, find the country c2 that *now* has the maximum number n2 of countries/areas depending on it. Output c1, n1, c2, n2, and the difference between n1 and n2.

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描述已自动生成

1. [4 points] List the country names that have more than 4 different kinds of religion and at least one religion takes more than 80%.

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描述已自动生成

1. [3 points] Compute the total length of the border that China shares with its neighboring countries.

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描述已自动生成

1. [4 points] Find the top five popular religions and the numbers of their believers in the world.

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描述已自动生成

1. [3 points] Find the names of the lakes in the United States with an elevation that is above the average elevation of all lakes world-wide.

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描述已自动生成

1. [4 points] Find the largest population density (population/area) of provinces that have mountains of the “volcano” type. Output the province name, mountain name, and the population density.

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描述已自动生成

1. [3 points] Find the provinces that are located on more than 2 islands and whose country’s GDP is greater than 1000000.

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描述已自动生成

1. [3 points] Find the two longest rivers that flow through at least one lake and that finally flow into the Atlantic Ocean. Output the name and the length of the rivers.

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描述已自动生成

1. [4 points] Determine the names of countries that have more than three rivers and that have lakes next to more than three provinces.

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描述已自动生成

1. [4 points] Find the names of those countries that are bounded by the largest lake.

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描述已自动生成

1. [2 points] Find the height of the highest mountain for each continent.

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描述已自动生成

1. [3 points] Find the countries whose depth of the deepest sea is less than the elevation of the highest mountain. Display the country name, depth of its deepest sea, and the elevation of the highest mountain.

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描述已自动生成

1. [4 points] Find the northernmost cities of each continent (except Asia). Display the names of these cities and their continent. List cities that are northern of other cities in the result table first.

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描述已自动生成

1. [1 point] Find all countries whose capitals have positive latitudes and less than 10000 inhabitants.

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描述已自动生成

1. [4 points] Find what is larger. Is it the sum of the areas of the 10 largest countries (attribute *top10*) or the sum of the areas of the remaining countries (attribute *rest\_world*)? What is their difference (attribute *difference*)? Display the values for the attributes *top10*, *rest\_world*, and *difference*.

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描述已自动生成

1. [2 points] Find all countries that cross continental boundaries.

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描述已自动生成

1. [2 points] Display each island in Africa and its area if the area is larger than 1000 square kilometers. The output should be in descending order of the size of the areas.

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描述已自动生成

1. [3 points] List the names and GDPs of those countries which are members of the NATO and more than 5 percent of their population are Muslims.

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描述已自动生成

1. [1 point] Find names of rivers which cross at least 12 provinces in the same country.

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描述已自动生成

1. [2 points] Find the name and length of the longest river on the American continent.

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描述已自动生成

1. [3 points] Find the provinces that have the largest number of islands in the world. Output the country code, the province, and the number of islands.

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描述已自动生成

1. [3 points] List the 10 country names (attribute “Country Name”) with the highest population density (attribute “Population Density”) as well as the percentage of the world population (attribute “Percentage”) each one contains.

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描述已自动生成

1. [5 points] List the names of organizations that have only Asian countries as members.

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描述已自动生成

**Exercise 2 (QBE) [15 points]** Consider the following database schema: **Drivers** (did, dname, gender, age)

**Reserve** (did, cid, day, cost)

**Cars** (cid, cname, model, color, rid) **RentalCompany** (rid, rname, revenue, rating) **IsMember**(did, rid, join\_time, member\_type)

Display the QBE tables that will answer the following questions.

1. [2 points] Find the names of drivers who have reserved a red car on day “02/14/2017” of model “Chevrolet”.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Drivers | did | dname | gender | age |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | \_d | P.ALL.\_n |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reserve | did | cid | day | cost |
|  | \_d | \_c | 02/14/2017 |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cars | cid | cname | model | color | rid |
|  | \_c |  | Chevrolet | red |  |

1. [2 points] Find the names of all drivers that are members of a rental company whose rating is greater than 6.5.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Drivers | did | dname | gender | age |
|  | \_d | P.ALL.\_n |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IsMember | did | rid | join\_time | member\_type |
|  | \_d | \_r |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RentalCompany | rid | rname | revenue | rating |
|  | \_r |  |  | \_rate |

|  |
| --- |
| Conditions |
| \_rate>6.5 |

1. [3 points] Find the youngest driver who is a member of both company ‘Avis’ and company ‘Hertz’.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Driver | did | dname | gender | age |
| ¬ | \_xd | P.\_n |  | \_a |
| \_zd |  |  | <\_a |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IsMember | did | rid | join\_time | member\_type |
|  | \_xd | \_rb |  |  |
| \_xd | \_rc |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| \_zd | \_rb |  |  |
| \_zd | \_rc |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RentalCompany | rid | rname | revenue | rating |
|  | \_rb | Avis |  |  |
| \_rc | Hertz |  |  |

1. [2 points] Update the member type to ‘VIP’ for those drivers who were members of company ‘Avis’ and have spent more than 2000 in renting (reserving) cars from Avis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reserve | did | cid | day | cost |
|  | G.\_id | \_c |  | SUM.ALL. \_z |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IsMember | did | rid | join\_time | member\_type |
| U. | \_id | \_r |  | ‘VIP’ |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RentalCompany | rid | rname | revenue | rating |
|  | \_r | \_name |  |  |

|  |
| --- |
| Conditions |
| \_name = ‘Avis’ AND SUM.ALL. \_z > 2000 |

1. [3 points] Find the rental company which has the largest number of members.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RentalCompany | rid | rname | revenue | rating |
|  | \_r | P.\_n |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IsMember | did | rid | join\_time | member\_type |
|  | CNT.UN.ALL.\_id | G.\_r |  |  |

¬

|  |  |  |  |
| --- | --- | --- | --- |
| >CNT.UN.ALL.\_id | G.\_r2 |  |  |

1. [3 points] Find the car model that is rented most frequently by drivers whose age is between 21 and 30 (not equal to 21 or 30).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Driver | did | dname | gender | age |
|  | \_id |  |  | \_age |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cars | cid | name | model | color | rid |
| ¬ | CNT.ALL.\_c, \_c |  | P.G.\_m |  |  |
| >CNT.ALL.\_c |  | \_m1 |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reserve | did | cid | day | cost |
|  | \_id | \_c |  |  |

|  |
| --- |
| Conditions |
| \_age >21 AND \_age<30 |