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S(σ) — sigma
P(Π) — pi
R — Rename
F — Function

Q1
Sol:

a.

DEP — $\Pi_{\text{Dependent\_Name,Essn}}$ (DEPENDENT)
EMP — $\Pi_{\text{Fname,Ssn}}$ (EMPLOYEE)

RESULT — $\sigma_{\text{DEP.Dependent\_Name = EMP.Fname AND DEP.Essn = EMP.Ssn}}$ (DEP X EMP)

b.

$\Pi_{\text{Lname,Fname}}$ ($\sigma_{\text{EMPLOYEE.SSN = WORKS\_ON.Essn AND PROJECT.Pnumber = WORKS\_ON.Pno}}$ (EMPLOYEE X WORKS_ON X PROJECT))

c.

F $_{\text{Average Salary}}$ ($\sigma_{\text{Sex = "Female"}}$ (EMPLOYEE))

d.

$\Pi_{\text{Lname, Fname}}$ ($\sigma_{\text{ssn = Mgr\_ssn}}$ (($\Pi_{\text{Mgr\_ssn}}$ (DEPARTMENT) - $\Pi_{\text{Mgr\_ssn}}$ (DEPARTMENT) * Π_{ESSN} (DEPENDENT)) X EMPLOYEE)

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Q2
Sol:

a.

σ Flight_number = 'co197) (FARE)

b.

FH <— Π Airport_code (σ city = 'iah' (AIRPORT))

FLA <— Π Airport_code (σ city = 'lax' (AIRPORT))

FLIGHTNUM <— σ Departure_airport_code = FH.Airport_code AND Arrival_ariport_code = FLA.Airport_code (FLIGHT_LEG, FH, FLA)

RESULT <— Π Flight_number,Weekdays (FLIGHTNUM * FLIGHT)

c.

F COUNT Number_of_available_seats (σ Flight_number = 'co197' AND Date='2009-10-09' (LEG_INSTANCE))

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Q3
Sol:

a.

$$\Pi_{\text{Order\#,Ship\_date}} \left(\sigma_{\text{WareHouse\# = 'W2'}} (\text{SHIPMENT}) \right)$$

b.

$$_{\text{Cname}}\mathcal{F}_{\text{COUNT Order\#, AVERAGE Ord\_amt}} (\text{CUSTOMER} * \text{ORDER\_ITEM})$$

c.

$$\Pi_{\text{Order\#}} (\text{SHIPMENT} *(\sigma_{\text{City='New York'}} (\text{WAREHOUSE})))$$