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Lab Section 22

CS166 HW 2 Relational Algebra

Problem 1. Consider the following relational database:
employee (employee-name, street, city)
works (employee-name, company-name, salary)
company (company-name, city)
manages (employee-name, manager-name)

1) Find the names of all employees who work at Bank4U
$\pi_{\text{employee-name}}(\sigma_{\text{company-name='Bank4U'}}(\text{works}))$

2) Find the names and cities of residence of all employees who work at Bank4U and earn more than $15,000 a year
$\pi_{\text{employee-name, city}}(\sigma_{\text{company-name='Bank4U'}}(\sigma_{\text{salary>15000}}(\text{works} \bowtie \text{employee})))$

3) Find the names, streets, and cities of residence of all employees who live in the same city as the company they work in
$\pi_{\text{employee-name, city, street}}(\text{works} \bowtie \text{employee} \bowtie \text{company})$ (natural join)

Problem 2. A university database contains the following relations:
STUDENTS (Sno: integer, Sname: string, Sdept: string, Age: integer)
COURSES (Cno: integer, Cname: string)
ENROLLMENT (Sno: integer, Cno:integer, Grade: integer)

1) Find the Sno and course grades for students who take “OS” or “DBMS”
$\pi_{\text{Sno, Grade}}(\sigma_{\text{Cname='OS'}} \text{ OR } \sigma_{\text{Cname='DBMS'}}(\text{COURSES} \bowtie \text{ENROLLMENT}))$

2) Find the Sno of students whose courses include all courses taken by the student with Sno = 10.
$\pi_{\text{Cno}}(\text{COURSES})$ -
$\pi_{\text{Cno}}(\sigma_{\text{Sno=10}}(\text{COURSES} \bowtie \text{ENROLLMENT}))$
$= \mathbf{P}_{\text{B(Cno)}}$ (**represents classes student 10 doesn't have**)
$\pi_{\text{Sno}}(\text{STUDENTS})$ - (**subtract from all students**)
$\pi_{\text{Sno}}(\sigma_{\text{B.Cno=Cno}}(\text{COURSES} \bowtie \text{ENROLLMENT}))$(**students with a class student 10 doesn't have**)

3) Find the Sname and Sdept for all the students who do not enroll in the course with Cno = 3.
$\pi_{\text{Sname, Sdept}}(\text{STUDENTS})$ -
$\pi_{\text{Sname, Sdept}}(\sigma_{\text{Cno=3}}(\text{STUDENTS} \bowtie \text{COURSES} \bowtie \text{ENROLLMENT}))$ (natural join)

(20 points) Problem 3 Consider a database consisting of the following relations:
VISITS (DRINKER, BAR)
SERVES (BAR, BEER)
LIKES (DRINKER, BEER)

1) Find the bars that serve a beer that drinker Smith likes.

$\pi_{SERVES.BAR}(\sigma_{LIKES.DRINKER='Smith'}(SERVES \bowtie_{SERVES.BEER=LIKES.BEER} LIKES))$

2) Find the bars that serve all beers that drinker Smith likes.

$\pi_{BEER}(SERVES)$ - (**subtract from all beers served**)

$\pi_{SERVES.BEER}(\sigma_{LIKES.DRINKER='Smith'}(SERVES \bowtie_{SERVES.BEER=LIKES.BEER} LIKES))$

$= P_{S(BEER)}$ (**represents beer Smith doesn't like**)

$\pi_{BAR}(SERVES)$ - (**subtract from all bars**)

$\pi_{BAR}(\sigma_{S.BEER=BEER}(SERVES))$ (**bars that serve any beer Smith doesn't like**)