The University of British Columbia
Computer Science 304

Midterm Examination
February 8, 2010

Time: 50 minutes                              Total marks: 50

Instructor: Rachel Pottinger

Name_________________________          Student No__________
(Print) (Last) (First)

Signature_____________________________________________

This examination has 6 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
1. {7 marks} Consider the schema \( R(A, B, C, D, E, F, G, H, I) \) together with the functional dependencies: \( A \rightarrow B, C \rightarrow D \). Assume that \( R_1(A,B,C,D,E) \) is a relation obtained through decomposition of \( R \). Is \( R_1 \) in BCNF? Why or why not? If not, decompose into a collection of BCNF relations using the method we used in class and the book and circle the relations in your final answer. Show all your work.
2. {18 marks} Consider the schema S(A, B, C, D, E) together with the functional dependencies:

   BD → A
   AB → C
   D → A
   B → C
   C → E

Is S in 3NF? Why or why not? If not, decompose into 3NF using the method we used in class and the book and circle all relations in your final answer. Show all your work.
3. {10 marks} Create an ER diagram for the following specification:

- A bank has a database with accounts.
- For each account it records the (unique) account number and the current balance.
- There are two types of accounts: chequing and savings. Savings accounts have an interest rate. Chequing accounts have a monthly fee.
- The database also has information about depositors — their name, (unique) social-insurance number, and a single address.
- The bank stores, for each account, the depositor or depositors (in the case of joint accounts), that own the account.
- Each account must have at least one depositor.
4. {15 marks}

Transform the ER diagram into a relational schema using the methods discussed in class/the book. State any assumptions that you make – but your assumptions cannot contradict the facts given.

a. {12 marks} Give the SQL DDL necessary to create the relational schema. You do not have to include types for any attributes.

b. {3 marks} Are there any constraints in the relational schema that cannot be modeled without using assertions? If so, which constraint(s)? If not, why not?
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