PRINTED NAME:

STUDENT ID:

CS621 Lab Exam 3 2019 [White]

Exam Duration: 2 hours
Date: 5th December 2019 11:15 – 13:15

Lab Exam 3 – PART A – Self Joins and Operators (6.5%)

On Moodle you will find an SQL file called **LabExam3.sql** which must be executed **on your own schema**. This file contains the DDL statements for 3 tables: **LabEx3poly**, **LabEx3roads** and **LabEx3traffic**.

- All of the three tables contain a primary key field/column called **ID**.
- All of the three tables contain a geometry field/column called **geom**.
- All of the three tables contain a column/field called **name**.
- The geometry objects in all three tables is given in **EPSG:4326**.

You should **use EPSG:3035** for any meter-based projection requirements in Lab Exam 3 (part A). All answers must be entered into the Moodle Quiz for Lab Exam 3 Part A. **Absolutely no late submissions are allowed. TWO ATTEMPTS are allowed in the Quiz Part A .**

Lab Exam 3a Q1: Write an SQL query which returns the ID of the object in the `LabEx3poly` table which is farthest away (in meters) from any object in the `LabExam3traffic` table. Moodle will require the ID of this object.

Lab Exam 3a Q2: Write an SQL query which returns the distance between the two points in the `LabExam3traffic` table which are closest to each other, measured in meters. You shoud provide this distance to Moodle. You should provide your answer, correct to the nearest integer.

Lab Exam3a Q3: Using a SELF-JOIN write a query which returns the distance measurement between the two objects in the `LabExamPoly` table which are farthest away from each other. You should use ST_Distance to measure the distance. You should provide your answer, correct to the nearest integer.

Lab Exam3a Q4: Using a SELF-JOIN write a query which returns the distance measurement between the two objects in the `LabExamPoly` table which are farthest away from each other. The names of the two polygon objects must begin with one UPPERCASE alphabetical character. You should use ST_Distance to measure the distance. You should provide your answer, correct to the nearest integer.

Lab Exam3a Q5: Using a SELF-JOIN write a query which returns the number of pairs of buildings in the **`LabEx3Poly`** table which have bounding boxes/rectangles which intersect each other. You will need to supply the number of rows returned to Moodle.

LabExam3a Q6: Write an SQL query to find the ID of the road segment in the **`LabExam3Roads`** table which contains the largest number of points. You must provide the ID of the object in Moodle and NOT the number of points.

LabExam3a Q7: Write an SQL query to find number of building objects in the **`LabExam3Poly`** table which contain less than 10 points or nodes. The Moodle Quiz will require you specify how many such objects are in the **`LabExam3Poly`** table.

Lab Exam 3 – PART B – QGIS and Vector Grid Analysis (6%)

On Moodle you will find two ZIP files: One Zip file called **luxbuildings.zip** which contains the building polygons from OpenStreetMap in Luxembourg (polygons in EPSG:3035) in ESRI Shapefile format. The other Zip file called **luxtraffic.zip** contains the locations (points in EPSG:3035) of objects related to traffic management such as traffic lights, crossing signals, etc., also in Luxembourg This file is also in ESRI Shapefile format. You are advised that use EPSG: 3035 meter-based projection for Europe and should be used in all calculations in Lab Exam 3 Part B. The primary key in both Shapefiles is named **id**. The geometry column in both Shapefiles is called **geom**.

TASK: You are required to generate a Vector Grid (in EPSG:3035) using QGIS. This Vector Grid will have grid cells of $300m^2$ (300m x 300m)
Each grid cell in the vector grid should contain a column called **TotalObjects** which holds the value of the total number of objects from both **luxbuildings** and **luxtraffic** which are completely contained within the corresponding grid cell.
You are then required to create an additional column called *luxclass* which is updated as follows.

The value of *luxclass* is 4 if the value in TotalObjects is greater than 80
The value of *luxclass* is 3 if the value in TotalObjects is greater than 60 but less than or equal to 80.
The value of *luxclass* is 2 if the value in TotalObjects is greater than 30 but less than or equal to 60.
The value of *luxclass* is 1 if the value in TotalObjects is greater than 10 but less than or equal to 30.
Otherwise the value of *luxclass* is 0.

You must use QGIS to visualise the Vector grid. This choropleth map representation of the vector grid must have with 5 classes, using Jenks Natural Breaks, based on the *luxclass* column/field from the vector grid. You must use the 'reds' colour ramp in QGIS.

REMEMBER: When you import these Shapefiles using DB Manager – you need to specify a table name with only lower case characters. You are advised to choose short names for the tables (all lower case). Otherwise you will probably get a relation or table not found error in PostGIS.

How to submit your answer to Lab Exam 3 Part B?

On the Moodle Quiz for this section you must upload two things: (1) your SQL code used to generate the choropleth map in PostGIS and (2) a FULL SCREEN screenshot of your Choropleth map visualised in QGIS. This follows the same process we followed in CS621 Lab Exam 2 Part B.

ALWAYS SAVE YOUR WORK – You must hand up this question sheet SIGNED at the end of the examination.

APPENDIX

How do you round to the nearest integer?

The rule for rounding is simple: look at the digits in the tenth's place (the first digit to the right of the decimal point).

If the digit in the tenths place is less than 5, then round down, which means the units digit remains the same; if the digit in the tenths place is 5 or greater, then round up, which means you should increase the unit digit by one.

For example, 4.3 is rounded to 4, and 4.9 is rounded to 5. or For example, 4.37 is rounded to 4, and 4.75 is rounded to 5.

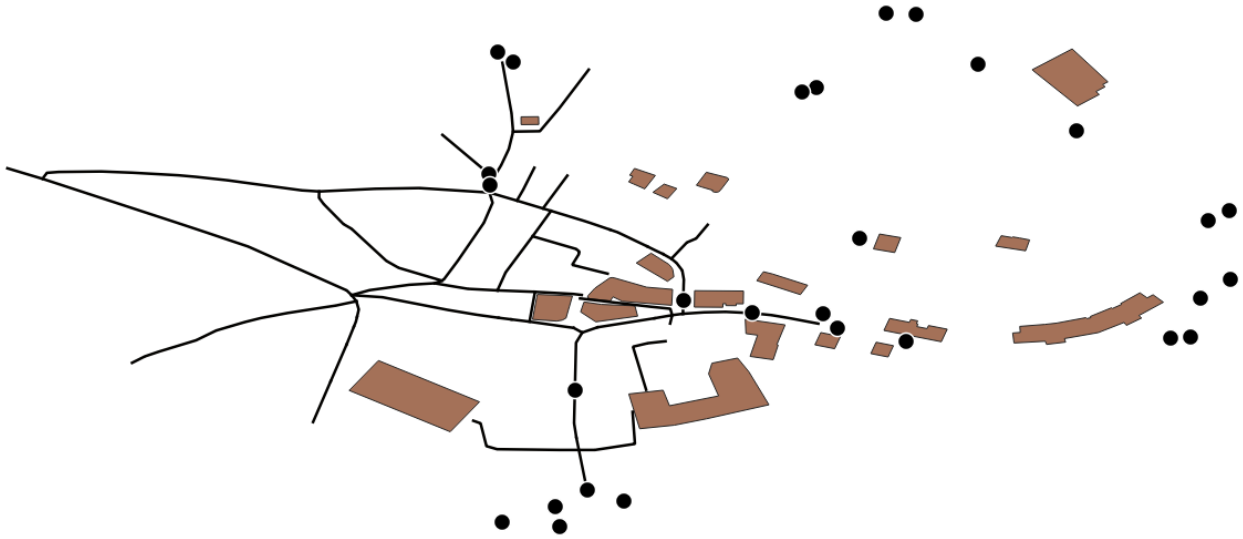

Illustration 1: Lab Exam 3 - Part A - Diagram form of the three tables provided