

Specify the following queries using Relational Algebra:

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

$EMP_W_X \leftarrow \sigma_{pname='productx'} (PROJECT) \bowtie PNUMBER=PNO (WORKS_ON)$

$EMP_WORK_10 \leftarrow (EMPLOYEE) \bowtie ssn=essn (\sigma HOURS>10(EMP_W_X))$

$RESULT \leftarrow \pi LNAME,FNAME (\sigma DNO=5 (EMP_WORK_10))$

Result:

LNAME FNAME

Smith John

English Joyce

2. Find the names of employees who are directly supervised by 'Franklin Wong'.

$WONG_SSN \leftarrow \pi SSN (\sigma FNAME='Franklin' \text{ AND } LNAME='Wong' (EMPLOYEE))$

$WONG_EMPS \leftarrow (EMPLOYEE) \bowtie SUPERSSN=SSN (WONG_SSN)$

$RESULT \leftarrow \pi LNAME,FNAME (WONG_EMPS)$

Result:

LNAME FNAME

Smith John

Narayan Ramesh

English Joyce

3. For each project, list the project name and the total hours per week (by all employees) spent on that project.

$PROJ_HOURS(PNO,TOT_HRS) \leftarrow PNO \text{ f SUM HOURS } (WORKS_ON)$

$RESULT \leftarrow \pi PNAME,TOT_HRS ((PROJ_HOURS) \bowtie PNO = PNUMBER (PROJECT))$

Result:

PNAME TOT_HRS

ProductX 52.5

ProductY 37.5

ProductZ 50.0

Computerization 55.0

Reorganization 25.0

Newbenefits 55.0

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

$ALL_EMPS \leftarrow \pi_{SSN} (EMPLOYEE)$

$WORKING_EMPS(SSN) \leftarrow \pi_{ESSN} (WORKS_ON)$

$NON_WORKING_EMPS \leftarrow ALL_EMPS - WORKING_EMPS$

$RESULT \leftarrow \pi_{LNAME, FNAME} (EMPLOYEE * NON_WORKING_EMPS)$

Result (empty):

LNAME FNAME

5. For each department, retrieve the department name, and the average salary of employees working in that department.

$DEPT_AVG_SALS(DNUMBER, AVG_SAL) \leftarrow DNO \text{ f } AVG \text{ SALARY } (EMPLOYEE)$

$RESULT \leftarrow \pi_{DNUMBER, AVG_SAL} (DEPT_AVG_SALS * DEPARTMENT)$

Result:

DNUMBER AVG_SAL

Research 33250

Administration 31000

Headquarters 55000

6. Retrieve the average salary of all female employees.

$RESULT(AVG_F_SAL) \leftarrow \text{f } AVG \text{ SALARY } (\sigma_{SEX='F'} (EMPLOYEE))$

Result:

AVG_F_SAL

31000

7. Retrieve 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.

$E_P_HOU(SSN) \leftarrow \pi_{ESSN} (WORKS_ON \bowtie PNO = PNUMBER(\sigma_{PLOCATION='Houston'} (PROJECT)))$

$D_NO_HOU \leftarrow \pi_{DNUMBER} (DEPARTMENT) - \pi_{DNUMBER} (\sigma_{DLOCATION='Houston'} (DEPARTMENT))$

$E_D_NO_HOU \leftarrow \pi_{SSN} (EMPLOYEE \bowtie PNO = DNUMBER (D_NO_HOU))$

$RESULT_EMPS \leftarrow E_P_HOU - E_D_NO_HOU$

$RESULT \leftarrow \pi_{LNAME,FNAME,ADDRESS} (EMPLOYEE * RESULT_EMPS)$

Result:

LNAME FNAME ADDRESS

Wallace Jennifer 291 Berry, Bellaire, TX

8. Retrieve the last names of all department managers who have no dependents

$DEPT_MANAGERS(SSN) \leftarrow \pi_{MGRSSN} (DEPARTMENT)$

$EMPS_WITH_DEPENDENTS(SSN) \leftarrow \pi_{ESSN} (DEPENDENT)$

$RESULT_EMPS \leftarrow DEPT_MANAGERS - EMPS_WITH_DEPENDENTS$

$RESULT \leftarrow \pi_{LNAME,FNAME} (EMPLOYEE * RESULT_EMPS)$

Result:

LNAME FNAME

Borg James