PRACTICE PROBLEM SET #6

CSC 261/461 (Database Systems), Spring 2018, University of Rochester 03/20/2018

Problem 1

Specify the following queries on the COMPANY relational database schema shown in Figure 1, using the relational operators.

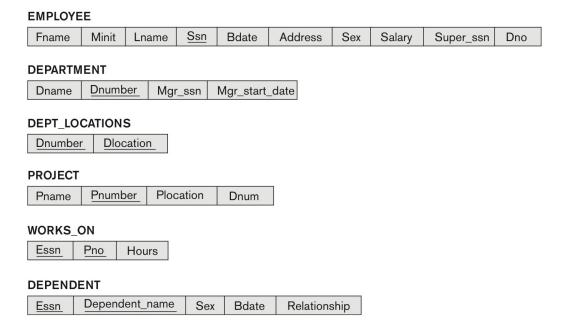


Figure 1: Company Schema

- 1. Retrieve the names of employees in department 5 who work more than 10 hours per week on the 'ProductX' project.
- 2. List the names of employees who have a dependent with the same first name as themselves.
- 3. Find the names of employees that are directly supervised by 'Franklin Wong'.
- 4. Retrieve the names of employees who work on every project.
- 5. Retrieve the names of employees who do not work on any project.
- 6. Find the names and addresses of employees who work on at least one project located in Houston but whose department has no location in Houston.
- 7. List the last names of department managers who have no dependents.

Solution:

In the relational algebra, as in other languages, it is possible to specify the same query in multiple ways. We give one possible solution for each query. We use the symbol σ for SELECT, π for PROJECT, \bowtie for EQUIJOIN, * for NATURAL JOIN

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- 1. EMP_W_X \leftarrow ($\sigma_{Pname='ProductX'}$ (PROJECT)) $\bowtie_{PNumber=PnO}$ (WORKS_ON) EMP_WORK_10 \leftarrow (EMPLOYEE) $\bowtie_{Ssn=Essn}$ ($\sigma_{Hours>10}$ (EMP_W_X)) RESULT \leftarrow $\pi_{Lname,Fname}$ ($\sigma_{Dno=5}$ (EMP_WORK_10))
- 2. $E \leftarrow (EMPLOYEE)\bowtie_{(Ssn,Fname) = (Essn,Dependent_name)} (DEPENDENT)$ $R \leftarrow \pi_{Lname,Fname} (E)$
- 3. WONG_SSN $\leftarrow \pi_{Ssn}$ ($\sigma_{Fname='Franklin'}$ AND Lname='Wong' (EMPLOYEE)) WONG_EMPS \leftarrow (EMPLOYEE) $\bowtie_{SUPERSSN=SSN}$ (WONG_SSN) RESULT $\leftarrow \pi_{Lname.Fname}$ (WONG_EMPS)
- 4. PROJ_EMPS(PNO,SSN) $\leftarrow \sigma_{\text{PNO,ESSN}}$ (WORKS_ON) ALL_PROJS(PNO) $\leftarrow \pi_{\text{Pnumber}}$ (PROJECT) EMPS_ALL_PROJS \leftarrow PROJ_EMPS \div ALLPROJS RESULT $\leftarrow \pi_{\text{Lname,Fname}}$ (EMPLOYEE * EMP_ALL_PROJS)
- 5. ALL_EMPS $\leftarrow \pi_{SSN}$ (EMPLOYEE) WORKING_EMPS(SSN) $\leftarrow \pi_{Essn}$ (WORKS_ON) NON_WORKING_EMPS \leftarrow ALL_EMPS - WORKING_EMPS RESULT $\leftarrow \pi_{Lname,Fname}$ (EMPLOYEE * NON_WORKING_EMPS)
- 6. $E_P_HOU(SSN) \leftarrow \pi_{Essn}$ (WORKS_ON $\bowtie_{PNO} = PNumber$ ($\sigma_{Plocation='Houston'}$ (PROJECT))) $D_NO_HOU \leftarrow \pi_{Dnumber}$ (DEPARTMENT) $\pi_{Dnumber}$ ($\sigma_{Dlocation='Houston'}$ (DEPARTMENT)) $E_D_NO_HOU \leftarrow \pi_{Ssn}$ (EMPLOYEE $\bowtie_{Dno} = Dnumber$ (D_NO_HOU)) $RESULT_EMPS \leftarrow E_P_HOU \cap E_D_NO_HOU$ $RESULT \leftarrow \pi_{L,name,Fname,Address}$ (EMPLOYEE * RESULT_EMPS)
- 7. DEPT_MANAGERS(SSN) $\leftarrow \pi_{\text{Mgr_ssn}}$ (DEPARTMENT) EMPS_WITH_DEPENDENTS(SSN) $\leftarrow \pi_{\text{Essn}}$ (DEPENDENT) RESULT_EMPS \leftarrow DEPT_MANAGERS - EMPS_WITH_DEPENDENTS RESULT $\leftarrow \pi_{\text{Lname}}$ (EMPLOYEE * RESULT_EMPS)