

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

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

3.

S1CNO 定义同上题，原问题所求为

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

0.3

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

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

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

(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:

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

0.5

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

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