# Assignment 4

CIS451/551, Fall 2006
*due 5:00pm Thursday, November 9 (Extended)*

1.  Exercise 7.1 (7.2 in 4<sup>th</sup> edition).

    a) If we use the decomposition (A,B,C) and (C,D,E) instead, is it still a lossless-join decomposition?

    b) Give a lossless decomposition into BCNF of the schema R from 7.1.

    c) Give a lossless, dependency preserving decomposition into 3NF.

2.  Exercise 7.2 (7.4 in 4<sup>th</sup> edition).

3.  Exercise 7.6 (7.11 in 4<sup>th</sup> edition).

4.  Apply Armstrong's axioms (reflexivity rule, augmentation rule, and transitivity rule) to prove that the union rule and pseudotransitivity rule are correct.  As an example, given below is the proof of soundness for the decomposition rule.

    if $\alpha \rightarrow \beta\gamma$ holds, then $\alpha \rightarrow \beta$ holds and $\alpha \rightarrow \gamma$ holds.

    **Answer**   Given: $\alpha \rightarrow \beta\gamma$
    $\beta\gamma \rightarrow \beta$ reflexivity rule
    $\alpha \rightarrow \beta$ transitivity rule
    $\beta\gamma \rightarrow \gamma$ reflexivity rule
    $\alpha \rightarrow \gamma$ transitivity rule

5.  You are given the following relation about book publications:

    PUBLISHED_BOOK(title, author, book_type, price, author_affiliation, publisher);

    and the following functional dependencies:

    title $\rightarrow$ book_type, publisher

    book_type $\rightarrow$ price

    author $\rightarrow$ author_affiliation

    a) Does this relation satisfy 3NF?  Why or why not?

    b) Decompose the relation into BCNF and show your work.

6.  The ZFIN lab affiliated with the CIS department uses what is called a "ZDB_ID" to identify every single entity in their database (genes, morpholinos, people, figures etc.).  This unique id is saved in a central table in their schema called "zdb_active_data" to which all other tables have a foreign key.  Here are some ZDB_ID examples:

ZDB-GENE-990415-72

ZDB-MRPHLNO-041109-5

ZDB-PERS-970909-9

ZDB-FIG-051104-4

Is the ZFIN schema in first normal form (1NF)?  In reality, this sort of situation is quite common.  Please speculate why a database like ZFIN would do this.  Guess (explain) what the database stored procedure "GetNewZDBID(String type)" does?  What do you think the third "field" is in a ZDB_ID (e.g., 041109, 051104)?  What other functions can you expect to support this implementation (*hint*: what information can you return given a ZDB_ID parameter)?