Assignment 2

Q. 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

1. 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.

Answer:

DEPARTURES = $\pi_{\text{Flight\_number, Departure\_airport\_code}}(\sigma_{\text{leg\_number=1}}(\text{FLIGHT\_LEG}))$

ARRIVALS = $\pi_{\text{Flight\_number, Arrival\_airport\_code}}(\pi_{\text{Flight\_number, } \sum\text{MAX(leg\_number), Arrival\_airport\_code}}(\text{FLIGHT\_LEG}) \sum \text{GROUP BY (Flight\_number)})$

AIRPORTS = $\pi_{\text{Airport\_code, Name}}$ (AIRPORT)

RESULT1 = DEPARTURES $\bowtie_{\text{DEPARTURES.Flight\_number = Arrivals.Flight\_Number}}$ ARRIVALS

RESULT2 = RESULT1 $\bowtie_{\text{RESULT1.Departure\_Airport\_code = AIRPORTS.Airport\_code}}$ AIRPORTS

$\rho_{\text{Name = Departure\_airport\_name}}$ (RESULT2)

RESULT3 = RESULT2 $\bowtie_{\text{RESULT2.Arrival\_Airport\_code = AIRPORTS.Airport\_code}}$ AIRPORTS

$\rho_{\text{Name = Arrival\_airport\_name}}$ (RESULT3)

$\pi_{\text{Flight\_number, Departure\_airport\_name, Arrival\_airport\_name}}$ (RESULT3)

2. 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').

Answer: $\pi_{\text{Flight\_number,Weekdays}}(\sigma_{\text{Departure\_airport\_code = 'iah' AND Arrival\_airport\_code = 'lax'}}(\text{FLIGHT} \bowtie_{\text{FLIGHT.Flight\_number = FLIGHT\_LEG.Flight\_number}} \text{FLIGHT\_LEG}))$

3. 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.

Answer:

DEPARTURES = FLIGHT_LEG $\bowtie_{\text{FLIGHT\_LEG.Departure\_airport\_code = AIRPORT.Airport\_code}}$ AIRPORT

ARRIVALS = FLIGHT_LEG $\bowtie_{\text{FLIGHT\_LEG.Arrival\_airport\_code = AIRPORT.Airport\_code}}$ AIRPORT

HOUSTON = $\sigma_{\text{city = 'Houston'}}$ (DEPARTURES)

LA = $\sigma_{\text{city = 'Los Angeles'}}$ (ARRIVALS)

$\pi_{\text{Flight\_number, Departure\_airport\_code, Scheduled\_departure\_time, Arrival\_airport\_code, Scheduled\_arrival\_time, Weekdays}}$ ((HOUSTON ∩ LA) ⋈ FLIGHT)

4. List all fare information for flight number 'co197'.

Answer: $\sigma_{\text{Flight\_Number = 'co197'}}$ (FARE)

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

Answer: $\pi_{\text{Number\_of\_available\_seats}}$ ($\sigma_{\text{Flight\_Number = 'co197' AND Date = '2009-10-09'}}$ (LEG_INSTANCE))