

CS143 Homework 1

CHARLES XIAN ZHANG

TOTAL POINTS

4 / 4

QUESTION 1

1 Question 1 1 / 1

- ✓ - **0 pts** Correct
- **1 pts** Incorrect
- **0.5 pts** Partial correct

QUESTION 2

2 Question 2 1 / 1

- ✓ - **0 pts** Correct
- **1 pts** Incorrect

QUESTION 3

3 Question 3 1 / 1

- ✓ - **0 pts** Correct
- **1 pts** Incorrect
- **0.5 pts** Partial correct

QUESTION 4

4 Question 4 1 / 1

- ✓ - **0 pts** Correct
- **1 pts** Incorrect

CS 143 Homework 1

Charles Zhang

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Problem 1

Compute $(R - S) \cup (S - R)$.

This is the set of tuples that are present in R but not S *or* are present in S , but not R .

$$(R - S) = \{(7, 5, 3), (1, 4, 3), (6, 7, 9)\}$$

$$(S - R) = \{(1, 4, 4), (8, 3, 2)\}$$

$(R - S) \cup (S - R) = \{(7, 5, 3), (1, 4, 3), (6, 7, 9), (1, 4, 4), (8, 3, 2)\}$
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1 Question 1 1 / 1

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Problem 2

Compute $\sigma_{R.L > S.M \wedge R.M < S.P}(R \times S)$.

This is the set of tuples in the Cartesian product of R and S that satisfy the condition that $R.L$ is greater than $S.M$ and $R.M$ is less than $S.P$.

$$\{R.L, R.M, S.M, S.N, S.P\}$$

$$(R \times S) = \{(4, 3, 6, 1, 8), (4, 3, 1, 6, 4), (4, 3, 2, 5, 1), (4, 3, 3, 4, 7), (6, 5, 6, 1, 8), (6, 5, 1, 6, 4), \\ (6, 5, 2, 5, 1), (6, 5, 3, 4, 7), (8, 7, 6, 1, 8), (8, 7, 1, 6, 4), (8, 7, 2, 5, 1), (8, 7, 3, 4, 7)\}$$

$$\sigma_{R.L > S.M} = \{(4, 3, 1, 6, 4), (4, 3, 2, 5, 1), (4, 3, 3, 4, 7), (6, 5, 1, 6, 4), (6, 5, 2, 5, 1), (6, 5, 3, 4, 7), \\ (8, 7, 6, 1, 8), (8, 7, 1, 6, 4), (8, 7, 2, 5, 1), (8, 7, 3, 4, 7)\}$$

$$\sigma_{R.M < S.P} = \{(4, 3, 6, 1, 8), (4, 3, 1, 6, 4), (4, 3, 3, 4, 7), (6, 5, 6, 1, 8), (6, 5, 3, 4, 7), (8, 7, 6, 1, 8)\}$$

$$\sigma_{R.L > S.M \wedge R.M < S.P}(R \times S) = \{(4, 3, 1, 6, 4), (4, 3, 3, 4, 7), (6, 5, 3, 4, 7), (8, 7, 6, 1, 8)\}$$

2 Question 2 1/1

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Problem 3

Student(student-name, department)

Course(course-name, department)

Enrollment(student-name, course-name)

a) Find the names of all students who are not enrolled in the 'Database Management Course'.

$$\Pi_{\text{student-name}}(\text{Enrollment} - \sigma_{\text{course-name} = \text{'DatabaseManagementCourse'}}(\text{Enrollment}))$$

b) Find the names of all students who are enrolled in at least one course not offered by their home department.

$$\Pi_{\text{student-name}}(\sigma_{\text{Student.student-name} = \text{Enrollment.student-name} \wedge \text{Student.department} \neq \text{Course.department}}(\text{Student} \times (\text{Course} \bowtie \text{Enrollment})))$$

c) Find the names of all courses which have no students enrolled.

$$\Pi_{\text{course-name}}(\text{Course}) - \Pi_{\text{course-name}}(\text{Course} \bowtie \text{Enrollment})$$

d) Find the department names that students belong to if the students take at least one class offered by the CS department.

$$\Pi_{\text{department}}(\text{Student} \bowtie (\text{Enrollment} \bowtie \sigma_{\text{department} = \text{'CS'}}(\text{Course})))$$

e) Find the department names of all students who are enrolled in at most one course.

$$\Pi_{\text{department}}(\text{Student} \bowtie (\Pi_{\text{student-name}}(\text{Student}) -$$

$$\Pi_{\text{E1.student-name}}(\sigma_{\text{E1.student-name} = \text{E2.student-name} \wedge \text{E1.course-name} \neq \text{E2.course-name}}(\rho_{\text{E1}}(\text{Enrollment}) \times \rho_{\text{E2}}(\text{Enrollment}))))$$

3 Question 3 1/1

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Problem 4

Company(company-name, valuation)

Write a relational algebra expression to find the name of the lowest-valued companies.

$$\Pi_{\text{company-name}}(\text{Company} \bowtie (\Pi_{\text{valuation}}(\text{Company}) - \Pi_{\text{Company.valuation}}(\sigma_{\text{Company.valuation} > \text{Company2.valuation}}(\text{Company} \times \rho_{\text{Company2}}(\text{Company}))))))$$

4 Question 4 1 / 1

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- 1 pts Incorrect