Database Systems, CSCI 4380-01
Homework #2
Due Thursday February 10, 2011 at 2 pm

Please submit your answers as a text or PDF file via RPILMS assignment drop box function.

Question 1 (20+10 bonus points). You are given the following simple relations (for simplicity, we are using unique integer ids as identifiers in this example):

Person(id, name, countryOfBirth, yearOfBirth)
Topics(id, title)
Books(id, title, publisher, isbn, versionNo, publicationYear)
BookAuthorbook_id, person_id)
BookEditor(book_id, person_id)
BookTopic(book_id, topic_id)

Write the following queries using relational algebra.

(a) Find people who are both an author and editor of the same book on topic 'Databases'.

(b) Find the latest version of all books on 'Artificial Intelligence' topic (use versionNo).

(c) **Bonus.** Find people who authored a book every year between 1990 and 2000. Assume that the database contains at least one book published every year between 1990 and 2000.

Question 2 (10+20+20 points). You are given the following functional dependency set for relation $R(A, B, C, D, E, F, G)$. Assume these dependencies form a minimal basis.

$$\mathcal{F} = \{A \rightarrow BC, AD \rightarrow EF, AF \rightarrow E\}$$

(a) Based on these functional dependencies, what are the keys for R?

(b) Is this relation in BCNF? If not, list all functional dependencies that violate BCNF and convert it to BCNF using BCNF decomposition.

(c) Is this relation in 3NF? If not, list all functional dependencies that violate 3NF and convert it to 3NF using 3NF decomposition.

Question 3 (10 points): Find a minimal basis that is equivalent to the following set of functional dependencies:

$$\mathcal{F} = \{AF \rightarrow BD, A \rightarrow F, C \rightarrow D, CD \rightarrow E, AB \rightarrow B\}$$