

Querying exercises from Company database

<p>EMPLOYEE (<u>ssn</u>, fname, minit, lname, bdate, dno, gender, superssn) Foreign Keys: dno REFERENCES department (dno), Foreign Key: superssn REFERENCES employee (ssn)</p> <p>DEPARTMENT (<u>dno</u>, dname, mgrssn, mgrstartdate) Foreign Keys: mgrssn REFERENCES employee (ssn)</p> <p>DEP_LOCATIONS (<u>dno</u>, dlocation) Foreign Keys: dno REFERENCES department (dno),</p> <p>PROJECT (<u>pno</u>, pname, plocation, dno) Foreign Keys: dno REFERENCES department (dno),</p> <p>WORKS_ON (<u>essn</u>, <u>pno</u>, hours) Foreign Keys: essn REFERENCES employee (ssn) Foreign Keys: pno REFERENCES project (pno)</p> <p>DEPENDENT (<u>essn</u>, <u>dep_name</u>, gender, bdate date, relationship) Foreign Keys: essn REFERENCES employee (ssn)</p>
--

Queries based on Selection and Project operations:

(Q-01) List employees working for dno=4

$\sigma_{DNO=4} (EMPLOYEE)$

SELECT * FROM employee WHERE dno = 4;

(Q-02) List employees having salary > 30000

$\sigma_{SALARY > 30000} (EMPLOYEE)$

SELECT * FROM employee WHERE salary > 30000;

(Q-03) List first name, last name, and salary of all employees

$\pi_{LNAME, FNAME, SALARY} (EMPLOYEE)$

SELECT fname, lname, salary FROM employee;

(Q-04) List first name, last name, and salary of employees that work for dno=5.

$\pi_{LNAME, FNAME, SALARY} (\sigma_{DNO=5} (EMPLOYEE))$

SELECT fname, lname, salary FROM employee WHERE dno=5;

(Q-05) List employees having salary >= 10000 and <= 30000

$\sigma_{salary \geq 10000 \text{ AND } salary \leq 30000} (EMPLOYEE)$

SELECT * FROM employee WHERE salary >= 10000 AND salary <= 30000;

(Q-06) List (fname, dno, salary) of employees having salary ≥ 30000

$r1 \leftarrow \sigma_{\text{salary} \geq 30000}(\text{EMPLOYEE})$

$\text{result} \leftarrow \pi_{\text{fname}, \text{dno}, \text{salary}}(r1)$

OR

$\text{result} \leftarrow \pi_{\text{fname}, \text{dno}, \text{salary}}(\sigma_{\text{salary} \geq 30000}(\text{EMPLOYEE}))$

SELECT fname, dno, salary FROM employee WHERE salary ≥ 30000 ;

(Q-07) List Fname, Salary of all Female Employees

$\pi_{\text{fname}, \text{salary}}(\sigma_{\text{GENDER}='F'}(\text{EMPLOYEE}))$

SELECT fname, salary FROM employee WHERE gender='F';

(Q-08) List employees either working dno=4 and salary > 25000 or working dno=5 and salary > 30000 .

$\sigma_{(\text{DNO}=4 \text{ AND } \text{SALARY}>25000) \text{ OR } (\text{DNO}=5 \text{ AND } \text{SALARY} > 30000)}(\text{EMPLOYEE})$

SELECT * FROM employee WHERE (dno=4 AND salary > 25000) OR
(dno=5 AND salary ≥ 30000);

(Q-09) List all employees supervised by employee having ssn = 123

$\sigma_{(\text{superssn}=123)}(\text{EMPLOYEE})$

SELECT * FROM employee WHERE superssn=123;

Queries based on JOIN operations:

(Q-10) List Fname, Dname of all employees

$r1 \leftarrow \text{EMPLOYEE} \bowtie_{\text{employee.dno}=\text{department.dno}} \text{DEPARTMENT}$

$\text{result} \leftarrow \pi_{\text{fname}, \text{dname}}(r1)$

SELECT fname, dname FROM employee AS e
JOIN department AS d ON (e.dno=d.dno);

(Q-11) List Fname, Salary of all Female Supervisors

$s \leftarrow \pi_{\text{SUPERSSN}}(\text{EMPLOYEE})$

$r1 \leftarrow s \bowtie_{s.\text{superssn}=\text{ssn}} \text{EMPLOYEE}$

$r2 \leftarrow \sigma_{\text{GENDER}='F'}(r1)$

$\text{result} \leftarrow \pi_{\text{fname}, \text{salary}}(r2)$

SELECT fname, salary FROM employee AS e JOIN
(SELECT DISTINCT superssn FROM employee) AS r1
ON (r1.superssn=e.ssn)
WHERE gender='F';

(Q-12) List Fname, Salary of all Female Managers

$r1 \leftarrow \text{EMPLOYEE} \bowtie_{\text{employee.ssn}=\text{department.mgrssn}} \text{DEPARTMENT}$
 $\text{result}(\text{dname}, \text{mgr_name}) \leftarrow \pi_{\text{dname}, \text{fname}}(\sigma_{\text{GENDER}='F'}(r1))$

SELECT dname, fname AS mgr_name FROM employee AS e
JOIN department AS d ON (e.ssn=d.mgrssn)
WHERE gender='F';

(Q-13) List Employee that are working on projects monitored by DNO=4

$\pi_{\text{EMPLOYEE}.*}((\sigma_{\text{DNO}=4}(\text{PROJECT})) * \text{WORKS_ON}) * \text{EMPLOYEE})$

SELECT employee.* FROM project NATURAL JOIN works_on
JOIN employee ON(ssn=essn) WHERE project.dno=4

(Q-14) List Employee Name, SupervisorName (if any)

$\pi_{\text{e.fname}, \text{s.fname}}(\text{EMPLOYEE } e \text{ LEFT JOIN EMPLOYEE } s \text{ ON } (e.\text{superssn}=s.\text{ssn}))$

SELECT e.fname, s.fname FROM employee AS e LEFT JOIN employee AS s
ON(e.superssn=s.essn)

(Q-15) List employees(ssn, fname) that work on projects managed by department 'Research'.

$r1 \leftarrow \sigma_{\text{DNAME}='Research'}(\text{DEPARTMENT})$
 $r2 \leftarrow r1 * \text{PROJECT} * \text{WORKS_ON}$
 $r3 \leftarrow r2 \bowtie_{\text{ESSN}=\text{SSN}} \text{EMPLOYEE}$
 $\text{RESULT} \leftarrow \pi_{\text{SSN}, \text{FNAME}}(r3)$

SELECT ssn, fname FROM (
(SELECT * FROM department WHERE dname = 'Research') AS r1
NATURAL JOIN project NATURAL JOIN works_on) AS r2
JOIN employee AS e ON (ssn=essn);

Queries based on SET operations:

(Q-16) List ssn of non-managers, i.e. they are not manager of any department

$\pi_{\text{SSN}}(\text{EMPLOYEE}) \text{ EXCEPT } \pi_{\text{MGRSSN}}(\text{DEPARTMENT})$

SELECT ssn FROM employee
EXCEPT
SELECT DISTINCT mgrssn FROM department;

(Q-17) List ssn, and name of non-managers

$NM \leftarrow \pi_{SSN}(EMPLOYEE) \text{ EXCEPT } \pi_{MGRSSN}(DEPARTMENT)$
 $RES \leftarrow \pi_{SSN,FNAME}(EMPLOYEE * NM)$

SELECT ssn, fname FROM employee
NATURAL JOIN

(SELECT ssn FROM employee EXCEPT SELECT mgrssn FROM department) AS nm;

OR using Semi DIFFERENCE

SELECT ssn, fname FROM employee
WHERE ssn NOT IN (SELECT mgrssn FROM department);

Note: operator * between two relations here, represent Natural Join.

(Q-18) List SSN, FNAME of employees who do not work on any project.

$NW \leftarrow \pi_{SSN}(EMPLOYEE) \text{ EXCEPT } \pi_{ESSN}(WORKS_ON)$
 $RES \leftarrow \pi_{SSN,FNAME}(EMPLOYEE * NW)$

SELECT ssn, fname FROM employee
NATURAL JOIN

(SELECT ssn FROM employee EXCEPT SELECT essn FROM works_on) AS nw;

OR using Semi DIFFERENCE

SELECT ssn, fname FROM employee
WHERE ssn NOT IN (SELECT essn FROM works_on); //SEMI-DIFFERENCE

(Q-19) Find out Employees that either work for DNO=4 or associated with a department as manager

$e1 \leftarrow \sigma_{DNO=4}(EMPLOYEE)$
 $e2 \leftarrow \pi_{EMPLOYEE.*}(\sigma_{\text{department.dno}=4}(EMPLOYEE * DEPARTMENT))$
result $\leftarrow e1 \text{ UNION } e2$

OR

SELECT * FROM employee WHERE dno=4

UNION

SELECT employee.* FROM employee NATURAL JOIN department
WHERE department.dno=4;

(Q-20) List SSN, FNAME of employees who work on at least one project.

$EW \leftarrow \pi_{SSN}(EMPLOYEE) \text{ INTERSECT } \pi_{ESSN}(WORKS_ON)$
result $\leftarrow \pi_{SSN,FNAME}(EMPLOYEE * EW)$

SELECT ssn, fname FROM employee
NATURAL JOIN

(SELECT ssn FROM employee INTERSECT SELECT essn FROM works_on) AS ew;

SELECT ssn, fname FROM employee
WHERE ssn IN (SELECT essn FROM works_on); //SEMI-JOIN or SEMI-INTERSECT