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CS353 Section 2
HW1

Q1)

a) ① $t_1 \leftarrow \Pi_{c\text{-}id} \left(\sigma_{dept="EE" \land credits=3}^{(course)} \right)$ ② $t_2 \leftarrow \Pi_{s\text{-}id}(t_1 \bowtie take)$

③ $\Pi_{s\text{-}id, s\text{-}name} \left(\sigma_{dept="CS"}^{(student)} \bowtie t_2 \right)$

b) ① $t_1 \leftarrow \Pi_{c\text{-}id} \left(\sigma_{dept="MATH" \land credits=4}^{(course)} \right)$ ② $t_2 \leftarrow \Pi_{s\text{-}id, c\text{-}id}(take)$

③ $\Pi_{s\text{-}id, s\text{-}name} \left(\sigma_{dept="CS" \land year=4} ((t_2 \div t_1) \bowtie student) \right)$

c) ① $t_1 \leftarrow \Pi_{c\text{-}id} \left(\sigma_{p\text{-}id="CS101"}^{(prereq)} \right)$ ② $t_2 \leftarrow \Pi_{s\text{-}id} \left(\sigma_{grade="A"} (take \bowtie t_1) \right)$

③ $\Pi_{s\text{-}id, s\text{-}name} \left(\sigma_{dept="CS"} (student \bowtie t_2) \right)$

d) ① $t_1 \leftarrow \sigma_{c\text{-}id="CS353"}^{(prereq)}$ ② $t_2 \leftarrow \sigma_{grade="A"} (take \underset{take.c\text{-}id = t_1.p\text{-}id}{\bowtie} t_1)$

③ $\Pi_{s\text{-}id, s\text{-}name} \left(\sigma_{dept="CS"}(student) \bowtie t_2 \right)$

e) ① $t_1 \leftarrow \Pi_{s\text{-}id} \left(\rho_a \left(\sigma_{c\text{-}id="CS353"}^{(take)} \right) \underset{a.s\text{-}id=b.s\text{-}id \land a.grade > b.grade}{\bowtie} \rho_b \left(\sigma_{c\text{-}id="CS342"}^{(take)} \right) \right)$

② $\Pi_{s\text{-}id, s\text{-}name} \left(\sigma_{year=3 \land dept="CS"} (student \bowtie t_1) \right)$

f) ① $t_1 \leftarrow \sigma_{year=1 \land dept="CS"} (student)$ ② $\Pi_{s\text{-}id, s\text{-}name} \left(\sigma_{grade \geq C} (take \bowtie t_1) \right)$

g) $\mathcal{G}_{count(*)} \left(\sigma_{c\text{-}id="CS353" \land grade="A"} (take) \right)$

h) ① $t \leftarrow {}_{c\text{-}id}\mathcal{G}_{count(*) \text{ as prereq-number}}^{(prereq)}$ ② $\Pi_{c\text{-}id} \left(\sigma_{prereq\text{-}number \geq 3} (t) \right)$

i) ① $t_1 \leftarrow {}_{c\text{-}id}\mathcal{G}_{count(*) \text{ as prereq-number}}^{(prereq)}$ ② $t_2 \leftarrow \mathcal{G}_{max(prereq\text{-}number) \text{ as max-prereq}}^{(t_1)}$

③ $\Pi_{c\text{-}id} \left(t_1 \underset{t_1.prereq\text{-}number = t_2.max\text{-}prereq}{\bowtie} t_2 \right)$

Q2)

a) ① $t_1 \leftarrow \sigma_{\text{away-team}="Anadolu Efes" \wedge \text{home-points} > \text{away-points}} (\text{game})$

② $\pi_{\text{tname}} (\text{team} \bowtie_{\text{team.tname} = t_1.\text{home-team}} t_1)$

b) ① $t_1 \leftarrow \sigma_{\text{home-team}="Anadolu Efes" \wedge \text{away-points} > \text{home-points}} (\text{game})$ ② $\pi_{\text{p-id, pname}} (\text{player} \bowtie_{\text{player.tname} = t_1.\text{away-team}} t_1)$

c) ① $t_1 \leftarrow \pi_{\text{home-team}} (\sigma_{\text{home-points} \leq \text{away-points}} (\text{game}))$

② $\pi_{\text{tname}} (\text{team}) - t_1$

d) ① $t_1 \leftarrow \pi_{\text{tname}} (\sigma_{\text{city}="istanbul"} (\text{team}))$ ② $t_2 \leftarrow \text{player} \bowtie t_1$

③ $_{\text{tname}} G_{\text{min(age) as min-age}} (t_2)$

e) ① $t_1 \leftarrow \, _{\text{tname}} G_{\text{min(age) as age}} (\text{player} \bowtie (\sigma_{\text{city}="istanbul"} (\text{team})))$

② $\pi_{\text{p-id, pname}} (\text{player} \bowtie t_1)$

f) ① $t_1 \leftarrow \pi_{\text{home-team}} (\sigma_{\text{away-team}="Anadolu Efes" \wedge \text{home-points} > \text{away-points}} (\text{game}))$ ② $t_2 \leftarrow G_{\text{min(budget) as min-budget}} (\text{team} \bowtie_{\text{team.tname} = t_1.\text{home-team}} t_1)$

③ $\pi_{\text{tname}} (\rho_a (\text{team} \bowtie_{\text{team.tname} = t_1.\text{home-team}} t_1) \bowtie_{a.\text{budget} = t_2.\text{min-budget}} t_2)$

Q3) **Proof by Contradiction:**

Consider R:

A	B
1	a
2	b
3	c

and S:

A	B
1	a
1	b
3	c

and θ: A < 2

In this case, $\sigma_\theta (R \cup S) = $

A	B
1	a
1	b

and $\sigma_\theta (R) \cup S = $

A	B
1	a
1	b
3	c

The two results are different, hence by contradiction $\sigma_\theta (R \cup S) \neq \sigma_\theta (R) \cup S$.