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Chapter 8 Review Questions

1) Specify the following queries on the COMPANY relational database schema as shown in Figure 5.5 using the relational operators discussed in this chapter.

a) List the names of all employees who have a dependent with the same first name as themselves:

Ans:

```
 $\rho_E$  (EMPLOYEE) // renaming EMPLOYEE AS E  
 $\rho_D$  (DEPENDENT) // renaming DEPENDENTS AS D  
EMPLOYEE_DEPENDENTS <-  $E \bowtie_{E.Ssn = D.Essn} D$   
RESULT <-  $\pi_{E.Fname, E.Minit, E.Lname} (\sigma_{E.Fname = D.Dependent\_name} (EMPLOYEE\_DEPENDENTS))$ 
```

b) Retrieve the names of all employees that work on every project.

Ans:

```
ALL_PROJECTS (Pno) <-  $\pi_{Pnumber} (PROJECT)$   
EMPLOYEE_PROJECTS(SSN, Pno) <-  $\pi_{Essn, Pno} (WORKS\_ON)$   
RESULT <-  $\pi_{E.Fname, E.Minit, E.Lname} ((EMPLOYEE\_PROJECTS \div ALL\_PROJECTS) * EMPLOYEE)$ 
```

c) Retrieve the average salary of all female employees.

Ans:

```
FEMALE_EMPLOYEE <-  $\sigma_{SEX = 'F'} (EMPLOYEE)$   
RESULT (AVG_SALARY) <-  $\gamma_{AVERAGE\ SALARY} (FEMALE\_EMPLOYEE)$ 
```

d) List the last names of all department managers who have no dependents.

Ans:

```
ALL_DEPARTMENT_MANAGERS (Ssn) <-  $\pi_{Mgr\_ssn} (DEPARTMENT)$   
EMPLOYEES_WITH_DEPENDENTS (Ssn) <-  $\pi_{Essn} (DEPENDENT)$   
RESULT <-  $\pi_{Lname} ( (ALL\_DEPARTMENT\_MANAGERS - EMPLOYEES\_WITH\_DEPENDENTS) * EMPLOYEE)$ 
```

2) Consider the AIRLINE relational database schema shown in Figure 5.8. Specify the following queries in relational algebra.

a) List all fare information for flight number 'co197'.

Ans:

RESULT <- $\sigma_{\text{Flight_number} = 'co197'}(\text{FARE})$

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').

Ans:

HOUSTAN_LA (Fno) <- $\pi_{\text{Flight_number}}(\sigma_{\text{Departure_airport_code} = 'iah' \text{ AND } \text{Arrival_Airport_code} = 'lax'}(\text{FLIGHT_LEG}))$

RESULT <- $\pi_{\text{Flight_number}, \text{Weekdays}}(\text{HOUSTAN_LA} \bowtie_{(\text{Fno} = \text{Flight_number})} \text{FLIGHT})$

c) Retrieve the number of available seats for flight number 'co197' on '2009-10-09'.

Ans:

RESULT <- $\pi_{\text{Number_of_available_seats}}(\sigma_{\text{Flight_number} = 'co197' \text{ AND } \text{Date} = '2009-10-09'}(\text{LEG_INSTANCE}))$

3) Specify the following queries in relational algebra on the database schema given in Exercise 5.14:

a) List the Order# and Ship_date for all orders shipped from Warehouse #W2

Ans:

RESULT <- $\pi_{\text{Order\#, Ship_date}}(\sigma_{\text{Warehouse\#} = 'W2'}(\text{SHIPMENT}))$

- b) Produce a listing Cname, No_of_orders, Avg_order_amt, where the middle column is the total number of orders by the customer and the last column is the average order amount for that costumer.

Ans:

```
Customer_Record ( CustNo, No_of_orders, Avg_amount) <- Cust# ⋈ COUNT Order#, AVERAGE  
Ord_amt (ORDER)  
RESULT(Cname, No_of_orders, Avg_order_amt) <-  $\pi$  Cname, No_of_orders, Avg_amount  
(Customer_Record ⋈ CUSTOMER)
```

- c) List the Order# for orders that were shipped from all warehouses that the company has in New York.

Ans:

```
NewYork_Warehouse(Num) <-  $\pi$  Warehouse# ( $\sigma$  City = 'New York'(WAREHOUSE))  
RESULT <-  $\pi$  Order# ( NewYork_Warehouse ⋈ Num = Warehouse# (SHIPMENT))
```