

CS392 Database System Concept

Assignment 1

Due: Mar. 3rd, 2014

1. (10') What are the drawbacks of using file systems to store data?
2. (10') List two disadvantages of DBMS.
3. (10') Null Values, calculate the result of the following expressions:
For example: *exam* = true **and** unknown = unknown

	<i>and</i> unknown	<i>or</i> unknown	<i>not</i>
true	<i>exam</i>		
false			
unknown			

4. (20') Consider a relation $R(A, B)$ that contains r tuples, and a relation $S(B, C)$ that contains s tuples; assume $r > 0$ and $s > 0$. Make no assumptions about keys. For each of the following relational algebra expressions, state in terms of r and s the minimum and maximum number of tuples that could be in the result of the expression.
 - a. $R \cup \rho_{S(A,B)} S$
 - b. $\pi_{A,C}(R \bowtie S)$
 - c. $\pi_B R - (\pi_B R - \pi_B S)$
 - d. $(R \bowtie R) \bowtie R$
 - e. $\sigma_{A>B} R \cup \sigma_{A<B} R$
5. (20') Consider the employee database of Figure 1, where the primary keys are underlined. Give an expression in relational algebra for each of the following queries.

employee (employee_name, street,city)
works (employee_name, company_name,salary)
company (company_name, city)
manages (employee_name, manager_name)

Figure 1

- a. Find the names and cities of residence of all employees who work for First Bank Corporation.
 - b. Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than \$10,000.
 - c. Find the company that has the most employees.
 - d. Find those companies whose employees earn a higher salary, on average, than the average salary at First Bank Corporation.
6. (30') Consider the following relational schema:

employee(empno, name, office, age)
books(isbn, title, authors, publisher)
loan(empno, isbn, date)

Write the following queries in relational algebra.

- a. Find the names of employees who have borrowed a book published by McGraw-Hill.
- b. Find the names of employees who have borrowed all books published by McGraw-Hill.
- c. Find the names of employees who have borrowed more than five different books published by McGraw-Hill.
- d. For each publisher, find the names of employees who have borrowed more than five books of that publisher.