

## CSE 462 : Relational Algebra

Name: \_\_\_\_\_

Date: February 4, 2011

\*\*\*\*\* Solved in class, on February 4, 2011. \*\*\*\*\*

1. Consider the **Library Schema** below, where primary keys are underlined, and provide relational algebra expressions to answer the queries below. (Appeared on the first test of the Summer 2010 semester.)

Person(personNo, name, street, city, phoneNo)

Book(isbn, title, publisher)

Author(isbn, author)

Loan(personNo, isbn, date)

a) Find the *name* of all people who never borrowed any books.

$All(personNo) := \pi_{personNo}(Person)$

$Borrower(personNo) := \pi_{personNo}(Loan)$

$Answer(name) := \pi_{name}(Person \bowtie (All - Borrower))$

b) Find the *title* and *isbn* of all books loaned to someone living in Buffalo but never to anyone living in Amherst.

$Buffalo(isbn) := \pi_{isbn}(\sigma_{city="Buffalo"}(Loan \bowtie Person))$

$Amherst(isbn) := \pi_{isbn}(\sigma_{city="Amherst"}(Loan \bowtie Person))$

$Answer(title, isbn) := \pi_{isbn, title}(Book \bowtie (Buffalo - Amherst))$

c) Find the *authors* who authored exactly one book.

$AuthorOfTwoOrMore(author) := \pi_{A1}(Author(I1, A1) \bowtie_{A1=A2 \wedge I1 < I2} Author(I2, A2))$

$Answer(author) := \pi_{author}(Author) - AuthorOfTwoOrMore$

2. Consider the **Company Schema** below, where primary keys are underlined, and provide relational algebra expressions to answer the queries below. (Appeared on the final exam of the Summer 2010 semester.)

Employee(empName, street, city, manager)

WorksFor(empName, company, salary)

Company(company, city)

In the above, *manager* is the name of some employee in Employee.

a) Find the *name* of all employees who live in the same city and street as their managers, and also earn more than their managers. A manager must work in the same company as their supervised employees.

$EmpManSameAddress(en, mn) := \pi_{en, mn}(Employee(en, st, ct, mn) \bowtie Employee(mn, st, ct, mn2))$

$EmpPairs(en1, en2) := \pi_{en1, en2}(WorksFor(en1, co1, sa1) \bowtie_{co1=co2 \wedge sa1 > sa2} WorksFor(en2, co2, sa2))$

$Answer(name) := \pi_{name}(EmpManSameAddress(name, manager) \cap EmpPairs(name, manager))$