Washington State University

School of Electrical Engineering and Computer Science

CptS 451 – Introduction to Database Systems

Assigned: March 26, 2020
Dr. Sakire Arslan Ay

Homework-5

Due Date: Friday, April 3

Name: ______________________________

Student Number:______________________

Question:	Max points:	Score:
1	40	
2	60	
Total	100	

(40pts) Question1: Identifying Functional Dependencies

Your friend designed a simple database to keep track of the expected monthly sales in his small store. He created the following database:

```
MySales (pname, category, price, discount, month)
```

He inserted the projected data into the database, then he realized that there is something wrong with his table: it is difficult to update. He asked your help to fix his data management problems. He gave you the file `salesData.csv` and asked you to revise the table schema. You agreed to help and realized that you need to normalize his database. Unfortunately you cannot sit down and talk to him to find out what functional dependencies make sense in his business. Instead, you will reverse engineer the functional dependencies from his data instance. You should do the following steps:

a) Create a table “MySales “ in the database and load the data from the provided file into that table (use PostgreSQL). Please refer to the Milestone-1 description for instructions on how to import a .csv file in PostgreSQL.

b) Now, you need to find all **non-trivial** functional dependencies (FDs) in the relation. This is a reverse engineering task, so expect to proceed in a trial and error fashion. First, you search for the simple dependencies, (e.g., one attribute determines other attribute(s)) then try the more complex ones, (e.g. two or more attributes determine some other attribute(s)), as needed.
To check each functional dependency, you write a SQL query that checks whether that FD holds for all rows in the table. You should be able to argue whether FD holds or not by looking at the query's answer.
You find the following FDs in sales data:

```
pname, category -> price
month -> discount
```

Write two SQL queries which will verify that these FDs hold on the sales data.

c) Decompose the table to BCNF relations and create SQL tables for the decomposed schema. **Show your work.**
Create primary keys and foreign keys where appropriate. **Turn in the SQL commands for creating the tables.**

d) Populate your BCNF tables from the original data. For this you need to write SQL INSERT statements that insert the data into the tables you created at part (c) from the original MySales table. **Provide the INSERT statements and give the number of tuples in each decomposed table** (obtained by running SELECT count(*) FROM Table).

(60pts) Question2: BCNF Decomposition

Consider the following relations and functional dependencies. For each relation do the following:

a) Identify the minimal key(s) for the relation

b) Identify whether the relation is in BCNF, if not in BCNF decompose it into a set of BCNF relations.

c) If you decomposed the relation in part b, argue whether the composition preserved functional dependencies.

1. (30pts) **R(A,B,C,D,E,F)** and FD's **A → BC, D → AF**
2. (30pts) **S(A,B,C,D)** and FD's **ABC → D, D → A**

Submission Instructions:

HW5 will be on Blackboard (HW5 dropbox under “Homeworks”). Write your answers in a file and save it as PDF. Name your file “HW5.pdf”.
Please don’t submit Word or text files.