Relational Algebra Examples: (Not: SQL sorguları siz yazın)

Consider the following relations:

- Student(ssn, name, address, major)
- Course(code, title)
- Registered(ssn, code)

1. List the codes of courses in which at least one student is registered (registered courses):

\[ \pi_{\text{Code}}( \text{Registered}) \]

2. List the titles of registered courses (of those in 1.)

\[ \pi_{\text{Code}}( \text{Course} \bowtie \text{Registered}) \]

3. List the codes of courses for which no student is registered

\[ \pi_{\text{Code}}( \text{Course}) - \pi_{\text{Code}}( \text{Registered}) \quad \text{Try: Students who are not registered to any courses.} \]

4. The titles of courses for which no student is registered.

*In the previous query we found the codes; natural join with Course to find the titles.*

\[ \pi_{\text{Name}}((\pi_{\text{Code}}( \text{Course}) - \pi_{\text{Code}}( \text{Registered}))) \bowtie \text{Course} \]

5. Names of students and the titles of courses they registered to.

\[ \pi_{\text{Name}, \text{Title}}( \text{Student} \bowtie \text{Registered} \bowtie \text{Course}) \]

or, can be written as

\[ \pi_{\text{Name}, \text{Title}}((\sigma_{1=4 \land 5=6}(\text{Student} \bowtie \text{Registered} \bowtie \text{Course}))) \]

6. SSNs of students who are registered for ‘Database Systems’ or ‘Analysis of Algorithms’.

\[ \pi_{\text{SSN}}( \text{Student} \bowtie \text{Registered} \bowtie (\sigma_{\text{title}=\text{Database Systems}}(\text{Course}))) \cup \pi_{\text{SSN}}( \text{Student} \bowtie \text{Registered} \bowtie (\sigma_{\text{title}=\text{Analysis of Algorithms}}(\text{Course}))) \]

7. SSNs of students who are registered for both ‘Database Systems’ and ‘Analysis of Algorithms’.

\[ \pi_{\text{SSN}}( \text{Student} \bowtie \text{Registered} \bowtie (\sigma_{\text{title}=\text{Database Systems}}(\text{Course}))) \cap \pi_{\text{SSN}}( \text{Student} \bowtie \text{Registered} \bowtie (\sigma_{\text{title}=\text{Analysis of Algorithms}}(\text{Course}))) \]

The name of those students:

\[ A = \pi_{\text{SSN}}( \text{Student} \bowtie \text{Registered} \bowtie (\sigma_{\text{title}=\text{Database Systems}}(\text{Course}))) \cap \pi_{\text{SSN}}( \text{Student} \bowtie \text{Registered} \bowtie (\sigma_{\text{title}=\text{Analysis of Algorithms}}(\text{Course}))) \]

\[ \pi_{\text{Name}}(A \bowtie \text{Student}) \quad \text{used } A= \text{ instead of } \rho( ) \text{ function.} \]
8. List of courses in which all students are registered.
\[ \pi_{\text{code, ssn}} (\text{Registered}) / \pi_{\text{ssn}} (\text{Student}) \]

SQL: (başka türlü de yazılabilir, önerilerinizi bana email ile yazın)

\[
\text{SELECT code FROM Registered } \\
\text{GROUP BY code } \\
\text{HAVING count(*) = (select count(code) from Course)}
\]

9. List of courses in which all ‘ECMP’ major students are registered.

\[ \pi_{\text{code, ssn}} (\text{Registered}) / \pi_{\text{ssn}} (\sigma_{\text{major=’ECMP’}} \text{Student}) \]