#Created exam with SQL and EER diagram
#Original work (Q+A)

1. Logic

   Does ¬P∧¬Q |= ¬(P∨Q) ∧ ¬(P∧Q)? Prove or Disprove, showing all work.

Answer:

P	Q	¬P	¬Q	¬P∧¬Q	(P∨Q)	¬(P∨Q)	(P∧Q)	¬(P∧Q)	¬(P∨Q) ∧ ¬(P∧Q)	A→B
0	0	1	1	1	0	1	0	1	1	1
0	1	1	0	0	1	0	0	1	0	1
1	0	0	1	0	1	0	0	1	0	1
1	1	0	0	0	1	0	1	0	0	1

2. EER Modeling

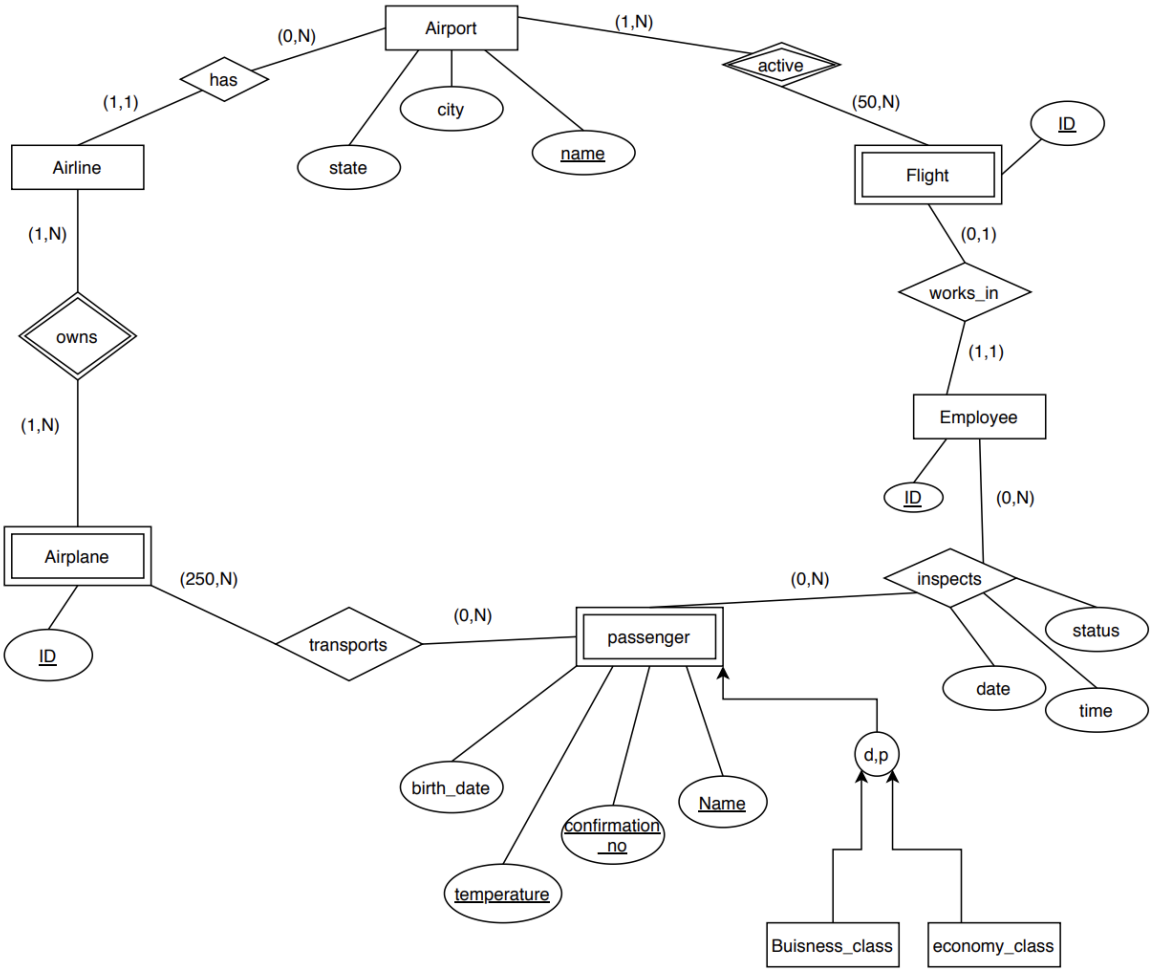
In response to COVID-19, California's government wants to study the activity in the San Francisco airport due to the high-rates in that area. You are hired to organize the following information into a database.

- For every airplane, we record its ID and airline that owns it. For each passenger, we record their name, birthdate, and confirmation number. No passenger has two flights with the same name and time. Each airline has three types of passengers, the employees, the business class, and the economy class, they can only be one type.
- Each airport has 50 or more active flights. Each has a flight ID that is unique for the airplane. Each airplane can transport 50 to 200 passengers at a time. Whenever an airplane has a flight, we record the date and time. Assume all flights have made at least 5 trips.
- For each employee that works for a flight will have a unique ID, you can assume that each employee only works for one flight or less. An employee will store whether each passenger has a normal temperature and their confirmation number, the employees will be inspecting each person who gets off the flight. We will store their unique confirmation number and temperature they have. For people with above average temperature, we keep a list of their confirmation number. We also keep a list of confirmation numbers with normal temperatures just in case. Whenever an employee inspects a person, we record the date and time.

Draw an EER Diagram with *exactly 5 Regular Entity Types (including sub- classes), 2 Weak Entity Types, and 6 Relationship Types (including weak en- tity relationships)*. Clearly label details, including primary and partial keys and (max,min) constraints. List any additional assumptions you make.

Please do your work on the next page.

This page is available for your EER Diagram.
Answer:


Airport
(0,N)
has
(1,1)
Airline
(1,N)
owns
(1,N)
Airplane
ID
(250,N)
transports
(0,N)
passenger
birth_date
temperature
confirmation_no
Name
d,p
Buisness_class
economy_class
(1,N)
active
(50,N)
Flight
ID
(0,1)
works_in
(1,1)
Employee
ID
(0,N)
inspects
(0,N)
status
date
time
city
state
name

3. Queries in Algebra and SQL

Consider a database of mainstream social media platforms (TikTok, Instagram, Snapchat, Facebook, Twitter) for a marketing company. In the relations below we store the amount of users and activity in each platform.

1. user (UID, lname, fname, MI, birthday, email, phone_number, city)
2. platform (PID, name, year, city, ceo)
3. activity (PID_2, interactions)
4. downloaded (UID_1, PID_2, day, month, year)

For each query below, write both (ALG) relational algebra expressions and (SQL) statements. If it is impossible to formulate a query in one of the languages explain why. Clearly list all assumptions you make.

(a) Which platforms (by PID) were downloaded on August, 2017?

(ALG)

Answer:

R ← πPID(σ month = 'August' AND year = 2017 (downloaded))

(SQL)

Answer:

```
SELECT PID
FROM platform, downloaded
WHERE PID = PID AND month = 'August' AND year = 2017;
```

(b) Which users (by UID) didn't use their phone_number?

(ALG)

Answer:

R ← πUID(user) - πUID(σ phone_number = 'True'(user))

(SQL)

Answer:

```
SELECT UID
FROM user
WHERE UID NOT IN(SELECT UID FROM user WHERE IN phone_number)
```

(c) Which pairs of platforms originated from the same ceo?

(ALG)

Answer:

R1(PID1, ceo) ← πPID, ceo

R2(PID2, ceo) ← πPID, ceo

R ← πPID1, PID2(σ PID < PID2(R1 * R2))

(SQL)

Answer:

```
SELECT p1.name, p2.name
FROM platform p1, platform p2
WHERE p1.ceo = p2.ceo
```

(d) Which platforms (by PID) were downloaded by all users?

(ALG)

Answer:

R1(PID1, ceo) ← πPID, ceo

R2(PID2, ceo) ← πPID, ceo

R ← πPID1, PID2(σ PID < PID2(R1 * R2))

(SQL)

Answer:

```
SELECT p.PID
From platform
WHERE NOT EXISTS (SELECT u.UID
                  FROM user u
                  WHERE NOT EXISTS (SELECT *
                                    FROM downloaded d
                                    WHERE p.PID = d.PID AND u.UID = d.UID)
```

4. Short Answer.

(a) (2) Why are spreadsheets not considered a database? Why is a relational database prefered?

Answer: Spreadsheets are not considered a database because they have different formats which make it hard to keep the database from being coherent the more data you use. Since we want to know things in relational databases, the different formats make it difficult and awkward to answer the questions. Therefore, a relational database creates different tables and is very good at linking the entities.

(Note: If the data was small, the spreadsheet would work but not in this class.)

(b) (2) What is the difference between Entity-Relationship and "Relation"?

Answer: An Entity-Relationship is a graphical method that captures the structure of the data in a diagram (birds-eye view of your database), while a relation is a mathematical object in the relational algebra that is an abstraction of a table.

(c) (6) Name any two entities from your Team Design Project and a relationship between them. (Kept this the same because problem was used last year too, assuming it was an occuring/required problem)

Answer: