CSC134

Relational algebra practice questions – through cross product

Use the Company relational model to answer these questions

1. Find all female employees who make more than 50,000.

    50K $\longleftarrow \sigma_{SALARY > 50000}$ (EMPLOYEE)

    RESULT $\longleftarrow \sigma_{SEX = \text{'FEMALE'}}$ (50K)

2. Find the department name for department number 3

    DEPT3 $\longleftarrow \sigma_{DNUMBER = 3}$ (DEPARTMENT)

    RESULT $\longleftarrow \pi_{DNAME}$ (DEPT3)

3. Find the first and last name of all employees who work on project 3

    How to approach this problem: there is no single relation that has both project number and employee names, so we need to use one of the operators that work on more than one relation. Since we don't have a way to make project number union compatible with a relation that will have first and last name, cross product is our only option.

    PROJ3 $\longleftarrow \sigma_{PNO = 3}$ (WORKS_ON)

    EMP_PROJ3 $\longleftarrow \sigma_{SSN = ESSN}$ (EMPLOYEE x PROJ3)

    RESULT $\longleftarrow \pi_{FNAME, LNAME,}$ (EMP_PROJ3)

4. Find the SSNs of all employees who are managers but who do not have dependents.

   How to approach this problem: We could do a series of cross products, selects, and projects, but there is an easier way. We can do a project on DEPARTMENT to find all manager SSNs and a project on DEPENDENT to final all SSNs of employees with dependents. These two results are union compatible, so we can take the difference of the two sets to find our answer.

   MGR_SSN ⟵ π_{MGRSSN} (DEPARTMENT)
   DEP_SSN ⟵ π_{ESSN} (DEPENDENT)
   RESULT ⟵ MGR_SSN – DEP_SSN

5. Find the names of the dependents of all employees who are managers.

   How to approach this problem: We know we can find who is a manager by using the MGRSSN column of DEPARTMENT. Since ESSN is part of the dependent relation, we can use the cross product plus select technique to find the dependents we want, then use project to get only the column we want.

   MGR_X_DEP ⟵ DEPARTMENT x DEPENDENT
   RESULT ⟵ $\pi_{DEPENDENT\_NAME}$ ($\sigma_{ESSN = MGRSSN}$ (MGR_X_DEP))