**CS 122A: Introduction to Data Management – Winter 2017**

**Homework 4: Relational Algebra and Calculus  (100 points)**

***Due Date:* Tuesday, Feb 14 (6:00 PM)**

**Submission**

All HW assignments should contain both your student ID and your name and must be submitted online, formatted per the instructions provided on Piazza, through the associated dropbox on EEE. Fill the answers in this word document and upload it as a PDF. The instructions and other information can be removed from your submission, but please do not reorder the questions. See the table below for the HW submission opportunities. Note that after 6 PM on Thursday no further HW submissions will be accepted. (We will be releasing the solution at that time.) Please strive to get all your work in on time! If possible, try to save the one dropped assignment for the end of the term when you are most likely to want/need it.

|  |  |
| --- | --- |
| **Date / Time** | **Grade Implications** |
| Tuesday, Feb 14 (6:00 PM) | Full credit will be available |
| Wednesday, Feb 15 (6:00PM) | 20 points will be deducted |
| Thursday, Feb 16 (6:00 PM) | 40 points will be deducted |

**Relational Algebra and Calculus [100 pts]**

Congratulations! Now, TopicalBirds has started its actual business and several transactions have been made successfully. Of course, your design works well so far. Now, you want to search and analyze the underlying relations by using the Relational Algebra and Calculus.

**Schema, Data, and Tools**

TopicalBirds is currently using the relations resulting from HW #2. You can refer to the provided solution to remind yourself of their schemas. You will also be able to see the relations’ schemas in your browser when you are using the online relational algebra executor for this assignment. A small sample data set will be provided for you to use in testing your queries. More information about how to load the schema and associated sample data – and how to enter and run queries – can be found in the relational algebra instructions linked from HW #4’s entry on the course wiki page. You are to use the online tool for the relational algebra part of this assignment and then use pen and paper (or a typed-in equivalent thereof ☺) for the relational calculus part.

**Part A. Relational Algebra [70 pts]**

Write the following queries in the relational algebra against the TopicalBirds.com test relations. Show the parse tree and result of each query that you wrote where requested to do so. We suggest that you write your relational algebra expressions on paper first before attempting to execute them on the Relational Algebra Calculator site. Please note that you will not get any points for giving the result of a query on this assignment if your relational algebra expression is not correct (!). Since you have a “live” algebra interpreter at your disposal, this should not be an issue – you will be able to test all of your queries that way.

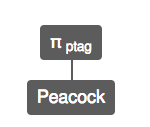
As an example, we have included a sample question and answer below. Please note that we expect you to use the parse tree generated from the Relational Algebra Calculator site.

Question: Print the bird tags of Peacocks.

1. **[6pts] Relational algebra**

π ptag (Peacock)

1. **[1pt] Parse Tree**



1. **[3pts] Result**

|  |
| --- |
| **Peacock.ptag** |
| HillaryClinton |
| realDonaldTrump |

1. [10pts] Find all Chirps whose sentiment is greater than 0.9.

a) [6pts] Relational Algebra

b) [1pt] Parse Tree

c) [3pts] Result

2. [10pts] Print the tag, first name, last name, and gender of Birds whose last name is ‘Trump’.

a) [6pts] Relational Algebra

b) [1pt] Parse Tree

c) [3pts] Result

3. [10pts] Print the tag, email address, signup date, first name, and last name of Birds whose first name is ‘Hillary’.

a) [6pts] Relational Algebra

b) [1pt] Parse Tree

c) [3pts] Result

4. [10pts] Find the btag, chirp number, chirp date, and text of all Chirps uttered by a Bird whose email address is 'realDonaldTrump@gibson.info'.

a) [6pts] Relational Algebra

b) [1pt] Parse Tree

c) [3pts] Result

5. [10pts] Find the tag, email address, gender, and varieties of all of the Peacocks.

a) [6pts] Relational Algebra

b) [1pt] Parse Tree

c) [3pts] Result

6. [10pts] Find the bird tag, last name, first name, and birth date of any birds who are currently listening to ***none*** of the birds.

a) [6pts] Relational Algebra

b) [1pt] Parse Tree

c) [3pts] Result

7. [10pts] Find the bird tag, last name, first name, and birth date of any birds who are currently listening to ***all*** of the birds.

a) [6pts] Relational Algebra (Hint: ***Use Division!***)

b) [1pt] Parse Tree

c) [3pts] Result

**Part B. Tuple Relational Calculus [30 pts]**

In this part, write the same queries as above using the tuple relational calculus (TRC) against the same relations as above.

1. [2 pts] Find all Chirps whose sentiment is greater than 0.9.

2. [3 pts] Print the tag, first name, last name, and gender of Birds whose last name is ‘Trump’.

3. [5 pts] Print the tag, email address, signup date, first name, and last name of Birds whose first name is ‘Hillary’.

4. [5 pts] Find the btag, chirp number, chirp date, and text of all Chirps uttered by a Bird whose email address is 'realDonaldTrump@gibson.info'.

5. [5 pts] Find the tag, email address, gender, and varieties of all of the Peacocks.

6. [5 pts] Find the bird tag, last name, first name, and birth date of any birds who are currently listening to ***none*** of the birds.

7. [5 pts] Find the bird tag, last name, first name, and birth date of any birds who are currently listening to ***all*** of the birds. (Hint: ***Use University Quantification!***)