ASSIGNMENT 1 - 601.315/415/615 - Databases

Due date: Tuesday, October 8, 2019 at 2:55PM EDT

Part 1: Database Schema Design (50 points)

Your task is to design a database for an airline dispatch office that keeps records on the flights, crews, airports and airplane operations but not on passenger reservations. To save costs, all the information of several cooperating airlines is in the system.

From the database, it should be possible to answer the following questions:

(1) List the city, airport-code and miles-from-the-city of all airports in Iowa.

(2) For each AirTran airline flight that is scheduled to depart BWI weekdays before 0900 hours, list the scheduled arrival time and arrival city code.

(3) List the actual arrival time, arrival city code, and airplane ID number (unique one for every physical plane) of all flights on 17-JUL-19.

(4) List the airport code, city and state of the destinations of all flights that are scheduled to depart BWI on weekends.

(5) List the name, SSN, birthdate and position working (e.g. captain, first-officer, flight attendant) of all flights on 14-AUG-19 that actually arrived in BWI before 2200 hours.

(6) List all flight crew members that are certified to fly Boeing 787’s that actually flew Boeing 787’s yesterday (16-SEP-19).

(7) List the types of aircraft (manufacturer, model, weight and seating capacity) that are small enough to land in some airport in Delaware.

(8) List the airlines that have nonstop flights from some city in Maryland to some city in California.

(9) List cities in which all of the crew members who have served on AirTran flights have had a day off.

(10) List all airports that flights carrying federal air marshals took off from.

(11) List all planes due for maintenance within the next year, and the dates at which maintenance is due.

(12) List the crew members who have worked in different roles for different airlines

(13) List the airlines which give their employees free flights as a benefit.

(14) List the names of all the captains working today (17-SEP-19).

(15) List all flight crew members that are certified to pilot all the flights that reach Iowa tomorrow.
(16) List all flights that arrive at a city where at least one of the crew members on that flight lives.

(17) List all cities that have a connecting flight from BWI only on weekdays.

(18) List the name of all airlines that allow a free cabin bag and have a flight from BWI and to Hawaii on weekends.

Simplifying assumptions:
The database only contains domestic flights. All flights only have one leg (no stops or connections). No plane is in the air at midnight. Flights either fly daily, weekdays, or weekends. The basic information about a flight (city codes served, scheduled arrival and departure times, etc.) does not change from day to day, but information such as actual arrival time does change. Flight crew members can potentially work in different roles (captain, 1st officer, flight attendant) on different flights - the flight attendants are striking and need other employees to fill in for them. Flight crew certifications of ability to work on a given aircraft type do not change over time. In the information about a flight, you may only store airport codes (e.g. BWI, JFK, LAX), not cities or states.

Part 2: Relational Algebra and Relational Calculus (50 pts.)

Consider the following hypothetical database schema. Suppose all bars in the US have a unique bar license number (BNO) and each drinker is identified by a unique drivers’ license number (DLicNo). All bartenders have a unique barttending number (BTNO). Every time
a drinker represented by DLicNo goes to a bar represented by BNO, the information is recorded in the database. The number of times a drinker visits a particular bar can be obtained by examining the VISIT relation. The VISIT relation has the DLicNo and the BNO pair only if the drinker represented by DLicNo has visited the bar represented by BNO at least once, i.e. the attribute NumberOfTimes in VISIT is never zero. The relation DRINKORDER represents all drinks ordered by drinkers at bars, including which bartender served the drink, and the relation BARTENDER represents all active bartenders. The relation SERVES represents all the drinks a particular bar serves.

For queries 2.1, 2.2, 2.3, 2.4 and 2.9 all students should give equivalent expressions in both the relational algebra and the relational calculus.

For queries 2.5, 2.6, 2.7, 2.12, 2.13 and 2.14, all students should give equivalent expres-
sions in **only** the relational algebra.

For query 2.8 students in 601.415/615 **only** should give equivalent expressions **only** in the relational algebra.

For queries 2.10 students in 601.415/615 **only** should give equivalent expressions in **both** the relational algebra and relational calculus.

For query 2.11 students in 601.315 should give the expressions **only** in the relational algebra.

For query 2.11 students in 601.415/615 should give the expressions in the relational algebra and relational calculus.

2.1 List the name of every bar that Donald Trump has visited more than once.

2.2 List the names of bars in Maryland that are **not** in Baltimore **and** do not serve Bud Lite.

2.3 List all bartenders who have served drinks in every bar that is only visited by drinkers over 50, but have never served their specialty drink.

2.4 List the name and age of everyone who has visited at least one bar that Donald Trump has visited.

2.5 List the names and ages of all people who have visited every bar in Towson.

2.6 List the names and ages of people who have visited at least every bar that Joe Biden has visited, and has visited all of these bars the identical number of times that Joe Biden has visited the bar.

2.7 List the names and ages of people who have visited every bar that Donald Trump has visited and have never visited a bar that Bernie Sanders has visited.

2.8 List the names of people who have never drunk a drink named for them (e.g. “Sam Adams” drinking a beer called “Sam Adams”), but have visited at least 1 bar named for them.

2.9 List the drinks served in all the bars Donald Trump has only visited once.

2.10 List the name of every bar in Towson that serves no drink that is served in a Bar in Timonium.

2.11 List the names of bartenders who have never served a drink to a drinker that shares their first name, but has served a drink named after them.

2.12 List the name, city and state of the bar that serves the greatest number of different drinks.

2.13 List all drinkers who have ordered every drink served at at least one bar.

2.14 List all drinkers who have ordered every drink served at every bar in the database.