CPSC 304 SAMPLE FINAL EXAM QUESTIONS
December 15, 2009

For extra practice, you can review:

- Additional questions shown below
- Learning goals given throughout the course
- Midterms and assignments for this course (especially the assignment on Concurrency Control and its solutions)
- Online sample practice questions on the non-WebCT Web pages for the course
- An assortment of the odd –numbered questions from the textbook (note that textbook solutions are given for odd-numbered questions on Raghu's Web site (WebCT has a link))—some from our later units are listed in this document

1. {10 marks} Answer true (T) or false (F) for each of the following questions.

   a) ____ Foreign key constraints are referential integrity constraints.
   b) ____ A primary key uniquely identifies a row in a table.
   c) ____ Nulls reduce space requirements in tables.
   d) ____ It may be difficult to tell whether the presence of additional indexes is going to speed up an UPDATE operation, or whether it will actually slow down the UPDATE.
   e) ____ SQL*Plus is a language that allows you to embed SQL in application programs.
   f) ____ Relational algebra can implement all SQL aggregate functions.
   g) ____ Suppose relation R=(A,B,C,D) and R has only one candidate key, namely A,B. If we know that B→D, then R cannot be in 2NF.
   h) ____ A disadvantage of highly normalized tables is that queries may require too many time-consuming joins.
   i) ____ The deletion of a row from a table never causes the violation of a primary key constraint.
   j) ____ A table in Oracle cannot contain two identical rows.

2. {4 marks} Consider the following SQL fragment:

```
CREATE TABLE NHL_STATS (…
FOREIGN KEY (playerID) REFERENCES NHL_PLAYERS
            ON DELETE CASCADE)
```

   Explain, in detail, what this 3-line SQL fragment does. Be sure to mention how this particular foreign key constraint works.

3. {8 marks} Consider the following 3 relational tables about golf courses, golfers (players), and the golfers' scores ... whose schema is probably familiar to you by now.

GolfCourses

CourseID	Name	Location
233	Banff Springs	Banff
171	Mount Lorette	Kananaskis
172	Mount Kidd	Kananaskis
487	University	Vancouver
489	Fraserview	Vancouver

Golfers

GolferID	Name	HomeTown
90	Susan	Vancouver
180	Angela	Calgary
270	Ron	Banff
360	Mike	Vancouver

Scores

GolferID	CourseID	DatePlayed	Score
90	487	2000-05-17	94
90	171	2000-05-17	110
180	233	2000-06-23	107
270	489	1999-09-29	86
360	487	2000-08-15	95
360	172	2000-08-22	124

a) {3 marks} Write an SQL statement to list each golfer's ID, the number of times he/she played, and his/her average score. For example, golfer number 90 (Susan) played a total of 2 times, and has an average golf score of 102. Sort the results from most times played, to least times played, but ignore any golfers who haven't played at all.

b) {5 marks} Write a relational algebra expression to list the IDs of golfers who have played on all courses in Vancouver sometime during the year 2000. Feel free to break your expression into parts.

4. {7 marks} Consider relation R=(A,B,C,D) with the following functional dependencies (among others):

$A,B \rightarrow C$
$B,C \rightarrow D$

a) How many non-empty subsets are there of the attributes of R?

b) For each such subset *S*, give the closure S^+ based on the functional dependencies given.

c) List the candidate key(s) for R.

d) Is R in BCNF? If so, state why; else if not, then show a lossless-join decomposition of R such the decomposed relations are in BCNF.

5. {12 marks} Create an E-R diagram for the following enterprise. Use the E-R diagram style found in the textbook. Be sure to underline the primary keys in your diagram, and indicate any participation constraints and key constraints. (Also, write down any assumptions that you make.)

The British Columbia Court of Appeal operates as follows. There are about 20 judges in the Court of Appeal. Several judges (usually 3, but in rare cases 5) sit on a *panel* in order to decide an appeal (i.e., a court case). Each judge has his or her own *chambers* (i.e., an office) and a phone number. A judge is uniquely identified by his or her name, and will sit on many panels throughout the year.

A panel hears an *appeal* in one of several courtrooms. A courtroom is identified by its room number, and has a specified seating capacity. A CA file number (Court of Appeal file number) uniquely identifies the appeal. Each appeal has a *style of cause*, which is a title like "Her Majesty the Queen versus Carrier Lumber", and each appeal also lists the origin of the appeal. The appeal also names both the *appellent* (the person or organization that is appealing) and the *respondent* (the person or organization that is defending).

A *hearing* is the name given to the event in which a given panel hears a given appeal in a given courtroom. (By the way, not every appeal is heard because the appeal may be *abandoned*; if so, the appeal's status is simply listed as "abandoned".) A hearing has a start date and an end date, and usually lasts for no more than a few days. At some future date (perhaps as early as the end of the hearing), a judgment is recorded. This concludes the appeal for now. In rare cases, the same appeal may be reopened at a future date. In such a case, the appeal will have the same CA file #, but the new hearing may have a different panel and be in a different courtroom.

6. {12 marks} Consider the following sequence of actions using the ARIES protocol:

LSN	**LOG**
00	begin checkpoint
10	end checkpoint
20	update: T1 writes P61
30	update: T2 writes P72
40	update: T3 writes P95
50	T1 commit
60	T1 end
70	T2 commit
80	update: T3 writes P77
90	T2 end
100	update: T4 writes P72
	<CRASH, RESTART>

a) What is done during Analysis? (Be precise about the points at which Analysis begins and ends and describe the contents of the tables constructed in this phase.)
b) What is done during Redo? (Be precise about the points at which Redo begins and ends.)
c) What is done during Undo? (Be precise about the points at which Undo begins and ends.)

7) {5 marks} What is the difference between crash recovery, a rollback, and an aborted transaction?

8) {5 marks} For the lock-compatibility matrix for "Warning Locks" given in class (and shown below), we see that the intersection of the X column with the S column is blank (i.e., there is no "x" for this case). Does this mean that if someone is updating a row in a table, that no one else can read a (possibly different) row in the table? Provide an SQL example to help explain this case in detail.

	-	IS	IX	S	X
-	x	x	x	x	x
IS	x	x	x	x	
IX	x	x	x		
S	x	x		x	
X	x				

9) {4 marks} Explain the circumstances under which you might be better off using Optimistic Concurrency Control over strict 2PL, for example.

And here are some final exam practice questions from the textbook. Solutions are available in the online answer guide at Raghu's Web site. (See the link under Practice Questions.)

ARIES, Chapter 20

Exercise 20.1: Questions 1, 2, 3, 4, 5.

Exercise 20.3: 1, 2a,b,c

Exercise 20.7: 1

Exercise 20.9: 1, 2, 3

CONCURRENCY CONTROL, Chapter 19

Exercise 19.1: Questions 1, 2, 3 (interesting to know, but not examinable), 4, 5
(Note that some solutions online at Raghu's Web site may be out of order.)

You already have lots of practice exercises about CS, VS, serializable/serial schedules, recoverable, ACA (avoids cascading aborts), wait-die, wound-wait, deadlock detection, etc.; so, re-visit Assignment 4 and its solutions.