



CS660 Fall 2024 – Written Assignment 4

Title: *Relational Algebra*,

Problem 1: Relational Algebra. [40pts]

Consider the following database schema that is part of a larger database and stores information about electronic products (that in our case can be either PC, Laptop or Printer.)

Product (maker, model, type)

PC (model, speed, ram, hdd, price)

Laptop (model, speed, ram, hdd, screen, price)

Printer (model, color, type, price)

The Product stores the maker, the model and the type that can be either PC, Laptop, or Printer. Each of the other three relations store specific information about each product. Maker and model, or model and type are unique.

Give an expression(s) in relational algebra for each of the queries below (multiple expressions can be used to answer one query):

1. What PC models have speed at least 3?
2. Which manufacturers make laptops with hard disks at least 100GB?
3. Find the manufacturers that make Laptops but not PCs.
4. Find the hard disk sizes that occur in two or more PCs.
5. Find the manufacturer(s) of the PC(s) with the highest available speed.

Problem 2: Relational Algebra. [40pts]



Consider a database with the following schema:

Employee (SSN, name, salary, DNo)

Department (DNo, DeptName, MgrSSN)

Project (PNo, location, ProjName)

HourLog (SSN, PNo, hours)

The Employee relation provides a list of employees with their SSN, name, salary, and department number (DNo). The SSN is unique for each employee. Each employee belongs to only one department. The Department relation contains a list of the departments for the company. Its schema includes a unique department number called DNo. It also includes the name of the department (DeptName) and the social security number of the department's manager (MgrSSN). Each department has only one manager. The Project relation includes a unique project number (PNo), location and the project name (ProjName). An employee can be assigned to any number (including zero) projects. Each project has at least one person assigned to it. Finally, the HourLog relation lists for each project the number of hours of work for each employee who is assigned to that project. The key of this relation is SSN and PNo.

Write the following queries in Relational Algebra. You may use assignment of intermediate results for long queries.

1. Find the name and the SSN of everyone who works more than 100 hours on a project located in Boston.
2. Find the name and SSN of everyone who works for department number 1 and also works on project 2
3. Find the name and the SSN of everyone who works on at least two projects.
4. Find the name and the SSN of everyone who works on all projects.