CS 1555 / 2055 – Database Management Systems (Fall 2020)
Dept. of Computer Science, University of Pittsburgh

Assignment #6: Database Design - Normalization

Release: Nov. 3, 2020 Due: 8:00 PM, Nov. 12, 2020.

Goal:

Understand and gain familiarity with relational database design. You will practice using normalization techniques in this *individual*-student assignment.

Questions [Total: 100 points]

1. [30 points] Consider the relation R(A,B,C,D,E,F). Use **synthesis method** to construct a set of 3NF relations from the following functional dependencies. Indicate the primary key for each relation in the result.

   $AB \rightarrow E$

   $B \rightarrow ED$

   $E \rightarrow D$

   $DF \rightarrow A$

   $C \rightarrow F$

   $DC \rightarrow A$

2. [30 points] Consider the relation R(A,B,C,D) and the following set of functional dependencies F. Apply the **decomposition method** on R to end up with BCNF relations and dependency preserving. Indicate the primary key for each relation in the result.

   $A \rightarrow B$

   $B \rightarrow CD$

   $A \rightarrow D$

   $B \rightarrow C$

   $AB \rightarrow CD$

3. [40 points] Using the table method, check if the following decomposition is *good, bad* or *ugly*. Show all steps.

   R1: (ProductID, Length, Width, Height, Weight, OrderID, OrderDate, CustomerID, TotalPrice)
   R2: (CustomerID, Address, City, State, ZipCode, PhoneNumber)
   R3: (ProductID, OrderID, ProductQuantity)

   Assume the functional dependency set to be:

FD1: ProductID → Length, Width, Height, Weight
FD2: OrderID → OrderDate, CustomerID, TotalPrice
FD3: CustomerID → Address, City, State, ZipCode, PhoneNumber
FD4: ProductID, OrderID → ProductQuantity

Hint: bad decomposition is a lossy one, while ugly decomposition is lossless but does not preserve some dependencies.

What to submit:

1. You are required to electronically submit **exactly one** PDF (.pdf) or Microsoft Word (.docx) file named **hw6-<pitt_user_name> (e.g., hw6-pitt01.pdf or hw6-pitt01.docx)**. *Do not forget to include your name and username (account name) in the beginning of the file.* **No hand-written solutions are accepted**.

How to submit it:

1. Submit your file (i.e., the PDF or DOCX file) that contains your solution through the class Web-based submission interface you have used for previous Assignments.
2. Submit your files by the due date **(8:00pm, Nov. 12, 2020). There is no late submission**.
3. **It is your responsibility to make sure the assignment was properly submitted and on-time**.

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.