

16337341(朱志儒)数据库系统作业 3

6.11

a.

$$\Pi_{person_name}(\sigma_{company_name = "First Bank Corporation"}(employee \bowtie works))$$

b.

$$\Pi_{person_name, city}(\sigma_{company_name = "First Bank Corporation"}(employee \bowtie works))$$

c.

$$\Pi_{person_name, street, city}(\sigma_{company_name = "First Bank Corporation" \wedge salary > 10000} (employee \bowtie works))$$

d.

$$\Pi_{person_name}(employee \bowtie works \bowtie company)$$

e.

$$\Pi_{company_name}(company \div \Pi_{city}(\sigma_{company_name = "Small Bank Corporation"}(company)))$$

6.12

a.

$$t_1 \leftarrow \text{course_id} \mathcal{G}_{count(ID) \text{ as } teacher_num}(teaches) \\ \Pi_{couse_id}(\sigma_{teacher_num > 1}(t_1))$$

b.

$$\Pi_{teaches.couse_id}(teaches \bowtie_{teaches.couse_id=ta.couse_id \wedge teaches.ID \neq ta.ID} \rho_{ta}(teaches))$$

6.13

a.

$$t_1 \leftarrow \text{company_name} \mathcal{G}_{count(person_name) \text{ as } person_num}(works) \\ t_2 \leftarrow \mathcal{G}_{max(person_num)}(t_1) \\ \Pi_{company_name}(\sigma_{person_name=t_2}(t_1))$$

b.

$$t_1 \leftarrow \mathcal{G}_{min(salary)}(works) \\ \Pi_{company_name}(\sigma_{salary=t_1}(works))$$

c.

$$\begin{aligned} t_1 &\leftarrow \text{company_name} \mathcal{G}_{avg}(\text{salary}) \text{ as } avg_salary(\text{works}) \\ t_2 &\leftarrow \mathcal{G}_{avg}(\text{salary})(\sigma_{\text{company_name}="First Bank Corporation"}(\text{works})) \\ &\quad \Pi_{\text{company_name}}(\sigma_{avg_salary > t_2}(t_1)) \end{aligned}$$

6.15

a.

元组关系演算表达式:

$$\{t | \exists s \in \text{works}(t[\text{person_name}] = s[\text{person_name}] \wedge s[\text{company_name}] = \text{"First Bank Corporation"})\}$$

域关系演算表达式:

$$\{ \langle pn \rangle \mid \exists cn, s \ (\langle pn, cn, s \rangle \in \text{works} \wedge cn = \text{"First Bank Corporation"}) \}$$

b.

元组关系演算表达式:

$$\begin{aligned} \{t | \exists s \in \text{works}(t[\text{person_name}] = s[\text{person_name}] \wedge s[\text{company_name}] \\ = \text{"First Bank Corporation"}) \wedge \exists u \in \text{employee}(u[\text{person_name}] \\ = s[\text{person_name}] \wedge t[\text{city}] = u[\text{city}]) \} \end{aligned}$$

域关系演算表达式:

$$\{ \langle pn, ci \rangle \mid \exists st, cn, s \ (\langle pn, st, ci \rangle \in \text{employee} \wedge \langle pn, cn, s \rangle \in \text{works} \wedge cn = \text{"First Bank Corporation"}) \}$$

c.

元组关系演算表达式:

$$\{t | t \in \text{employee} \wedge (\exists s \in \text{works}(s[\text{person_name}] = t[\text{person_name}]) \wedge s[\text{company_name}] = \text{"First Bank Corporation"} \wedge s[\text{salary}] > 10000)\}$$

域关系演算表达式:

$$\{ \langle pn, st, ci \rangle \mid \exists cn, s \ (\langle pn, st, ci \rangle \in \text{employee} \wedge \langle pn, cn, s \rangle \in \text{works} \wedge cn = \text{"First Bank Corporation"} \wedge s > 10000) \}$$

d.

元组关系演算表达式:

$$\begin{aligned} \{t | \exists s \in \text{employee}(t[\text{person_name}] = s[\text{person_name}]) \wedge \exists u \in \text{works}(u[\text{person_name}] \\ = s[\text{person_name}]) \wedge \exists r \in \text{company}(r[\text{company_name}] \\ = u[\text{company_name}] \wedge r[\text{city}] = s[\text{city}]) \} \end{aligned}$$

域关系演算表达式:

$$\{ \langle pn \rangle \mid \exists st, ci, cn, sa \ (\langle pn, st, ci \rangle \in employee \wedge \langle pn, cn, sa \rangle \in works \wedge \langle cn, ci \rangle \in company) \}$$

e.

元组关系演算表达式:

$$\begin{aligned} \{ t \mid \exists u \in manages \wedge \exists a \in employee \wedge \exists s \in employee (& t[person_name] \\ & = s[person_name] \wedge u[person_name] \\ & = s[person_name] \wedge u[manager_name] = a[person_name] \wedge s[city] \\ & = a[city] \wedge s[street] = a[street]) \} \end{aligned}$$

域关系演算表达式:

$$\{ \langle pn \rangle \mid \exists st, ci, mn \ (\langle pn, st, ci \rangle \in employee \wedge \langle pn, mn \rangle \in manages \wedge \langle mn, st, ci \rangle \in employee) \}$$

f.

元组关系演算表达式:

员工只在一个公司工作:

$$\{ t \mid \exists u \in works (u[person_name] = t[person_name] \wedge u[company_name] \neq "First Bank Corporation") \}$$

员工在多个公司工作或员工不属于任何公司:

$$\{ t \mid \exists s \in employee (t[person_name] = s[person_name]) \wedge \neg \exists u \in works (u[person_name] = s[person_name] \wedge u[company_name] = "First Bank Corporation") \}$$

域关系演算表达式:

员工只在一个公司工作:

$$\{ \langle pn \rangle \mid \exists cn, sa \ (\langle pn, cn, sa \rangle \in works) \wedge cn \neq "First Bank Corporation" \}$$

员工在多个公司工作或员工不属于任何公司:

$$\{ \langle pn \rangle \mid \exists st, ci \ (\langle pn, st, ci \rangle \in employee \wedge \neg \exists cn, sa \ (cn = "First Bank Corporation" \wedge \langle pn, cn, sa \rangle \in works)) \}$$

g.

元组关系演算表达式:

$$\{ t \mid \exists s \in works (t[person_name] = s[person_name]) \wedge \forall u \in works (u[company_name] = "Small Bank Corporation" \Rightarrow s[salary] > u[salary]) \}$$

域关系演算表达式:

$$\{ \langle pn \rangle \mid \exists cn, sa \ (\langle pn, cn, sa \rangle \in works \wedge \forall sal, pi \ (\langle pi, co, sal \rangle \in works \wedge co = "Small Bank Corporation" \Rightarrow sa > sal)) \}$$

h.

元组关系演算表达式:

$$\{t \mid \exists s \in company(t[company_name] = s[company_name]) \wedge \forall u \in company(u[company_name] = "Small Bank Corporation" \Rightarrow s[city] = u[city])\}$$

域关系演算表达式:

$$\{ \langle cn \rangle \mid \exists ci \ (\langle cn, ci \rangle \in company) \wedge \forall cit \ (\langle co, cit \rangle \in company \wedge co = "Small Bank Corporation" \Rightarrow ci = cit) \}$$

6.16

a.

$$\Pi_A(\sigma_{B=17}(r))$$

b.

$$\Pi_{A,B,C}(r \bowtie s)$$

c.

$$\Pi_A(r) \cup (s \div \Pi_C(s))$$

d.

$$\Pi_{r.A}((s \bowtie r) \bowtie_{s.C=t.A \wedge r.B > t.B} (\rho_t(r)))$$

6.17

a.

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SELECT A
FROM r
WHERE B = 17;
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b.

```
SELECT A, B, C
FROM r NATURAL JOIN s;
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c.

```
(SELECT A
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FROM r)
UNION
(SELECT A
FROM s T
WHERE NOT EXISTS (
    SELECT C
    FROM s N
    WHERE NOT EXISTS (
        SELECT *
        FROM s M
        WHERE M.A = T.A AND M.C = N.C)));
```

d.

```
SELECT r.A
FROM r NATURAL JOIN s, r AS t
WHERE s.C = t.A AND r.B > t.B;
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