2023 数据库概论第三次作业

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0.1

1.

$\Pi_{SNO}(\sigma_{S.CITY=Beijing \vee S.CITY=Tianjing}(SPJ \bowtie S))$

2.

$\Pi_{SNO}(\sigma_{S.CITY=J.CITY}(S \bowtie SPJ \bowtie J))$

3.

$\Pi_{SNO}(SPJ) - \Pi_{SNO}(\sigma_{S.CITY=J.CITY}(S \bowtie SPJ \bowtie J))$

4.

$\Pi_{SNO,JNO}(SPJ) \div \Pi_{JNO}(\sigma_{CITY=Beijing}(J))$

5.

$\Pi_{PNO}(P) - \Pi_{P.PNO}(\sigma_{P.PRICE<Q.PRICE}(P \times \rho_Q(P)))$

0.2

1.

$\Pi_{SC1.sno}(\sigma_{SC1.sno=SC2.sno}(\rho_{SC1}(\sigma_{cno=c1}(SC)) \times \rho_{SC2}(\sigma_{cno=c2}(SC)))) - \Pi_{sno}(\sigma_{sno \neq c1 \wedge sno \neq c2}(SC))$

2.

我们记 s1 选择的课程表为

$S1CNO \leftarrow \Pi_{cno}(\sigma_{sno=s1}(SC))$，

s1 没有选择的课程表为

$LEFT \leftarrow \Pi_{cno}(SC) - S1CNO$

原问题所求为

$\Pi_{sno,cno}(SC) \div S1CNO - \Pi_{SC.sno}(SC \bowtie_{SC.cno=LEFT.cno} LEFT)$

3.

$S1CNO$ 定义同上题，原问题所求为

$\Pi_{sno}(SC) - \Pi_{sno}(SC \bowtie_{SC.cno=S1CNO.cno} S1CNO)$

0.3

$$
\begin{aligned}
&\sigma_{\theta_1}(\sigma_{\theta_2}(R)) \\
=&\sigma_{\theta_1}(\{t|t \in R, \theta_2(T) = True\}) \\
=&\{t'|t' \in \{t|t \in R, \theta_2(T) = True\}, \theta_1(t') = True\} \\
=&\{t|t \in R, \theta_1(t) = True \wedge \theta_2(t) = True\}
\end{aligned}
$$

同理，$\sigma_{\theta_2}(\sigma_{\theta_1}(R)) = \{t|t \in R, \theta_1(t) = True \wedge \theta_2(t) = True\}$

因而 $\sigma_{\theta_1}(\sigma_{\theta_2}(R)) = \sigma_{\theta_2}(\sigma_{\theta_1}(R))$

0.4

(1)

记 $C1CNO$ 为 c1 的课程号，$C2CNO$ 为 c2 的课程号。

元组关系验算:

$\{t|\exists w_1, w_2 \in SC(w_1[cno] = C1CNO \wedge w_2[cno] = C2CNO \wedge w_1[sno] = t[sno] \wedge w_2[sno] = t[sno])\}$

域关系验算:

$\{< a > |\exists g_1, g_2(< a, C1CNO, g_1 >\in SC\wedge < a, C2CNO, g_2 >\in SC)\}$

(2)

记 $S1SNO$ 为 s1 同学的学号，$C1CNO$ 为 c1 的课程号。

元组关系验算:

$\{t|\exists w_0 \in SC, \exists w \in SC(w[sno] = t[sno] \wedge w_0[sno] = S1SNO \wedge w[cno] = C1CNO \wedge w_0[cno] = C1CNO \wedge w[grade] > w_0[grade])\}$

域关系验算:

$\{< a > |\exists c_1, c_2(< a, C1CNO, c_1 >\in SC, < S1SNO, C1CNO, c_2 >\in SC, c_1 > c_2)\}$

0.5

$\sigma_{R.A=S.A\wedge R.B\neq S.B}(R \times \rho_S(R)) = \Phi$

$\sigma_{R.A=S.A\wedge (R.B\neq S.B\vee R.C\neq S.C)}(R \times \rho_S(R)) = \Phi$