COMP 306: Database Management Systems

Spring 2022 - Homework #3

Use the 'index_quiz.php', 'result_quiz.php', 'functions_quiz.php' files to solve the questions below. In all questions, your application should always check whether user input is valid or not (i.e., perform input validation). Your application should give warnings if the user input is not a valid type or not a valid entry in the database, e.g., input country is not in the database.

Question 1. [10 pts] (GUI not necessary for this question)

Implement the **is_contains($conn, $string, $needle, $table_name)** function inside functions_quiz.php. This function checks whether the **$table_name** table has any tuple with cell value equal to **$string** in the **$needle** column; and returns True or False.

Example evaluations:
- **is_contains($conn, "AFK", "countryCode", "city")** should return False.
- **is_contains($conn, "AFG", "countryCode", "city")** should return True.

Question 2. [20 pts]
(a) Design an Input-Output GUI (two PHP forms) similar to the following (first one is for input; second one is for output):

First Country: [   ]
Second Country:[   ] Get Differences

Languages
Arabic
Hindi

(b) Implement the **diff_lang($conn, $country1, $country2)** function inside functions_quiz.php and the corresponding input validation conditions in result_quiz.php. This function should: (i) read user inputs from the above GUI, (ii) find the languages that are spoken in **$country1** but not in **$country2**, (iii) print such languages to the above GUI as output.

Important: Your **diff_lang** implementation MUST use a NESTED SQL QUERY. You are not allowed to write more than one query.

Example evaluations:

- **diff_lang($conn, "Turkey", "United Arab Emirates")**: In our database, the languages spoken in Turkey are "Arabic", "Kurdish", "Turkish". The languages spoken in the United Arab Emirates are "Arabic" and "Hindi". The result must be "Kurdish" and "Turkish".
- **diff_lang($conn, "Turkey", "United Kingdom")**: The result must be "Arabic", "Kurdish", "Turkish".

Question 3. [20 pts] Implement the **diff_lang_join($conn, $country1, $country2)** function inside functions_quiz.php and the corresponding input validation conditions in result_quiz.php.

This function should return the same result as **diff_lang** in Question 2, but this time, you are **NOT** allowed to use nested SQL queries and/or keywords such as EXCEPT, IN, EXISTS, NOT IN, NOT EXISTS. Instead, you must use JOIN operations. Also, you are not allowed to write more than one query.

To receive user's inputs and display the output, you can implement a GUI that is identical to Question 2.

Question 4. [20 pts]
(a) Design an Input-Output GUI (two PHP forms) similar to the following (first one is for input; second one is for output):

Choose an operation type: [MIN ∨]
Country Name: [_____]
[Get Life Expectancy]

Name	LifeExpectancy	GovernmentForm	Language
Afghanistan	45.9	Islamic Emirate	Dari
Afghanistan	45.9	Islamic Emirate	Pashto
Armenia	66.4	Republic	Armenian
Antigua and Barbuda	70.5	Constitutional Monarchy	English

(b) Implement the **aggregate_countries($conn, $agg_type, $country_name)** function inside functions_quiz.php and the corresponding input validation conditions in result_quiz.php. This function should: (i) read user inputs from the above GUI, (ii) find the countries that have higher

life expectancy than **$agg_type** life expectancy of all countries and lower life expectancy than **$country_name,** (iii) print the Name, Life Expectancy, Government Type and Official Language of such countries to the GUI as output.

Among the aggregate operators, you only need to consider **$agg_type** = **MIN** or **AVG**.

Example evaluations:
- **aggregate_countries($conn**, "**AVG**", "**Turkey**") returns countries which have higher life expectancy than **average** life expectancy of all countries and lower life expectancy than **Turkey**.

```
+-----------------------+----------------+-------------------------------------+----------------+
| Name                  | LifeExpectancy | GovernmentForm                      | Language       |
+-----------------------+----------------+-------------------------------------+----------------+
| Antigua and Barbuda   |           70.5 | Constitutional Monarchy             | English        |
| Bulgaria              |           70.9 | Republic                            | Bulgariana     |
| Belarus               |           68.0 | Republic                            | Belorussian    |
| Belarus               |           68.0 | Republic                            | Russian        |
| Belize                |           70.9 | Constitutional Monarchy             | English        |
| Colombia              |           70.3 | Republic                            | Spanish        |
| Cape Verde            |           68.9 | Republic                            | Portuguese     |
| Algeria               |           69.7 | Republic                            | Arabic         |
| Estonia               |           69.5 | Republic                            | Estonian       |
| Fiji Islands          |           67.9 | Republic                            | Fijian         |
| Greenland             |           68.1 | Part of Denmark                     | Danish         |
| Greenland             |           68.1 | Part of Denmark                     | Greenlandic    |
| Honduras              |           69.9 | Republic                            | Spanish        |
| Indonesia             |           68.0 | Republic                            | Malay          |
| Iran                  |           69.7 | Islamic Republic                    | Persian        |
| Iraq                  |           66.5 | Republic                            | Arabic         |
| Saint Kitts and Nevis |           70.7 | Constitutional Monarchy             | English        |
| Lithuania             |           69.1 | Republic                            | Lithuanian     |
| Latvia                |           68.4 | Republic                            | Latvian        |
| Morocco               |           69.1 | Constitutional Monarchy             | Arabic         |
| Mongolia              |           67.3 | Republic                            | Mongolian      |
| Malaysia              |           70.8 | Constitutional Monarchy, Federation | Malay          |
| Nicaragua             |           68.7 | Republic                            | Spanish        |
| Peru                  |           70.0 | Republic                            | Aimará         |
| Peru                  |           70.0 | Republic                            | Ketšua         |
| Peru                  |           70.0 | Republic                            | Spanish        |
| Philippines           |           67.5 | Republic                            | Pilipino       |
| Palau                 |           68.6 | Republic                            | English        |
| Palau                 |           68.6 | Republic                            | Palau          |
| North Korea           |           70.7 | Socialistic Republic                | Korean         |
| Romania               |           69.9 | Republic                            | Romani         |
| Romania               |           69.9 | Republic                            | Romanian       |
| Russian Federation    |           67.2 | Federal Republic                    | Russian        |
| Saudi Arabia          |           67.8 | Monarchy                            | Arabic         |
| El Salvador           |           69.7 | Republic                            | Spanish        |
| Seychelles            |           70.4 | Republic                            | English        |
| Seychelles            |           70.4 | Republic                            | French         |
| Syria                 |           68.5 | Republic                            | Arabic         |
| Thailand              |           68.6 | Constitutional Monarchy             | Thai           |
| Tonga                 |           67.9 | Monarchy                            | English        |
| Tonga                 |           67.9 | Monarchy                            | Tongan         |
| Vietnam               |           69.3 | Socialistic Republic                | Vietnamese     |
| Samoa                 |           69.2 | Parlementary Monarchy               | English        |
| Samoa                 |           69.2 | Parlementary Monarchy               | Samoan         |
+-----------------------+----------------+-------------------------------------+----------------+
```

- **aggregate_countries($conn**, "**MIN**", "**France**") returns countries which have higher life expectancy than **minimum** life expectancy of all countries and lower life expectancy than **France**.

```
+----------------------------+----------------+------------------------------------------------------+----------------+
| Name                       | LifeExpectancy | GovernmentForm                                       | Language       |
+----------------------------+----------------+------------------------------------------------------+----------------+
| Aruba                      |           78.4 | Nonmetropolitan Territory of The Netherlands         | Dutch          |
| Afghanistan                |           45.9 | Islamic Emirate                                      | Dari           |
| Afghanistan                |           45.9 | Islamic Emirate                                      | Pashto         |
| Anguilla                   |           76.1 | Dependent Territory of the UK                        | English        |
| Albania                    |           71.6 | Republic                                             | Albaniana      |
| Netherlands Antilles       |           74.7 | Nonmetropolitan Territory of The Netherlands         | Dutch          |
| Netherlands Antilles       |           74.7 | Nonmetropolitan Territory of The Netherlands         | Papiamento     |
| United Arab Emirates       |           74.1 | Emirate Federation                                   | Arabic         |
| Argentina                  |           75.1 | Federal Republic                                     | Spanish        |
| Armenia                    |           66.4 | Republic                                             | Armenian       |
| American Samoa             |           75.1 | US Territory                                         | English        |
| American Samoa             |           75.1 | US Territory                                         | Samoan         |
| Antigua and Barbuda        |           70.5 | Constitutional Monarchy                              | English        |
| Austria                    |           77.7 | Federal Republic                                     | German         |
| Azerbaijan                 |           62.9 | Federal Republic                                     | Azerbaijani    |
| Burundi                    |           46.2 | Republic                                             | French         |
| Burundi                    |           46.2 | Republic                                             | Kirundi        |
| Belgium                    |           77.8 | Constitutional Monarchy, Federation                  | Dutch          |
| Belgium                    |           77.8 | Constitutional Monarchy, Federation                  | French         |
| Belgium                    |           77.8 | Constitutional Monarchy, Federation                  | German         |
| Bangladesh                 |           60.2 | Republic                                             | Bengali        |
| Bulgaria                   |           70.9 | Republic                                             | Bulgariana     |
| Bahrain                    |           73.0 | Monarchy (Emirate)                                   | Arabic         |
| Bosnia and Herzegovina     |           71.5 | Federal Republic                                     | Serbo-Croatian |
| Belarus                    |           68.0 | Republic                                             | Belorussian    |
| Belarus                    |           68.0 | Republic                                             | Russian        |
| Belize                     |           70.9 | Constitutional Monarchy                              | English        |
| Bermuda                    |           76.9 | Dependent Territory of the UK                        | English        |
| Bolivia                    |           63.7 | Republic                                             | Aimará         |
| Bolivia                    |           63.7 | Republic                                             | Ketšua         |
| Bolivia                    |           63.7 | Republic                                             | Spanish        |
| Brazil                     |           62.9 | Federal Republic                                     | Portuguese     |
| Barbados                   |           73.0 | Constitutional Monarchy                              | English        |
| Brunei                     |           73.6 | Monarchy (Sultanate)                                 | Malay          |
| Bhutan                     |           52.4 | Monarchy                                             | Dzongkha       |
| Chile                      |           75.7 | Republic                                             | Spanish        |
| China                      |           71.4 | People'sRepublic                                     | Chinese        |
| Cook Islands               |           71.1 | Nonmetropolitan Territory of New Zealand             | Maori          |
| Colombia                   |           70.3 | Republic                                             | Spanish        |
| Comoros                    |           60.0 | Republic                                             | Comorian       |
| Cape Verde                 |           68.9 | Republic                                             | Portuguese     |
| Costa Rica                 |           75.8 | Republic                                             | Spanish        |
| Cuba                       |           76.2 | Socialistic Republic                                 | Spanish        |
| Cyprus                     |           76.7 | Republic                                             | Greek          |
| Cyprus                     |           76.7 | Republic                                             | Turkish        |
| Czech Republic             |           74.5 | Republic                                             | Czech          |
| Germany                    |           77.4 | Federal Republic                                     | German         |
| Djibouti                   |           50.8 | Republic                                             | Arabic         |
| Denmark                    |           76.5 | Constitutional Monarchy                              | Danish         |
```

Question 5. [30 pt] (GUI not necessary for this question)

(a) Implement the **find_min_max_continent($conn)** function inside functions_quiz.php. This function should find the name of the countries that have min and max life expectancy in each continent.
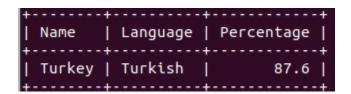
Example evaluations:
- **find_min_max_continent($conn)** returns countries which have **minimum** and **maximum** life expectancy in each continent.

```
+----------------+----------------+------------------+
| Name           | Continent      | LifeExpectancy   |
+----------------+----------------+------------------+
| Afghanistan    | Asia           |            45.9  |
| Andorra        | Europe         |            83.5  |
| Australia      | Oceania        |            79.8  |
| Brazil         | South America  |            62.9  |
| Canada         | North America  |            79.4  |
| French Guiana  | South America  |            76.1  |
| Haiti          | North America  |            49.2  |
| Kiribati       | Oceania        |            59.8  |
| Macao          | Asia           |            81.6  |
| Moldova        | Europe         |            64.5  |
| Saint Helena   | Africa         |            76.8  |
| Zambia         | Africa         |            37.2  |
+----------------+----------------+------------------+
```

(b) Implement the **find_country_language($conn, $percentage, $language)** function in functions_quiz. This function should find the name of the countries that speaks the **$language** with more than **$percentage** percent.

Example evaluations:
- **find_country_language($conn, 85, "Turkish")** returns countries in which more than 85% of the citizens speaks Turkish.

```
+---------+----------+------------+
| Name    | Language | Percentage |
+---------+----------+------------+
| Turkey  | Turkish  |      87.6  |
+---------+----------+------------+
```

(c) Implement the **find_country_count($conn, $amount)** function inside functions_quiz.php This function should find the following: Let *T* denote the list of countries that have more than **$amount** cities. For each continent, find which country among those in *T* has the maximum life expectancy in that continent. Print the name of the country that was found, the maximum life expectancy, and the continent.

Example evaluations:
- **find_country_count($conn, 100)** should return the following result:

```
+--------------------+---------------------+---------------+
| Name               | MAX(LifeExpectancy) | Continent     |
+--------------------+---------------------+---------------+
| Brazil             |                62.9 | South America |
| China              |                80.7 | Asia          |
| Mexico             |                77.1 | North America |
| Russian Federation |                67.2 | Europe        |
+--------------------+---------------------+---------------+
```

Submission

Your submission should consist of 'index_quiz.php', 'result_quiz.php' and 'functions_quiz.php' zipped as '<student_number>.zip'.