CS 1555 – Database Management Systems (Spring 2020)
Dept. of Computer Science, University of Pittsburgh

Assignment #8: Normalization

Release: Mar. 26, 2020 Due: 8:00 PM, Wednesday, Apr. 1, 2020

Goal

The goal of this assignment is to understand and gain familiarity with conceptual database design. You will practice using normalization techniques.

Answer the following questions [for a total of 100 points]:

1. Consider the following set of functional dependencies:

   FD1: ItemId → ItemDescription, ItemPrice, StockQuantity

   FD2: PurchaceId → PurchaceDate, VendorCode

   FD3: VendorCode → VendorName, VendorAddress

   FD4: ItemId, PurchaceId → OrderQuantity

   (a) [30 points] Using universal relational approach (top-down process), construct a set of 3NF/BCNF relations from the above functional dependencies. Indicate the primary keys for the result relations. Please show all steps clearly as mentioned in the lecture slides.

   (b) [20 points] Using the table method, check whether the constructed set of relations is lossless or not. Also, state if your decomposition is good, bad or ugly.
   You must show all steps.
   Hint: Bad decomposition is a lossy one, while ugly decomposition is lossless but does not preserve some dependencies.

2. Consider the following set of functional dependencies:

   A → B,

   B → CD,

   A → D,

   B → C,

   AB → CD,

   A → C,

   E → F

   (a) [40 points] Using synthesis approach (bottom-up process), construct a set of 3NF/BCNF relations from the above functional dependencies. Indicate the primary keys for the result relations and whether or not they are in 3NF or BCNF. Please show all steps clearly as mentioned in the lecture slides.

(b) [10 points] Using the table method, check whether the constructed set of relations is lossless or not. If not, correct them.

What to submit

You are expected to submit the following file:

1. `hw8-<pitt_user_name>.pdf`
   In this file, please submit your answers to all questions. **Please do not forget to include your name and Pitt user name at the top of the file.**

How to submit your assignment

1. Submit your assignment (the file described above) through the Web-based submission interface (go to the class web page `http://db.cs.pitt.edu/courses/cs1555/current.term/` and click the Submit button).
   It is your responsibility to make sure the assignment was properly submitted.
2. Submit your assignment by the due date (8:00 PM, Wednesday, Apr. 1, 2020). There is no late submission.

Academic Honesty

The work in this assignment is to be done *independently*. Discussions with other students on the assignment should be limited to understanding the statement of the problem. Cheating in any way, including giving your work to someone else will result in an F for the course and a report to the appropriate University authority.