Course: COSC475.101 – Database Management Systems

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Room: YR-304

Assignment #4

Due Date: March 12, 2020 11:59pm

1. Specify relational algebra expression for the following descriptions on the database schema shown in Figure 5.7 using the relational operators discussed in this chapter. Also show the result of each query if applied to the database of Figure 5.7 (pg. 164).
   1. Retrieve the names of employees in department 5 who work more than 10 hours per week on the 'ProductX' project.

Emp\_w ← (σ PNAME=’ProductX’(PROJECT)) PNUMBER = PNO(WORKS\_ON)

EMP\_WORK\_10 ← (EMPLOYEE) SSN=ESSN(σ HOURS>10(EMP\_W))

RESULT ← Π LNAME, FNAME(σ DNO = 5 (EMP\_WORK\_10)

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

E ← (EMPLOYEE) SSN = ESSN AND FNAME = DEPENDENT\_NAME (DEPENDENT)

R ← Π LNAME,FNAME (E)

Output: Empty

* 1. Find the names of employees that are directly supervised by 'Franklin Wong'.

Wong\_ssn ← Π SSN (σ FNAME = 'Franklin' AND LNAME = 'Wong' (EMPLOYEE))

WONG\_EMPS ← (EMPLOYEE) SUPERSSN = SSN (WONG\_SSN)

RESULT ← Π LNAME,FNAME (WONG\_EMPS)

Output: LNAME FNAME

Smith John

Narayan Ramesh

English Joyce

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

PROJ\_HOURS(PNO,TOTAL\_HRS) ← PNO ℑ SUM HOURS (WORKS\_ON)

RESULT ← Π PNAME,TOTAL\_HRS ( (PROJ\_HOURS) PNO=PNUMBER (PROJECT) )

Output: PNAME TOT\_HRS

ProductX 52.5

ProductY 37.5

ProductZ 50.0

Computerization 55.0

Reorganization 25.0

Newbenefits 55.0

* 1. Retrieve the names of employees who work on every project.

PROJ\_EMPS(PNO,SSN) ← Π PNO,ESSN (WORKS\_ON)

ALL\_PROJS(PNO) ← Π PNUMBER (PROJECT)

EMPS\_ALL\_PROJS ← PROJ\_EMPS ÷ ALLPROJS

RESULT ← Π LNAME,FNAME (EMPLOYEE \* EMP\_ALL\_PROJS)

Output: Empty

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

ALL\_EMPS ← Π SSN(EMPLOYEE)

WORKING\_EMPS(SSN) ← Π ESSN(WORKS\_ON)

NON\_WORKING\_EMPS ← ALL\_EMPS - WORKING\_EMPS

RESULT ← Π LNAME,FNAME (EMPLOYEE \* NON\_WORKING\_EMPS)

Output: Empty

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

DEPT\_AVG\_SALS(DNUMBER,AVG\_SAL) ← DNO ℑ AVG SALARY (EMPLOYEE)

RESULT ← Π DNAME,AVG\_SAL ( DEPT\_AVG\_SALS \* DEPARTMENT )

Output: DNAME AVG\_SAL

Research 33250

Administration 31000

Headquarters 55000

* 1. Retrieve the average salary of all female employees.

RESULT(AVG\_F\_SAL) ← ℑAVG SALARY (σ SEX='F' (EMPLOYEE) )

Output: AVG\_F\_SAL

31000

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

DEPT\_MANAGERS(SSN) ← Π MGRSSN (DEPARTMENT)

EMPS\_WITH\_DEPENDENTS(SSN) ← Π ESSN (DEPENDENT)

RESULT\_EMPS ← DEPT\_MANAGERS - EMPS\_WITH\_DEPENDENTS

RESULT ← Π LNAME,FNAME (EMPLOYEE \* RESULT\_EMPS)

Output: LNAME FNAME

Borg James

1. Specify relational calculus expression for the following descriptions on the database schema shown in Figure 3.5 using the relational operators discussed in this chapter. Also show the result of each query if applied to the database of Figure 5.7 (pg. 164).
2. Retrieve the names of employees in department 5 who work more than 10 hours per week on the 'ProductX' project.

With tuple relational calculus:

{ e.LNAME, e.FNAME | EMPLOYEE(e) AND e.DNO = 5 AND (∃ p) (∃ w)

(WORKS\_ON(w) AND PROJECT(p) AND e.SSN = w.ESSN AND

w.PNO = p.PNUMBER AND p.PNAME = 'ProductX' AND w.HOURS > 10 ) }

With Domain relational calculus:

{ qs | EMPLOYEE(qrstuvwxyz) AND z=5 AND (∃ a) (∃ b) (∃ e)

(∃ f) (∃ g) ( WORKS\_ON(efg) AND PROJECT(abcd) AND t=e AND f=b AND

a='ProductX' AND g>10 ) }

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

With tuple relational calculus:

{ e.LNAME, e.FNAME | EMPLOYEE(e) AND (∃ d) ( DEPENDENT(d) AND e.SSN=d.ESSN AND e.FNAME=d.DEPENDENT\_NAME ) }

Domain relational calculus:

{ qs | (∃ t) (∃ a) (∃ b) ( EMPLOYEE(qrstuvwxyz) AND DEPENDENT(abcde) AND a=t

AND b=q ) }