GROUP PROJECT 4

Assigned: 11/15/2017; Due 1:30 PM, 11/29/2017

(**BOTH a Hard copy and Soft copy of your solutions need to be submitted**; a hard copy is submitted in class AND a soft copy is submitted to the class website; **Late submission will not be accepted**; Read the "Group Project Grading Policy" posted on the class website).

Problem 1 (40%):
Given the following relational schema where each attribute is atomic:

EMPLOYEE (id, name, age, classid, gender, manager, salary)

and a set of functional dependencies:

SetOfFDs = {(classid, id, gender) -> (salary, manager),
name -> (age, id),
id -> name,
manager -> (gender, age, classid, id)}

a) Find ALL candidate keys for the schema EMPLOYEE; show your work.
b) For each of the normal forms (1NF, 2NF, 3NF, BCNF), **explain in detail** why EMPLOYEE satisfies/does not satisfy with respect to the set of functional dependencies SetOfFDs.
c) Use the decomposition algorithm to obtain the _lowest normal form_ that the schema EMPLOYEE _does not satisfy_ with respect to SetOfFDs (for example, if your answer for question (b) is that EMPLOYEE satisfies 1NF and 2NF, but does not satisfy 3NF and BCNF, then use the decomposition algorithm to decompose EMPLOYEE into the schemas each of which satisfies 3NF); **show your work**. For each resulting schema, give its **complete** set of functional dependencies and candidate keys. You must explain why each of your resulting schemas is in the desired normal form.
d) Explain in detail why your decomposition obtained in part (c) is/is not loss-less join.
e) Explain in detail why your decomposition obtained in part (c) is/is not dependency-preserving.

Problem 2 (30%):
Select a database application of your choice, describe the application in details, list all functional dependencies that should hold among the attributes, and then design relational schemas for your database so that every schema must be in 3NF or BCNF. Your relational database must contain at least 4 relational schemas. You must justify that each of your relational schemas is in 3NF or BCNF. The application must not come from the textbooks/ lecture notes / homework assignments / class projects / exams / examples / qualifying exams used for CS/DSA 4513 at the University of Oklahoma. If you have copied the application from some

other sources, you must provide the references of the sources in your answers. If you designed an ER diagram for this problem, do not turn it in; we will not grade your ER diagram.

Notes for Problem 2: you need to justify the functional dependencies you provide by explaining which functional dependency represents which requirement(s) in your application. Without the justifications, your solution for Problem 2 will not be graded and a zero score will be given for your Problem 2.

Problem 3 (30%):

You have been employed by the Oklahoma Department of Emergency Management (OEM) to design and implement a database system that stores the information about past and current natural disasters in Oklahoma for the public to access through the Internet. The information includes both the information provided by OEM and the information that the system will obtain from the Web and social media. Review the Lecture Topic 7 "Evaluating and Controlling Technology" and its associated Chapter 7 in the "Gift of Fire" textbook. Give CONCISE answers to the following questions:

a) What factors would you consider when getting the information from the Web and storing it in the system? Explain the impacts of those factors on 1) users, 2) OEM, and 3) society.

b) Assuming that you have decomposed one of your database tables T into two tables T1 and T2, and the decomposition is a lossy join decomposition. Give an example of the contents of tables T, T1 and T2 (use meaningful table names instead of T, T1 and T2, and meaningful contents with respect to the natural disaster application), and then discuss the impacts of such lossy join decomposition (using the table contents you have provided) on 1) users, 2) OEM, and 3) society.

SUBMISSION:

- Your solutions must be typed; no hand-written solutions will be graded.
- Submit your solutions for all three problems in one single PDF file with the file name convention (GP4_Group X where X is your group number) to the class website. Submit a hard copy of your file in class. Both soft copy and hard copy are due at 1:30 PM, 11/29/2017. No late submission will be accepted.
- Within 24 hours after the due time, submit the grades you give to your group members in a text file (file extention .txt; file name GP4_Group Grading_Your First name_Your Last name) to the Dropbox of Group Project 4 (do not use Email). In this file, include your name, your group number, the names of your group members and the grades you give to them. If you do not submit your member grades by that time, we will assume that you give equal points to all your group members (i.e. 10 points to each of your group members). **Read the "Group Project Grading Policy" posted on the class website.**