## 8.16

Specify the following queries on the COMPANY relational database schema shown in below using the relational operators discussed in this chapter. Also show the result of each query as it would apply to the database state in Figure 5.6.



1. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.

PROJESSN  (σ Pname = ‘ProductX’ (PROJECT)) ⨝ Pnumber = PnoWORKS\_ON

π Fname, Minit, Lname ((σ Dno = 5 (EMPLOYEE)) ⨝ Essn = SsnPROJESSN)

1. List the names of all employees who have a dependent with the same first name as themselves.

π Fname, Minit, Lname (DEPENDENT ⨝ Essn = Ssn AND Dependent\_name = FnameEMPLOYEE)

1. Find the names of all employees who are directly supervised by ‘Franklin Wong’.

FWSSN  σ Fname = ‘Franklin’ AND Lname = ‘Wong (EMPLOYEE)

π Fname, Minit, Lname (FWSSN ⨝ Ssn = Super\_ssn EMPLOYEE)

1. For each project, list the project name and the total hours per week (by all employees) spent on that project.
2. Retrieve the names of all employees who work on every project.

EMPSSN  π Essn, Pno (WORKS\_ON) ÷ ρ Pno (π Pnumber (PROJECT))

π Fname, Minit, Lname (EMPSSN ⨝ Essn = Ssn EMPLOYEE)

1. Retrieve the names of all employees who do not work on any project.

EMPWO  WORKS\_ON ⨝ Essn = Ssn EMPLOYEE

NOPROJSSN  π Ssn (EMPLOYEE) - π Ssn (EMPWO)

π Fname, Minit, Lname (NOPROJSSN \* EMPLOYEE)

1. Calculate the minimum salary of the whole company and list the name of all the employees who earn that minimum salary, with the name of the department they work in.

SALARIES  π Salary (EMPLOYEE)

MIN  SALARIES - π Salary (σ Salary > Sal2 (SALARIES × ρ Sal2 (SALARIES)))

π Fname, Minit, Lname, Dname ((MIN \* EMPLOYEE) ⨝ Dno=DnumberDEPARTMENT)

1. Compute the maximum salary of all the female employees.

SALARIES  π Salary (σ Sex = ’female’ (EMPLOYEE))

SALARIES - π Salary (σ Salary < Sal2 (SALARIES × ρ Sal2 (SALARIES)))

1. Find the names and addresses of all employees who work on at least one project located in Houston but whose department has no location in Houston.

DEPT  (σ Dlocation ≠ ’Houston’ (DEPT\_LOCATIONS)) ⨝ Dnumber = DnoEMPLOYEE

PROJ  (σ Plocation = ’Houston’ (PROJECT)) ⨝ Pnumber = PnoWORKS\_ON

π Fname, Minit, Lname, Address (PROJ ⨝ Essn = SsnDEPT)

1. List the last names of all department managers who have no dependents.

MGSSN  DEPARTMENT ⨝ Mgr\_ssn = SsnEMPLOYEE

DEPSSN  MGSSN ⨝ Ssn = Essn DEPENDENT

NODEPSSN  π Ssn (MGSSN) - π Ssn (DEPSSN)

π Fname, Minit, Lname (EMPLOYEE \* NODEPSSN)

## 8.18

Consider the LIBRARY relational database schema shown below, which is used to keep track of books, borrowers, and book loans. Referential integrity constraints are shown as directed arcs. Write down relational expressions for the following queries:



1. How many copies of the book titled *The Lost Tribe* are owned by the library branch whose name is ‘Sharpstown’?

BR  σ Branch\_name=’Sharpstown’ (LIBRARY\_BRANCH))

TLT  σ Title=’The Lost Tribe’ (BOOK)

π No\_of\_copies (BR \* (BOOK\_COPIES \* TLT))

1. How many copies of the book titled *The Lost Tribe* are owned by each library branch?

TLT  σ Title=’The Lost Tribe’ (BOOK)

π Branch\_name, No\_of\_copies (LIBRARY\_BRANCH \* (BOOK\_COPIES \* TLT))

1. Retrieve the names of all borrowers who do not have any books checked out.

CN  π Card\_no (BOOK\_LOANS)

π Name (BORROWER \* (π Card\_no (BORROWER) - CN))

1. For each book that is loaned out from the Sharpstown branch and whose “Due\_date” is today, retrieve the book title, the borrower’s name, and the borrower’s address.

BR  π Branch\_id (σ Branch\_name=’Sharpstown’ (LIBRARY\_BRANCH))

TODAY  σ Due\_date=’today’ (BOOK\_LOANS)

π Title, Name, Address (BOOK \* (BORROWER \* (BR \* TODAY)))

1. Find the title, publisher, and authors of the book for which a branch has the greatest (largest) number of copies.

COPIES  π No\_of\_copies (BOOK\_COPIES)

MAX  COPIES - π No\_of\_copies (σ No\_of\_copies < Cop2 (COPIES × ρ Cop2 (COPIES)))

π Title, Publisher\_name, Author\_name (BOOK \* (BOOK\_AUTHORS \* (MAX \* BOOK\_COPIES)

1. What can you add to the database to determine how many books each borrower has checked out? Explain in detail and try to keep it simple.
2. For each book authored (or coauthored) by Stephen King, retrieve the title and the number of copies owned by the library branch whose name is Central.

BA  σ Author\_name=’Stephen King’ (BOOK\_AUTHORS)

BR  σ Branch\_name=’Central’ (LIBRARY\_BRANCH)

π Title, No\_of\_copies (BOOK \* (BA \* (BOOK\_COPIES \* BR)))