Comp 521 Practice Midterm 1

4 October 2018

Instructions

This is for you. Take it just like you would the real exam but it won't count for anything. The exam will be similar to this.

You should use the latest **Google Chrome** browser to take this exam; it may work in other browsers but I can't help you if it doesn't.

You may use **only** a single 8.5 by 11 sheet of paper, possibly double sided, as a cheatsheet.

You **must expand your web browser window to cover the full screen** and keep it that way for the duration of the exam. You must **not** access anything besides this page in your browser before you submit the exam. I will know if you use other browser pages or programs.

You may **NOT** leave the room until you submit your exam. When you submit you will be given a date and time to enter on the pledge sheet (real exam only).

On the real exam you will pledge on your honor that you have neither given nor received help on the exam. You will turn in your pledge sheet as you leave the room.

No submissions will be accepted after the allotted time.

Questions

1. (5 points) Which of the following SQL operations can be expected to increase the cardinality of a relation?

insert 5 points

2. (5 points) What major function is NOT typically performed by a database management system?

translating ER diagrams to schemas 5 points

3. (4 points each) Which of the following statements characterize the relational database model?

- [x] Entities are stored in tables.
- [ ] Relations between entities are stored as tables.
- [ ] The domain for each attribute is pre-specified.
- [x] Each table has a distinct name.
- [ ] Each table must have a primary key.

4. (8 points each) How big is the natural join result?

Consider the relational algebra expression $C = A \bowtie B$. A has degree A_d and cardinality A_c and B has degree B_d and cardinality B_c . Further A and B have only one field in common and that field happens to be a key for each of them. What is the degree C_d and the cardinality C_c of the result?

Which expression describes the cardinality of C? Choose an answer 8 points

a. $C_c = 0$
b. $C_c = A_c * B_c$
c. $0 <= C_c <= min(A_c, B_c)$
d. $0 <= C_c <= max(A_c, B_c)$

Which expression describes the degree of C? Choose an answer 8 points

A. $C_d = 0$
B. $C_d = A_d + B_d - 1$
C. $C_d = A_d * B_c$
D. $C_d = max(A_d, B_d)$

Database info

You are to write a single SQL query to answer each question. You will not write any Python code below.

The schema of the database is below. It represents book reading activity on Tar Heel Reader over a short period.

The **ip** address is assumed to correspond to a single location. For reasons you'll learn in Comp 431 they sometimes don't but for the purposes of the exam assume they do.

```
create table Reads ( -- a record for each book that was read
    time date,       -- time the book was read
    ip integer,      -- ip of the computer
    bid integer,     -- book id
    foreign key (bid) references Books,
    foreign key (ip) references Locations)

create table Books (
    bid integer primary key,
    title text,
    aid integer,           -- author id
    reviewed integer,      -- 1 if the book is reviewed, 0 otherwise
    foreign key (aid) references Authors)

create table Locations (
    ip integer primary key, -- ip address of the computer
    country text)           -- country determined from the ip address

create table Authors (
    aid integer primary key,
    login text,    -- user id like Gary
    birthday text) -- month and day of the author's birthday like May 29
```

I'll dump the first few rows of each table so you can get a better idea of the contents.

Reads

```
(time, ip, bid)

('2017-10-01 00:06:48', 3023614022, 124363)
('2017-10-01 00:07:35', 3023614022, 124884)
('2017-10-01 00:07:53', 3023614022, 124366)
```

Books

```
(bid, title, aid, reviewed)

(148, 'Lullaby', 9, 1)
(171, 'Balloons Everywhere!', 14, 1)
(202, 'Baa Baa Black Sheep', 61, 1)
```

Authors

```
(aid, login, birthday)

(1, 'Gary', 'May 29')
(2, 'DLM', 'February 24')
(5, 'Jenny', 'January 18')
```

Locations

```
(ip, country)

(32591211, 'United States')
(40693121, 'United States')
(60836422, 'Canada')
```

More questions

5. (6 points) How many different countries read books?

```
SELECT COUNT(DISTINCT L.country) FROM Reads R, Locations L
WHERE R.ip = L.ip
```

Execute 6 points

6. (8 points) How many times were reviewed books read?

I'm looking for the number of reads of books that have the reviewed flag set to 1.

```
SELECT COUNT(*) FROM Reads R, Books B
WHERE B.bid = R.bid and B.reviewed = 1
```

Execute 8 points

7. (8 points) What are the titles and authors of the books that have "help" anywhere in their title?

List the books in alphabetical order by title, and author login.

```
SELECT B.title, A.login
FROM Books B, Authors A
WHERE B.aid = A.aid AND B.title LIKE '%help%'
ORDER BY B.title, A.login
```

Execute 8 points

8. (8 points) What are the logins of the authors whose books where read from Italy?

Produce a list of the logins in alphabetical order.

```
SELECT A.login
FROM Books B, Authors A, Locations L, Reads R
WHERE B.aid = A.aid AND B.bid = R.bid and R.ip = L.ip and L.country LIKE 'Italy'
GROUP BY A.login
```

Execute 8 points

9. (8 points) How many books were read in each country?

List the country and number in alphabetical order by name.

```
SELECT L.country, COUNT(L.country)
FROM Books B, Locations L, Reads R
WHERE B.bid = R.bid AND R.ip = L.ip
GROUP BY L.country
```

Execute 8 points

10. (8 points) How many authors wrote book that were NOT read in the United States?

I mean none of their books were read in the US. If even one of their books was read from the US, you should not include them.

```
SELECT COUNT(*)
FROM Authors A
WHERE A.aid NOT IN (
SELECT A.aid
FROM Authors A, Books B, Locations L, Reads R
WHERE R.ip = L.ip and B.bid = R.bid and B.aid = A.aid AND L.country LIKE '%United States%'
```

Execute 8 points

11. (8 points) How many books were read whose authors were born in May?

I'm looking for a single query that returns an integer.

```
SELECT COUNT(*)
FROM Books B, Authors A, Reads R
WHERE B.aid = A.aid AND A.birthday LIKE '%May%' and R.bid = B.bid
```

Execute 8 points

Submit your exam

You must enter the exam submit code displayed on the screen (or given to you by ARS) immediately before submitting. Your submission **will not be graded** if you use an incorrect or old code. The system will warn you if your code is invalid.

Only your **first submission** with a correct code will be counted

Enter submit code:

Submit