The University of British Columbia
Computer Science 304

Midterm Examination
March 2, 2012

Time: 50 minutes   Total marks: 60

Instructor: Rachel Pottinger

Name **ANSWER KEY**_____Student No_____

(PRINT)   (Last)   (First)

Signature_____

This examination has 3 doublesided pages.

Check that you have a complete paper.

This is a closed book, closed notes exam. No books or other material may be used.

Answer all the questions on this paper.

Give very **short but precise** answers.

State any assumptions you make

Work fast and do the easy questions first. Leave some time to review your exam at the end.

Good Luck

Question	Mark	Out of
1.a		10
1.b		10
2.a		10
2.b		10
2.c		10
2.d		10
TOTAL		Out of 60

All queries for this exam use the same schema as in class and in the SQL exercises in the book:

Student(*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)
Class(*name:* string, *meets_at:* string, *room:* string, *fid:* integer)
Enrolled(*snum:* integer, *cname:* string)
Faculty(*fid:* integer, *fname:* string, *deptid:* integer)

The schema will be repeated on following pages for easy reference.   The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class.

1.   {20 marks} Relational Algebra. For each query return EXACTLY the following:

   a. Find the names of all students who have taken at least two classes taught by "Elizabeth Taylor"

ρ(class1, $\pi_{snum, sname, cname}$((student $\bowtie$ enrolled $\bowtie_{cname = name}$ class $\bowtie$ $\sigma_{(fname = \text{'Elizabeth Taylor'}}$ faculty)))

ρ(class2, $\pi_{snum, sname, cname}$((student $\bowtie$ enrolled $\bowtie_{cname = name}$ class $\bowtie$ $\sigma_{(fname = \text{'Elizabeth Taylor'}}$ faculty)))

πsname (class1 $_{class1.snum = class2.snum \wedge class1.cname <> class2.cname}$ class2)

   b. Find the student numbers of the students who have taken classes from teachers with the same name (e.g., you'd return the student ID of the student "John Williams" if he took a class from "John Williams")

Note: this is very similar to practice question # 1a from the practice Midterm #11. The answer is as follows

$FT \leftarrow \pi_{fname, name}$(Class $\bowtie$ Faculty)

$SE \leftarrow \pi_{sname, snum, cname}$(Student $\bowtie$ Enrolled)

Π snum (SE $\bowtie_{name = cname \wedge sname = fname}$ FT)

The schema again:

      Student(*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)
      Class(*name:* string, *meets_at:* string, *room:* string, *fid:* integer)
      Enrolled(*snum:* integer, *cname:* string)
      Faculty(*fid*: integer, *fname:* string, *deptid:* integer)

2. {40 marks} **SQL Queries. For each query return EXACTLY the following (i.e., remove duplicates from your final answers where they are not explicitly requested, and include no extra columns):**
   a. Find the name of the faculty member(s) who taught the most number of unique students and how many students they taught

```
CREATE VIEW taught AS
SELECT f.fid, count(distinct e.snum) as count
FROM  faculty f, enrolled e, class c
WHERE f.fid = c.fid and c.name = e.cname
GROUP BY f.fid

SELECT f.fname, t1.count
FROM taught t1, faculty f
WHERE f.fid = t1.fid AND t1. count >= ALL (SELECT count
                                           FROM taught t2)
```

```
FNAME             COUNT
--------------------------------------
Linda Davis           6
```

Note: need to rename count(*), or it won't work
Note: need to say which fid you're grouping by, and has to be the same one in the select clause
Note: can't do this in one query (unless there's some very clever nesting involved)

b. Find an alphabetical list of the names of all students who have not taken a class taught by the faculty member with ID 489456522

```
SELECT sname
FROM   student s
WHERE s.snum not in (select e.snum
                     FROM enrolled e, class c
                     WHERE e.cname = c.name and c.fid = 489456522)
ORDER BY sname
```

```
SNAME
-----------------------------
Angela Martinez
Betty Adams
Charles Harris
Daniel Lee
Donald King
Dorthy Lewis
Edward Baker
George Wright
Juan Rodriguez
Kenneth Hill
Margaret Clark
Maria White
Mark Young
Nancy Allen
Paul Hall
Steven Green
Susan Martin
Thomas Robinson
```

c. List each major majored in by at least 2 students whose student IDs begin with "3"

select major
from student
where snum like '3%'
group by major
having count(*) > 1

MAJOR

Computer Science

Note that you can also do this one by comparing two separate students and ensuring that the two students have the same major but different student numbers. In that case, you MUST have "DISTINCT" in the select clause. Here, having DISTINCT in the select clause won't hurt anything, but since it's done by a group, each major will only be returned once anyway.

    d.   Find the names of all students who are enrolled in two classes that meet at the same time

Note: this is question 5.1.4 from the book

1 select distinct s.sname
2 from student s
3 where s.snum in (select e1.snum
4 from enrolled e1, enrolled e2, class c1, class c2
5 where e1.snum = e2.snum and e1.cname <> E2.cname
6 and E1.cname = C1.name
7 and e2.cname = c2.name and c1.meets_at = c2.meets_at)
SNAME

Luis Hernandez