The purpose of this assignment is to exercise your basic understanding of relations and sets, help you apply these concepts to develop expressions in basic relational algebra, and illustrate how these expressions represent queries.

This homework assignment is worth a total of 20 points.

Turn in hard copy or attach an electronic copy of the assignment in PDF form (converted from your word processor, or scanned) to the instructor at: CIS560TA-L@listserv.ksu.edu

1. (2 points) Database Management Systems (DBMS). Adapted from Problem 1.8, p. 32 Silberschatz et al. 5e. List four responsibilities of a database management system. For each responsibility, explain the problems that would arise if the responsibility were not discharged.

2. (2 points) Data Manipulation Languages (DMLs). Problem 1.9, p. 32 Silberschatz et al. 5e. List at least two reasons why database systems support data manipulation using a declarative query language such as SQL, instead of just providing a library of C or C++ functions to carry out data manipulation.

3. (2 points) Database administration. Problem 1.11, p. 32 Silberschatz et al. 5e. What are five main functions of a database administrator?

For problems 4-6, consider the two project options for this semester. Choose one for your solution (this need not be your final project choice). Indicate which domain you are discussing.

a. Preparing a university admissions and grade database for data mining to identify strong predictors of academic probation and dismissal.

b. Populating a university phonebook database from the K-State White Pages.

4. (2 points) Practical Databases. What do you think is a good server platform for the project, and why?

5. (2 points) Bad Database Design. What is wrong with exporting a single flat file (one table in ASCII form) from the original database? Give one example of data redundancy issue and one of a data integrity issue.

6. (2 points) Query Example. Give an example in English of a real select query that a user might submit over a web form, and write it in relational algebra.

For problems 7-8, refer to Sections 2.2 – 2.3 and consider the following relational database, where the primary keys are underlined:

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employee (person_name, street, city)
works (person_name, company_name, salary)
company (company_name, city)
manages (person_name, manager_name)
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Also refer to the following references.

Databases from scratch, intro:
http://www.geekgirls.com/databases_from_scratch_1.htm

Databases from scratch, design basics:
http://www.geekgirls.com/databases_from_scratch_2.htm

7. (2 points) Relational Algebra: Queries. Problem 2.5, parts a, d. Consider the following relational database above, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries:

a. Find the names of all employees who work for First Bank Corporation.

b. Find the names of all employees in this database who live in the same city as the company for which they work.

8. (2 points) Relational Algebra: Updates. Problem 2.7, parts a, b.

a. Give all employees of First Bank Corporation a 10 percent salary raise.

b. Give all managers in this database a 10 percent salary raise, unless the salary would be greater than $100,000. In such cases, give only a 3 percent raise.

9. (2 points) Relations. Give an example of a:

a. One-to-one function between a subset of A and a subset of B that is not onto.

b. Onto function between a subset of A and a subset of B that is not one-to-one.

10. (2 points) Databases and Data Structures. Consider a table in a relational database.

a. What kind of C++ or Java data structure would you use to represent it, and why?

b. What is the time complexity of updating a row given a primary key using your scheme?