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Relational Algebra

8.1:

σ (select) – Selects all tuples that satisfy a selection condition

π (project) - Produces a new relation with only some of the attributes of the original relation and removes duplicate tuples

⋈ (join) – produces all combinations of tuples from two relations that satisfy the join condition

ρ (rename) – renames columns

∪ (union) – Produces a relation that includes all the tuples in R_1 or R_2, or both R_1 and R_2. R_1 and R_2 must be union compatible.

∩ (intersection) – Produces a relation that includes all tuples in both R_1 and R_2. R_1 and R_2 must be union compatible.

— (difference) - Produces a relation that includes all tuples in R_1 that are not in R_2. R_1 and R_2 must be union compatible.

× (cartesian product) - Produces a relation that has the attributes R_1 and R_2 and includes as tuples all possible combinations of tuples from R_1 and R_2.

÷ (division) – Produces a relation (X) that includes all tuples in R_1 (Z) that appear in R_1 in combination with every tuple from R_2 (Y) where Z = X ∪ Y

8.16:

B: emp ← (employee) $\bowtie_{\text{SSN = ESSN and FNAME = DEPENDENT\_NAME}}$ (dependent)

result ← $\pi_{\text{LNAME, FNAME}}$ (emp)

query result = empty

C: sup ← π_{SSN} ($\sigma_{\text{FNAME = 'Franklin' and LNAME = 'Wong'}}$ (employee))

emps ← (employee) $\bowtie_{\text{SUPERSSN = SSN}}$ (sup)

result ← $\pi_{\text{FNAME, LNAME}}$(emps)

query result = John Smith, Ramesh Narayan, Joyce English

F: emps ← π_{SSN}(employee)

proj_emps(SSN) ← π_{ESSN}(works_on)

no_proj ← emps – proj_emps

result ← $\pi_{FNAME, LNAME}$(employee * no_proj)

query result = empty

8.17:

A: depart = flight_number ℨ MIN leg_number(flight_leg)

D_airport = $\pi_{flight\_number, departure\_airport\_code}$ (departure * flight_leg)

arrive = flight_number ℨ MAX leg_number(flight_leg)

A_airport = $\pi_{flight\_number, arrival\_airport\_code}$ (arrival * flight_leg)

Result ← D_airport * A_airport

B: departs ← $\sigma_{departure\_airport\_code = 'IAH'}$(flight_leg)

arrives ← $\sigma_{arrival\_airport\_code = 'LAX'}$(flight_leg)

trips ← departs * arrives

result ← $\pi_{flight\_number, weekdays}$ (trips * flight)

C: result ← $\pi_{flight\_number, weekdays, departure\_airport\_code, scheduled\_departure\_time, arrival\_airport\_code, scheduled\_arrival\_time}$ (trips * flight)

D: result ← $\sigma_{flight\_number = 'co197'}$(fare)

E: flight_day ← $\sigma_{flight\_number = 'co197' \text{ AND } date='1999-10-09'}$ (leg_instance)

result ← $\pi_{number\_of\_available\_seats}$ (available)