NYU Tandon School of Engineering **March 18, 2017**
Computer Science and Engineering
CS6083, Spring 2017

Problem Set #3(Due March 29)

Problem 1:

Consider a database modeling an online marketplace, where a store offers products for customer to purchase. This website also keep tracks of which customers have ordered which products. It is given by the following database schema:

CUSTOMER(cname,address,phone)
PRODUCT(pname,pdescription,pprice, pstatus)
PURCHASE(cname,pname,putime,quantity,puprice,status)

Each customer has a unique cname, along with an address and a phone number. Information about products is stored in the PRODUCT table. Each entry in PRODUCT table has a pname as its primary key, a description, a current price and its status(such as 'available', 'backordered', 'discontinued').

The PURCHASE table keeps track of the numbers of any products ordered by a customer, the time when the purchase was placed, the total price of the purchase, and the status of the order(such as 'pending', 'delivering', 'delayed', 'complete', 'cancelled');

In this problem, you are going to design a simple web front end with PHP that will allow people to access some of the information using a web browser. You web application should support the following:

a. On the start page, there is a box into which user can type a customer name and a keyword.
b. When the button is pressed, your web app should store this customer name as a session value. Then it creates html page displaying all products that have the keyword in the description, along with detailed information of each. If no keyword is entered, all of product(and their information) are displayed.
c. Using the form produced part (ii), the user can select a product to order. The order table is updated as follow: If the user has a pending order of the same product, the quantity on that purchase is increased by one, the total price is increased by the current price of the product and the purchase time is changed to the current time. Otherwise, a new tuple should be inserted in the PURCHASE table with the information about the purchase, including the current time and price, and a quantity of 1. In either case, the status of order should be set to 'pending'.

Note that to complete these functions, your web app will need to fetch the customer's name from the session.

Test your application, using the database schema and the data provided to create and populate your database. You need to submit your code and screenshots(about your functions) on NYU Classes. Besides, you must meet with graders to give a demo.

Problem 2:

Consider a relational schema R = (A, B, C, D, E, F, G) satisfying the following functional dependencies: F = {DF->A, E->A, FB->C, D->A, E->G, F->BG}

a. Derive all candidate keys for this schema.
b. Derive a canonical cover of the functional dependencies in F.
c. Is the above schema in BCNF? Prove or disprove. If it is not in BCNF, convert it into BCNF.
d. Is the BCNF schema from c) dependency-preserving? Prove or disprove. If not, convert it into 3NF.

Problem 3:

Consider the following single-table database modeling a bakery.

BakeryInformation(custid, custname, cphone, address, city, zip, cakeid, cakename, cakeprice, slices, status, ingredid, iname, iprice, qty, orderdate, pickupdate, pricepaid)

The bakery offers different types of cakes. A cake has a name, current price, and number of slices per cake. The attribute status can be set to either 'available' or 'discontinued', depending on whether a cake is still being offered or has been discontinued. Customer can make order in advance and then pick them up on the agreed day. Each order contains a customer's ID, a cake ID, orderdate, pickupdate and pricepaid.

Each cake contains a number of ingredients(e.g., flour, sugar) that are needed to make it . Each kind of ingredient has a name and a price. Every kind of cakes are made from same ingredients with same quantity.

a. Explain why the above is not a good relational design. Name several reasons.
b. Derive all candidate keys for this table.
c. Identify the set F of non-trivial functional dependencies for this schema. (It is enough to identify a subset E such that the closures of E and F are the same.)
d. Derive a canonical cover of the functional dependencies in F
e. Is the above schema in BCNF? Prove or disprove. If it is not in BCNF, convert it into BCNF
f. Is the BCNF schema from e) dependency-preserving? Prove or disprove. If not, convert it into 3NF

g. If we add an additional constraint that a certain kind of cakes ordered on a certain day have the same price(for example, customers paid the same price for all orders for a 'red bean cake' ordered on 2017-03-10). How would that change your answers in parts b) through f)?

Problem 4:

In this problem, you are asked to explore the metadata querying facilities in your database system. Thus, the answers may depend on which system you have installed. So remember to state which system you are using! Try to write the following queries using the customer-restaurant database(it is in ps1) supplied as part of the practice materials:

a. List all tables in the schema, and their number of attributes.
b. List the table with the most attributes.
c. List the attribute name and table name of any attribute of type int.
d. List any pairs of tables that have an attribute with the same name and same data type.