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CSE 4701

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Homework #1

1.) *Specify the following queries on the COMPANT relational database schema shown in figure 5.5, using the relational operators discussed in this chapter. Also show the result of each query as it would apply to the database state in figure 5.6.*

a.) *Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.*

Pno_1_Only <- $\sigma_{Pno = 1 \text{ and } Hours>=10}$(WORKS_ON)
Here I am selecting all tuples where the Pno is 1, so I can get all employees who worked on Product 1 and worked 10 or more hours, I am calling it Pno_1_Only. We also know that no one outside of department 5 has worked on ProductX so we can safely grab all employees from Pno 1.

Essn	Pno	Hours
123456789	1	32.5
453453453	1	20.0

Final_Answer <- $\Pi_{Fname\ Mint\ Lname}$(Pno_1_Only $*_{Essn,Ssn}$ EMPLOYEE)
This natural Join will join the Pno_1_Only table which has the Esnn of employees who worked 10+ hours on ProductX and the EMPLOYEE table which has the Ssn. If they are equal, then that means it will join them and the new table will have the names of those employees who worked 10+ hours on ProductX in department 5.
Just to clean things up this Project operation will shrink the table down to just the names of the employees.

Fname	Mint	Lname
John	B	Smith
Joyce	A	English

b.) *List the names of all employees who have a dependent with the same first name as themselves.*
Final_Answer <- $\Pi_{Fname\ Mint\ Lname}$(DEPENDENT $*_{Dependent\_name,\ Fname\ and\ Essn,}$ Ssn EMPLOYEE)
This sequence of operations will first naturally join the DEPENDENT table with the EMPLOYEE table if the Dependent_name and the Fname data are the same. Then it is projected so that the only data in the table is Fname, Mint, and Lname thus giving us a list of the names of employees who have a dependent with the same first name as themselves.

Fname	Mint	Lname
NULL	NULL	NULL

f.) Retrieve the names of all employees who do not work on any project.

Final_Answer <- $\Pi_{Fname, Mint, Lname}$(EMPLOYEE - (Π_{Essn}(Works_On) * EMPLOYEE))

Fname	Mint	Lname
James	E	Borg

h.) Retrieve the average salary of all female employees

Final_Answer <- $F_{Average}$(Π_{Salary}($\sigma_{Sex = F}$(EMPLOYEE)))

Final_Answer = 31,000

2.) Consider the Airline relational database schema shown in figure 5.8, which was described in exercise 5.12. Specify the following queries in relational algebra:

a.) For each flight, list the flight number, the departure airport for the first leg of the flight and the arrival airport for the last leg of the flight.

Departure_airport <- $\Pi_{Flight\_number, Departure\_airport\_code}$(Flight_number $F_{min\ Leg\_number}$(FLIGHT_LEG) $*_{Flight\_number, Flight\_number}$ AIRPORT)

Arrival_airport <- $\Pi_{Flight\_number, Arrival\_airport\_code}$(Flight_number $F_{max\ Leg\_number}$(FLIGHT_LEG) * $_{Flight\_number, Flight\_number}$ AIRPORT)

Final_Answer <- $\Pi_{Flight\_number, name}$ Departure_airport $*_{Flight\_number, Flight\_number}$ Arrival_airport

b.) List the flight numbers and weekdays of all flights or flight legs that depart from Houston Intercontinental Airport (airport code IAH) and arrive in Los Angeles International Airport (airport code LAX).

$\Pi_{Flight\_number, weekdays}$(($\Pi_{Flight\_number}$($\sigma_{Departure\_airport\_code = IAH, Arrival\_airport\_code = LAX}$(FLIGHT_LEG))) $*_{Flight\_number, Flight\_number}$ FLIGHT)

c.) List the flight number, departure airport code, scheduled departure time, arrival airport code, scheduled arrival time, and weekdays of all flights or flight legs that depart from some airport in the city of Houston and arrive at some airport in the city of Los Angeles.

Houston_departures <- FLIGHT_LEG $*_{(Departure\_airport\_code)(Airport\_code)}$ $\Pi_{Airport\_code, City}$ ($\sigma_{City = Houston}$(AIRPORT))

LA_arrivals <- FLIGHT_LEG $*_{(Arrival\_airport\_code)(Airport\_code)}$ $\Pi_{Airport\_code, City}$ ($\sigma_{City = Los\ Angeles}$(AIRPORT))

HtoLA <- $\Pi_{Flight\_number, Departure\_airport\_code, Arrival\_airport\_code}$ (Houston_departures $*_{(Arrival\_airport\_code)(Departure\_airport\_code)}$ LA_arrivals)

HtoLAwDtandAt <- HtoLA $*_{(Flight\_number)(Flight\_number)}$ $\Pi_{Flight\_number, Departure\_time, Arrival\_time}$ (LEG_INSTANCE)

Final_Answer <- HtoLAwDtandAt $*_{(Flight\_number)(Flight\_number)}$ $\Pi_{Flight\_number, Weekdays}$(FLIGHT)