Solution to Homework 2 for Database

March 29, 2001

1 Problem 1

1 \( \Pi_{\text{Lives, Pname, Lives, Street}}(\sigma_{\text{Works, Cname}=\text{Macy}}(\text{Lives} \land \text{Works})) \)

2 \( \Pi_{\text{Pname}}(\text{Lives}) - \Pi_{\text{Pname}}(\text{Works}) \)

3 \( \Pi_{\text{Lives, Pname}}(\sigma_{\text{LocatedAt, City}=\text{Lives, Pcity}}(\text{Lives} \land \text{Works} \land \text{LocatedAt})) \)

4 \( \Pi_{\text{Pname}}(\text{Works}) - \Pi_{\text{Pname}}(\sigma_{\text{Cname}=\text{Macy}}(\text{Works})) \)

5 \( \Pi_{\text{b.Pname, a.Mname}}(\sigma_{\text{a.Pname}=\text{b.Mname}}(\rho_{\text{a}}(\text{ReportsTo}) \times \rho_{\text{b}}(\text{ReportsTo}))) \)

6 \( I \leftarrow \rho_{\text{R}(\text{Pname1, Pname})}(\text{ReportsTo}) \land \text{Works} \land \text{LocatedAt} \)

7 \( \Pi_{\text{I, Pname, Lives, Pname}}(\sigma_{\text{I, City}=\text{Lives, Pcity}}(I \land \text{Lives})) \)

8 \( \Pi_{\text{Cname}}(\text{LocatedAt}) - \Pi_{\text{Cname}}(\sigma_{\text{L1.Cname}=\text{Macy}} \land \text{L2.City}=\text{L1.City}(\rho_{\text{L1}}(\text{LocatedAt}) \times \rho_{\text{L2}}(\text{LocatedAt}))) \)

9 \( \Pi_{\text{Pname}}(\sigma_{\text{Pname}=\text{Mname}}(\text{ReportsTo})) \)

\( \Pi_{\text{a.Pname}}(\sigma_{\text{a.Pname}=\text{b.Pname} \land \text{a.Cname}=\text{b.Cname}}(\rho_{\text{a}}(\text{Works}) \times \rho_{\text{b}}(\text{Works}))) \)

REM 1.1
FROM Lives, Works
WHERE Lives.Pname = Works.Pname
AND Works.Cname = 'Macy'
/
REM 1.2
SELECT distinct Pname
FROM Lives
WHERE Pname NOT IN (  
SELECT Pname  
FROM Works)
/
REM 1.3
SELECT distinct Li.Pname
FROM Lives Li, Works W, LocatedAt Lo
WHERE Li.Pname=W.Pname  
AND W.Cname=Lo.Cname  
AND Lo.Ccity=Li.Pcity
/
REM 1.4
SELECT distinct Pname
FROM Works
WHERE Pname NOT IN (  
SELECT Pname  
FROM Works
WHERE Cname = 'Macy')
/
REM 1.5
SELECT b.Pname, a.Mname
FROM ReportsTo a, ReportsTo b
WHERE a.Pname = b.Mname
/
REM 1.6
SELECT R.Mname, Li.Pname
FROM Lives Li, ReportsTo R, Works W, LocatedAt Lo
WHERE R.Mname=W.Pname  
AND W.Cname=Lo.Cname  
AND Lo.Ccity=Li.Pcity
/
REM 1.7
SELECT distinct Cname
FROM LocatedAt
WHERE Cname NOT IN (  
SELECT Cname
FROM LocatedAt
WHERE Ccity IN (  
SELECT Ccity
FROM LocatedAt
WHERE Cname='Macy')  
AND Ccity NOT IN (  
SELECT Ccity
FROM LocatedAt
WHERE Cname='Macy')
2 Problem 2

(a) \[ \Pi_{\text{employee-name}} (\sigma_{\text{company-name} \neq 'FCB'}(\text{works})) \]

(b) \[ \Pi_{\text{employee.employee-name,employee.city}} (\sigma_{\text{works.company-name} = 'FCB'}(\text{employee} \bowtie \text{works})) \]

(c) \[ \text{temp} \leftarrow \sigma_{\text{works.company-name} = 'FCB' \land \text{works.salary} > 10000}(\text{employee} \bowtie \text{works}) \]
\[ \Pi_{\text{employee.employee-name,employee.city,works.salary}}(\text{temp}) \]

(d) \[ \Pi_{\text{employee.employee-name}} (\sigma_{\text{employee.city} = \text{company.city}}(\rho_{\text{employee}}(\text{employee-name,street,city})(\text{employee}) \bowtie \text{works} \bowtie \text{company})) \]

(e) \[ \Pi_{e1.\text{employee-name}} (\sigma_{e}(\rho_{e1}(\text{employee}) \times \rho_{e2}(\text{employee}) \times \rho_{m}(\text{manages}))) \]
\[ c \text{ is } m.\text{employee-name} = e1.\text{employee-name} \land \text{m.manager-name} = e2.\text{employee-name} \land e1.\text{street} = e2.\text{street} \land e1.\text{city} = e2.\text{city} \]

(f) \[ \Pi_{\text{employee-name}}(\text{employee}) - \Pi_{\text{employee-name}}(\sigma_{\text{company-name} = 'FCB'}(\text{works})) \]

(g) \[ \text{w2} \leftarrow \sigma_{\text{company-name} = 'FCB'}(\text{works}) \]
\[ \Pi_{\text{employee-name}}(\text{employee}) - \Pi_{\text{works.employee-name}} (\sigma_{\text{works.salary} \leq \text{w2.salary}}(\text{works} \times \text{w2})) \]
3  Problem 3

REM 4.2a
SELECT employee-name
FROM works
WHERE company-name='First Bank Corporation'
/
REM 4.2b
SELECT e.employee-name, e.city
FROM employee e, works w
WHERE e.employee-name=w.employee-name
AND w.company-name='First Bank Corporation'
/
REM 4.2c
SELECT e.employee-name, e.city, w.salary
FROM employee e, works w
WHERE e.employee-name=w.employee-name
AND w.company-name='First Bank Corporation'
AND w.salary>10000
/
REM 4.2d
SELECT distinct e.employee-name
FROM employee e, works w, company c
WHERE e.employee-name=w.employee-name
AND w.company-name=c.company-name
AND c.city=e.city
/
REM 4.2e
SELECT distinct e1.employee-name
FROM employee e1, manages m, employee e2
WHERE e1.employee-name=m.employee-name
AND m.manager-name=e2.employee-name
AND e1.street=e2.street
AND e1.city=e2.city
/
REM 4.2f
SELECT distinct employee-name
FROM works
WHERE employee-name NOT IN (  
SELECT employee-name
FROM works
WHERE company-name='First Bank Corporation')
/
REM 4.2g
SELECT distinct e.employee-name, w.company-name, w.salary
FROM employee e, works w
WHERE e.employee-name=w.employee-name
AND w.salary > ( 
SELECT max(salary)
FROM works 
WHERE company-name='Small Bank Corporation')
/
REM 4.2h
SELECT distinct a.company-name 
FROM company a, company b 
WHERE a.city=b.city 
AND b.company-name='Small Bank Corporation'
AND a.company-name != 'Small Bank Corporation'
/
REM 4.2h alternative
SELECT distinct company-name 
FROM company 
WHERE company-name != 'Small Bank Corporation'
AND city IN ( 
SELECT city 
FROM company 
WHERE company-name='Small Bank Corporation')
/
REM 4.2i
SELECT distinct w.employee-name 
FROM works w, (SELECT company-name, avg(salary) salary 
FROM works 
GROUP BY company-name) a 
WHERE w.company-name = a.company-name 
AND w.salary > a.salary
/
REM 4.2j
SELECT max(num) 
FROM (SELECT count(employee-name) num 
FROM works 
GROUP BY company-name)
/
REM 4.2k
SELECT min(payroll) 
FROM (SELECT sum(salary) payroll 
FROM works 
GROUP BY company-name)
/
REM 4.2l
SELECT company-name 
FROM works 
GROUP BY company-name
HAVING avg(salary) > ( 
SELECT avg(salary) 
FROM works 
WHERE company-name = 'First Bank Corporation') 
/

4 Problem 4
(a) r1 union r2 
(b) r1 intersect r2 
(c) r1 except r2 
(d) select r1.A, r1.B,r2.C
from r1,r2 
where r1.B=r2.B

5 Problem 5
REM 5a
SELECT R.recipe-name 
FROM Recipe R, Recipe-Origin O 
WHERE R.recipe-name = O.recipe-name 
AND O.country != 'Italy' 
AND R.ingredient = 'garlic' 
AND R.amount-used > ( 
SELECT max(amount-used) 
FROM Recipe R, Recipe-Origin O 
WHERE R.recipe-name = O.recipe-name 
AND O.country = 'Italy' 
AND R.ingredient = 'garlic') 
/
REM 5b
SELECT R.recipe-name 
FROM Recipe R, Recipe-Origin O 
WHERE R.recipe-name = O.recipe-name 
AND O.country != 'Italy' 
AND R.ingredient = 'garlic' 
AND R.amount-used > ( 
SELECT min(amount-used) 
FROM Recipe R, Recipe-Origin O 
WHERE R.recipe-name = O.recipe-name 
AND O.country = 'Italy' 
AND R.ingredient = 'garlic') 
/

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