CSE 444: Homework 1

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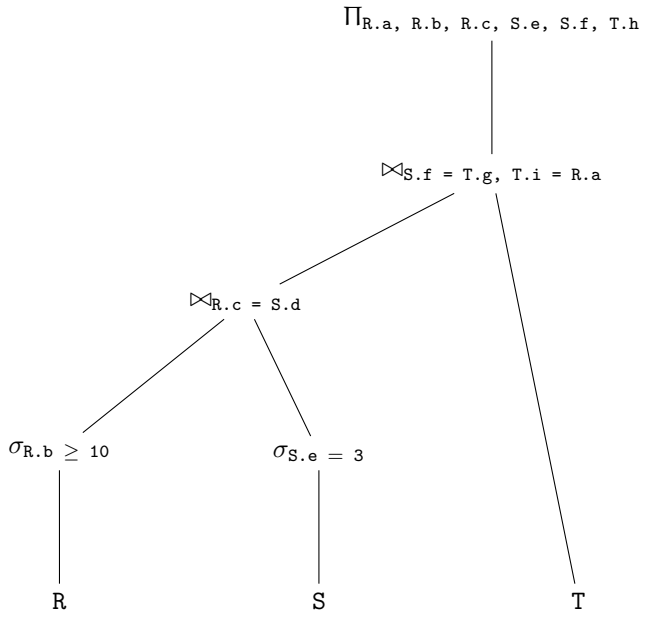
1. Simple SQL and Relational Algebra Review

(a) Logical query plan:



2. • See the queries below.

```
1  CREATE TABLE InsuranceCo (name varchar(20) PRIMARY KEY, phone integer);
2  CREATE TABLE Person (ssn integer PRIMARY KEY, name varchar(20));
3  CREATE TABLE Vehicle (
4      licensePlate varchar(20) PRIMARY KEY,
5      year integer,
6      maxLiability double,
7      name REFERENCES InsuranceCo (name),
8      ssn REFERENCES Person (ssn)
9      );
10 CREATE TABLE Driver (
11     driverID integer,
12     ssn REFERENCES Person (ssn)
13     );
14 CREATE TABLE NonProfessionalDriver (
15     ssn REFERENCES Person (ssn),
16     driverID REFERENCES Driver (driverID)
17     );
18 CREATE TABLE ProfessionalDriver (
19     medicalHistory varchar(20),
20     ssn REFERENCES Person (ssn),
21     driverID REFERENCES Driver (driverID)
22     );
23 CREATE TABLE Truck (
24     capacity integer,
25     licensePlate REFERENCES Vehicle (licensePlate),
26     ssn REFERENCES Person (ssn)
27     );
28 CREATE TABLE Car (
29     make varchar(20),
30     licensePlate REFERENCES Vehicle (licensePlate)
31     );
```

```
32  CREATE TABLE Drives (
33      licensePlate REFERENCES Vehicle (licensePlate),
34      ssn REFERENCES Person (ssn)
35      );
```

- The "`insures`" relationship is many-to-one, so it is included in the `Vehicle` relation.
- `Drives` is a many-to-many relationship, `Operates` is a many-to-one relationship. Therefore, `Drives` requires an individual relation table, while `Operates` can be integrated into `Truck`

3.

- First pick D $\rightarrow$ B. Then we have two relations (ACDE), (DB)
  Then fix CE $\rightarrow$ A in (ACDE), giving us (CDE), (CEA), (DB) as the final decomposition.
- First pick BC $\rightarrow$ A. Then we have two relations (BCDE), (BCA).
  Then fix DE $\rightarrow$ B, giving us (CDE), (DEB), (BCA) as the final decomposition.

4.

- {}
- {A $\rightarrow$ B, B $\rightarrow$ C, C $\rightarrow$ D, D $\rightarrow$ A}
- {A $\rightarrow$ B, B $\rightarrow$ A, C $\rightarrow$ (ABD), D $\rightarrow$ (ABC)}