CMPT 354 - Database Systems I

Assignment 4

Due date: December 7, 2015 — J.P. Delgrande
20 marks, 10% of grade — November 19, 2015

Important Note: Students must work individually on this, and other CMPT 354, assignments. You may not discuss the specific questions in this assignment, nor their solutions with any other student. You may not provide or use any solution, in whole or in part, to or by another student.

You are encouraged to discuss the general concepts involved in the questions in the context of completely different problems. If you are in doubt as to what constitutes acceptable discussion, please ask!

1. [10 marks] Do the following questions from the text:

   (a) Question 11.3.3, page 502. For this question, use *Sport* as the root element, and use *Team* and *Fan* as subelements of *Sport*. As well, assume that there are attributes *teamId* and *playerId* that uniquely identify teams and players.

   Be very careful with implicit cardinality conditions. For example, implicit in the information given in Exercise 4.1.3 are the facts that a team may have more than one colour for its uniform, and a fan may have more than one favourite team but just one favourite colour.

   (b) Question 12.1.2, page 528. Parts a, d, e.

   The question askes for the result of each query. In your answer don't bother giving more than the first three elements of the sequence returned.

   (c) Question 12.2.2, page 543. Parts a, d, e. Assume that the document is in file *Ships.xml*.

2. [5 marks] Consider the following set F of functional dependencies for relation scheme $R = (A, B, C, D, E, G, H)$.

   $A \rightarrow CD$
   $B \rightarrow AB$
   $AC \rightarrow E$
   $DE \rightarrow B$
   $CG \rightarrow H$
   $C \rightarrow G$

   (a) Compute the closure of F (don't bother listing trivial functional dependencies).

   (b) List the candidate keys for R.

   (c) Compute a canonical cover F_c.

3. [5 marks] Consider the schema $R = (B, C, D, F, G, H)$ with the functional dependencies

$BG \to CD$,
$G \to F$,
$CD \to GH$,
$C \to FG$,
$F \to D$.

(a) What functional dependencies hold on the projection onto CDG?

(b) Derive a lossless, dependency-preserving decomposition into 3NF.

(c) If any of the resulting schemas are not in BCNF, then decompose them into BCNF.