

The University of British Columbia
Computer Science 304

Midterm Examination
June 6, 2011

Time: 50 minutes

Total marks: 30

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		5
1.b		5
2.a		5
2.b		5
2.c		5
2.d		5
TOTAL		Out of 30

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. {10 marks} Relational Algebra. For each query return EXACTLY the following:
 - a. 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 "Elizabeth Taylor" if she also took a class from "Elizabeth Taylor")

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

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

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

Note: during the exam I clarified that I was asking about student names, not student numbers, otherwise you'd need to modify SE to project snum and then project snum from the answer.

- b. Find the names of all students who have taken all courses taught by Elizabeth Taylor.

$$\rho(ET(cname), \pi_{name}(\sigma_{fname = 'Elizabeth Taylor'}(Class \bowtie Faculty)))$$

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

SE/ET

Common errors:

- *Miss that it's division*
- *Have the wrong thing to divide by: it's student enrollments divided by classes by Elizabeth Taylor*
- *Forget to project the classes taught by Elizabeth Taylor*

Note: it's just fine to join student with enrolled after the division.

Name

Student No

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. {20 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. List in reverse alphabetical order the names of all students who have not taken a class with “Intro” in the title

```
select distinct sname
from student s
where s.snum not in (select s2.snum
                    from student s2, enrolled e
                    where e.snum = s2.snum and cname like '%Intro%')
```

order by sname desc

24 rows:

Thomas Robinson

Susan Martin

Steven Green

Paul Hall

Nancy Allen

Mark Young

Maria White

Margaret Clark

Luis Hernandez

Lisa Walker

Kenneth Hill

Karen Scott

Juan Rodriguez

Joseph Thompson

George Wright

Edward Baker

Dorothy Lewis

Donald King

Daniel Lee

Christopher Garcia

Charles Harris

Betty Adams

Angela Martinez

Ana Lopez

- b. How many classes have an unknown meeting time?

```
SELECT count(*)
```

```
FROM class
```

```
WHERE meets_at is NULL
```

Answer: 2

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)

- c. Find the age of the oldest student who is either a Economics major or enrolled in a course taught by John Williams

Note: this question is isomorphic to question 5.1.2 in the book

SELECT MAX(S.age)

FROM Student S

WHERE (S.major = 'Economics')

Or S.snum in (SELECT E.snum

FROM Class C, Enrolled E, Faculty F

WHERE E.cname = C.name AND C.fid = F.fid

AND F.fname = 'John Williams')

MAX(S.AGE)

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- d. Find the names of the students enrolled in the maximum number of classes.

Note: this is question 5.1.10 in the book

SELECT DISTINCT S.sname

FROM Student S

WHERE s.snum in (SELECT E.snum

FROM Enrolled E

Group By E.snum

Having Count() >= all (SELECT COUNT (*)*

FROM Enrolled E2

GROUP By E2.snum))

SNAME

Ana Lopez

Juan Rodriguez

Luis Hernandez