CS3743 Hwk 5 Relational Calculus (40 pts) - due Apr 9, 2020 ∀f ∃r

**Flight**(flightId, flightNm, airline, orig, dest, schedDt, depTm, maxSeats, numSeatsSold).

**Customer**(custNr, name, preferAirline, gender, birthDt)

**Reservation**(custNr, flightId, reqSeatQty)

To make it easier for the grader, use the following tuple variables: Flight – f, Customer – c, Reservation – r. There may be cases where you need multiple tuple variables for the same relation; please use something meaningful (e.g., rRD). Please show appropriate relational calculus RANGE statements and a **single GET** statement to answer each of the following.

**Customer**

+--------+---------------+---------------+------------+--------+

| custNr | name | preferAirline | birthDt | gender |

+--------+---------------+---------------+------------+--------+

| 111 | Perry Noid | Spirit | 2000-04-01 | M |

| 222 | Melba Toast | American | 1990-09-11 | F |

| 333 | Pete Moss | Clampett | 1992-03-03 | M |

| 444 | Bill Board | American | 1985-04-04 | M |

| 480 | Anita Vacay | Spirit | 1975-06-01 | F |

| 555 | Jerry Tall | PoDunk | 1927-04-15 | M |

| 666 | Tom E Gunn | Clampett | 1976-06-06 | M |

| 777 | Bob Wire | PoDunk | 1973-07-07 | M |

| 888 | Ron DeVoux | American | 1990-08-08 | M |

| 890 | Ann T Freeze | NULL | NULL | F |

| 901 | Peg Board | Delta | 1987-04-04 | F |

| 902 | Al B Tross | American | 1957-07-12 | M |

| 903 | B B Gunn | PoDunk | 1976-09-09 | F |

| 904 | Sally Mander | Delta | 1995-09-04 | F |

| 999 | Marcus Absent | Delta | 1999-09-09 | M |

+--------+---------------+---------------+------------+--------+

**Flight**

+----------+----------+----------+------+------+------------+----------+----------+--------------+

| flightId | flightNm | airline | orig | dest | schedDt | depTm | maxSeats | numSeatsSold |

+----------+----------+----------+------+------+------------+----------+----------+--------------+

| 331 | PD001 | PoDunk | SAT | MCO | 2020-03-03 | 10:00:00 | 30 | 30 |

| 341 | PD001 | PoDunk | SAT | MCO | 2020-03-04 | 10:00:00 | 30 | 30 |

| 411 | AH100 | American | HOU | CDG | 2020-04-01 | 08:00:00 | 130 | 25 |

| 412 | AH200 | American | HOU | FLL | 2020-04-01 | 06:00:00 | 130 | 125 |

| 441 | SH100 | Spirit | IHC | FLL | 2020-04-04 | 07:00:00 | 130 | 5 |

| 442 | SH110 | Spirit | IHC | FLL | 2020-04-04 | 15:00:00 | 130 | 0 |

| 460 | SF200 | Spirit | FLL | IHC | 2020-04-11 | 12:00:00 | 130 | 0 |

| 462 | SF200 | Spirit | FLL | IHC | 2020-04-12 | 12:00:00 | 130 | 50 |

| 510 | AS300 | American | SAT | MCO | 2020-05-10 | 10:30:00 | 130 | 5 |

| 519 | F333 | PoDunk | SAT | MCO | 2020-05-19 | 16:00:00 | 30 | 50 |

| 532 | PD002 | PoDunk | HOU | SEG | 2020-05-03 | 11:00:00 | 30 | 5 |

| 604 | AH200 | American | HOU | FLL | 2020-06-04 | 06:00:00 | 130 | 30 |

| 705 | CL123 | Clampett | SAT | MCO | 2020-07-05 | 04:00:00 | 30 | 0 |

| 706 | PD002 | PoDunk | HOU | SEG | 2020-07-06 | 11:00:00 | 30 | 0 |

| 707 | FXXXX | PoDunk | SAT | HOU | 2020-05-03 | 11:00:00 | 30 | 5 |

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**Reservation**

|  |  |
| --- | --- |
| +--------+----------+------------+  | custNr | flightId | reqSeatQty |  +--------+----------+------------+  | 111 | 341 | 10 |  | 111 | 441 | 2 |  | 111 | 519 | 2 |  | 222 | 331 | 12 |  | 222 | 341 | 11 |  | 222 | 441 | 2 |  | 222 | 705 | 2 |  | 333 | 441 | 2 |  | 444 | 412 | 5 |  | 444 | 441 | 2 |  | 444 | 510 | 5 |  | 444 | 519 | 5 |  | 444 | 532 | 2 |  | 444 | 705 | 2 |  | 444 | 706 | 2 |  | 444 | 707 | 2 |  | 480 | 331 | 2 |  | 480 | 441 | 2 |  | 555 | 341 | 3 |  | 555 | 411 | 30 |  | 555 | 412 | 20 |  | 555 | 510 | 20 |  | 555 | 519 | 1 |  | 555 | 706 | 2 | | | 555 | 707 | 8 |  | 666 | 705 | 3 |  | 777 | 442 | 1 |  | 777 | 460 | 1 |  | 777 | 510 | 1 |  | 888 | 341 | 1 |  | 888 | 519 | 1 |  | 888 | 604 | 1 |  | 890 | 341 | 1 |  | 890 | 510 | 2 |  | 890 | 519 | 1 |  | 890 | 604 | 1 |  | 901 | 341 | 20 |  | 901 | 412 | 8 |  | 901 | 532 | 1 |  | 901 | 706 | 4 |  | 902 | 412 | 5 |  | 903 | 412 | 3 |  | 904 | 412 | 2 |  | 904 | 519 | 5 |  | 999 | 341 | 14 |  | 999 | 412 | 10 |  | 999 | 510 | 15 |  | 999 | 519 | 14 |  | 999 | 532 | 1 |  | 999 | 706 | 5 |  +--------+----------+------------+ |

1. (1 pt) Find the flightId, airline, and departure time for flights departing from SAT for MCO.

**RANGE FLIGHT f**

**Get W1(f.flightId, f.airline, f.depTm): f.orig = “SAT” ^ f.dest = “MCO”**

2. (2 pts) Find the flightNm, departure time, and origin for flights on which the customer named Perry Noid has a reservation.

**RANGE Flight f**

**RANGE Customer c**

**RANGE Reservation r**

**Get W2 (f.flightNm, f.deptTm, f.orig): ∃r∃c (r.flightId = r.flightId ^ r.custNr = r.custNr ^ c.name = “Perry Noid”)**

3. (4 pts) Find the airline of flights departing "SAT" on "2020-03-03" for the customer named "Anita Vacay".

**RANGE Flight f**

**RANGE Customer c**

**RANGE Reservation r**

**Get W3 (f.airline): ∃r∃c (r.flightId = f.flightId ^ f.orig = “SAT”**

**^ f.sched = “2020-03-03” ^ r.custNr = c.custNR ^ c.name = “Anita Vacay”)**

**practice**

RANGE FLIGHT F

RANGE CUSTOMER C

RANGE RESERVATION R

GET W3 (f.airline):

**∃r∃c (r.flightId = f.flightId ^ f.orig = “SAT” ^ schedDt = “2020-03-03”**

**^ r.custNr = c.custNr ^ c.name = “Anita Vacay”)**

4. (6 pts) Find the customer numbers and names of customers who have a reservation on a flight leaving on April 4th of 2020 on which customer #444 also has a reservation. Do not include #444 in your result. Hint: you will have to use one of the relations twice.

practc

**Range Flight F, Reservation R, Customer C, Reservation R4**

**Get W4(c.custNr, c.name) :**

**c.custNr <> “444”**

^ **∃r4∃r∃f(r4.custNr = “444”**

**^ r4.flightId = f.flightId ^ f.schedDt = “2020-4-4”**

**^ r4.flightId = r.flightId ^ c.custNr = r.custNr)**

**RANGE Flight f**

**RANGE Customer c**

**RANGE Reservation r**

**RANGE Reservation rC444 !=**

**Get W4 (c.custNr, c.name): c.custNr <> “444”**

**^ ∃r444∃r∃f(rC444.custNr = “444”**

**^ rC444.flightId = f.flightId ^ f.schedDt = “2020-04-04”**

**^ rC444.flightId = r.flightId ^ c.custNr = r.custNr)**

5. (4 pts) Find the customer number of customers who are flying on **all**

of the flights having a destination of "SEG".

**RANGE Flight f**

**RANGE Reservation r**

**RANGE customer c for all dest = seg ->**

**Get W5 (c.custNr) : ∀f(f.dest = “SEG” → ∃r(r.flightId = f.flightId ^**

**r.custNr = c.custNr))**

6. (6 pts) Find the customer number, name, gender, and birth date of customers who **do not have** reservations on flights with Spirit airlines. State whether your answer includes customers that don't have any associated reservations. Universal

**RANGE Flight f**

**RANGE Reservation r**

**RANGE Customer c for all customers**

**Get W6 (c.custNr, c.Name, c.gender, c.birthDt) : ∀r(r.custNr = c.custNr →**

**∃f(f.flightId = r.flightId ^ f.airline <> “Spirit”))**

**\*Includes customers that don’t have any associated reservations**

**Get W6E (c.custNr, c.Name, c.gender, c.birthDt) : ∀r(r.custNr = c.custNr →**

**∃f(f.flightId = r.flightId ^ f.airline <> “Spirit”))**

**^∃r(r.custNr = c.custNr)**

**\*does not include customers having associative reservations**

7. (3 pts) Find the flightNm and scheduled dates for flights on which only customer #777 has a reservation. State whether your answer includes flights that don't have any associated reservations.

**RANGE Flight f**

**RANGE Reservation r**

**Get W7 (f.flightNm, f.schedDt) : ∀r(r.flightId = f.flightId → r.custNr = “777”)**

**\*includes flights that have no reservations**

8. (8 pts) Find the names of customers who are on **all** the flights which Ron DeVoux has reservations. State whether you included Ron DeVoux in your answer.

Hint: obtain the custNr for Ron DeVoux before attempting the universal quantifier.

**RANGE Customer c**

**RANGE Reservation r  
RANGE Customer cRD**

**RANGE Reservation rRD**

**Get W8 (c.name): c.name <> “Ron DeVoux”**

**^ ∃cRD (cRD.name = “Ron Devoux” ^ ∀r(cRD.custNr=r.custNr**

**→∃rRD(rRD.flightID = r.flightId ^ rRd.custNr = c.custNr)))**

\*Does NOT Include Ron Devoux

9. (6 pts) Find the customer number, names, and preferred airlines for customers who **only have** reservations on a flight which Podunk is the airline.

**RANGE Customer c**

**RANGE Reservation r**

**RANGE Flight f**

**Get W9 (c.custNr, c.name, c.preferAirline): ∀r(r.custNr = c.custNr →**

**∃f(f.flightId = r.flightId ^ f.airline = “Podunk”))**