CMPT 354: Database Systems

Midterm Exam

Simon Fraser University

Fall 2013

Instructor: Oliver Schulte

Student Name:

Student Number:

---

1. **Write down your name and student number.**

2. Answer all questions. This exam consists of 4 pages. You have 50 minutes to complete this exam. You can earn a total of 50 points on the exam. I indicate the worth of each question.

3. For short answer/multiple choice questions, you can get full marks for giving the right answer, and *partial* credit for explaining a wrong answer if the explanation contains enough correct insights.

4. You should answer the questions in the space provided. If necessary, you may continue your answer on the back of the question sheet. *Write your final answer in pen*.

5. This is a closed-book exam, but you may use 1 (one) 8.5 x 11 sheet of notes for reference, both sides. No electronics allowed (cellphones, laptops, tablets). *Put away your electronics*.

6. For writing SQL queries, either standard SQL or Microsoft SQL is acceptable. You may use all of the SQL:99 standard (including parts that are not supported by Microsoft SQL server). The last two pages in this exam list a number of standard SQL constructs as well as basic operations in relational algebra and some sample queries written in SQL and relational algebra. You can use everything listed, and you can also use other valid parts of SQL or relational algebra if you wish.

7. Work efficiently. Some questions are easier than others. Avoid getting bogged down in the more difficult ones before you have answered the easier ones.

Grading Breakdown.

Section	Your Mark	Total Possible
Database Concepts		15
Database Design		20
Queries		15
Total		**50**

Appendix 1: Basic Operations in SQL and relational algebra.

SQL keywords: SELECT, FROM, WHERE, AS, DISTINCT, INTERSECT, UNION, EXCEPT, IN, EXISTS, UNIQUE, ANY, ALL, COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, NULL, CHECK, ASSERTION.

Relational Algebra operations:

Projection	π
Selection	σ
Union	$\cup$
Intersection	$\cap$
Set Difference	–
Cross Product, Cartesian Product	X
Division	/
Condition Join	$\bowtie_c$
Renaming	ρ

Appendix 2: Sample Queries

Find names of sailors who have reserved all red boats.

Relational Algebra:

$\rho(\text{Tempsids}, (\pi_{\text{sid,bid}}\text{Reserves})/(\pi_{\text{bid}}\ (\sigma_{\text{colour = 'red'}}\text{Boats})))$

$\pi_{\text{sname}}(\text{Tempsids} \bowtie \text{Sailors})$

SQL:

```
SELECT  S.sname
FROM  Sailors S
WHERE  NOT EXISTS
                ((SELECT  B.bid
                FROM  Boats B
                WHERE B.colour = 'red')
                EXCEPT
                (SELECT  R.bid
                FROM  Reserves R
                WHERE  R.sid=S.sid))
```