Database Management System (DBMS)

Lecture-22

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Exercise(cont.)

Consider the relational database of previous question. Give an expression in the relational algebra for each request:

1. Modify the database so that Jones now lives in Newtown.
2. Give all employees of First Bank Corporation a 10 percent salary raise.
3. Give all managers in this database a 10 percent salary raise.
4. Give all managers in this database a 10 percent salary raise, unless the salary would be greater than $100,000. In such cases, give only a 3 percent raise.
5. Delete all tuples in the works relation for employees of Small Bank Corporation.

Solution

1. $employee \leftarrow \Pi_{person-name,street,"Newtown"}(\sigma_{person-name="Jones"}(Employee)) \cup (employee - \sigma_{person_name="Jones"}(employee))$
2. $works \leftarrow \Pi_{person-name,company-name,salary*1.1}(\sigma_{company-name="FirstBankCorporation"}(works)) \cup (works - \sigma_{company-name="FirstBankCorporation"}(works)$
3. $temp \leftarrow \Pi_{works.person-name,company-name,salary}(\sigma_{works.person-name=manages.manages-name}(works \times manages))$
   $works \leftarrow (works - temp) \cup \Pi_{works.person-name,comapny-name,salary*1.1}(temp)$

Solution(cont.)

4. $temp1 \leftarrow$
$\Pi_{works.person-name,company-name,salary}(\sigma_{works.person-name=manages.manages-name}(works \times manages))$
$temp2 \leftarrow \Pi_{works.person-name,company-name,salary*1.03}(\sigma_{salary*1.1>100000}(temp1))$
$temp2 \leftarrow$
$temp2 \cup \Pi_{works,person-name,company-name,salary*1.1}(\sigma_{salary*1.1\leq 100000}(temp1))$
$works \leftarrow (works - temp1) \cup temp2$

5. $works \leftarrow works - \sigma_{company-name="Small\ \ Bank\ \ Corporation"}(works)$

Exercise(cont.)

Let the following relation schemas be given:

R = (A, B, C) and S = (D, E, F)

Let relations r(R) and s(S) be given. Give an expression in the tuple relational calculus that is equivalent to each of the following:

1. $\Pi_A(r)$
2. $\sigma_{B=17}(r)$
3. r×s
4. $\Pi_{A,F}(\sigma_{C=D}(r \times s))$

Solution

1. $\{t \mid \exists u \in r(t[A] = u[A])\}$
2. $\{t \mid t \in r \wedge t[B] = 17\}$
3. $\{t \mid \exists u \in r(t[A] = u[A] \wedge t[B] = u[B] \wedge t[C] = u[C] \wedge \exists w \in s(t[D] = w[D] \wedge t[E] = w[E] \wedge t[F] = w[F]))\}$
4. $\{t \mid \exists u \in r(t[A] = u[A] \wedge \exists w \in s(t[F] = w[F] \wedge u[C] = w[D]))\}$

Exercise(cont.)

Let R = (A, B, C), and let r_1 and r_2 both be relations on schema R. Give an expression in the domain relational calculus that is equivalent to each of the following:

1. $\Pi_A(r_1)$
2. $\sigma_{B=17}(r_1)$
3. $r_1 \cup r_2$
4. $r_1 \cap r_2$
5. $r_1 - r_2$
6. $\Pi_{A,B}(r_1) \bowtie \Pi_{B,C}(r_2)$

Solution

1. $\{< a > \mid \exists b, c(< a, b, c > \in r_1)\}$
2. $\{< a, b, c > \mid < a, b, c > \in r_1 \wedge b = 17)\}$
3. $\{< a, b, c > \mid < a, b, c > \in r_1 \vee < a, b, c > \in r_2\}$
4. $\{< a, b, c > \mid < a, b, c > \in r_1 \wedge < a, b, c > \in r_2\}$
5. $\{< a, b, c > \mid < a, b, c > \in r_1 \wedge < a, b, c > \notin r_2\}$
6. $\{< a, b, c > \mid \exists p, q(< a, b, p > \in r_1 \wedge < q, b, c > \in r_2)\}$