**6.10** Write the following queries in relational algebra, using the university schema.

a. Find the names of all students who have taken at least one Comp. Sci.  
course.  
b. Find the IDs and names of all students who have not taken any course offering before Spring 2009.  
c. For each department, find the maximum salary of instructors in that department. You may assume that every department has at least one  
instructor.  
d. Find the lowest, across all departments, of the per-department maximum salary computed by the preceding query.

Solution:

a.

b.

c.

d.)

**6.11** Consider the relational database of Figure 6.22, 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 and cities of residence of all employees who work for “First Bank Corporation”.  
c. Find the names, street addresses, and cities of residence of all employees who work for “First Bank Corporation” and earn more than $10,000.  
d. Find the names of all employees in this database who live in the same city as the company for which they work.  
e. Assume the companies may be located in several cities. Find all companies located in every city in which “Small Bank Corporation” is located.

Solution:

a.

b.

c.

d.

e.

**6.15** Consider the employee database of Figure 6.22. Give expressions in tuple relational calculus and domain relational calculus for each of the following queries:

*employee* (*person name*, *street*, *city* )  
*works* (*person name*, *company name*, *salary*)  
*company* (*company name*, *city*)  
*manages* (*person name*, *manager name*)

a. Find the names of all employees who work for “First Bank Corporation”.  
b. Find the names and cities of residence of all employees who work for “First Bank Corporation”.  
c. Find the names, street addresses, and cities of residence of all employees who work for “First Bank Corporation” and earn more than $10,000.d. Find all employees who live in the same city as that in which the company for which they work is located.  
e. Find all employees who live in the same city and on the same street as their managers.  
f. Find all employees in the database who do not work for “First Bank Corporation”.  
g. Find all employees who earn more than every employee of “Small Bank Corporation”.  
h. Assume that the companies may be located in several cities. Find all companies located in every city in which “Small Bank Corporation” is located.

Solution:

A

B

C

D

E

F

G

H