CS304 Database System Concepts

Assignment 1

Due: February 21, 2012
(Please submit hard copies to class or to Zheng on due date.)

Name: Matric No:

Q1. What are the drawbacks of using file systems to store data?

Q2. 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. $\sigma_{A>B} R \cup \sigma_{A<B} R$

Q3. 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.

Q4. We mentioned in class that there are building aggregate functions in SQL, including sum, avg, min, max and count. Name 3 other aggregate functions and give a definition for each of them mathematically.

Q5. Compare the following join operations: natural-join, left-outer-join, right-outer-join, full-outer-join and define these join operations respectively using the six basic relational algebra operations, namely, select, project, union, set difference, Cartesian product and rename.