CS30202: Database Management Systems Class Test I: Time: 45 mins, Marks: 15

Roll Number: **Name:**

1. The following database tables are maintained by the traffic police of the city of Kolkata. A car is not involved in more than one accident in a single day. Also, the driver involved in a car accident may not always be the owner of the car. Write relational algebra, and SQL queries to find the following. **[5x(1+1) = 10]**

Person(aadhar_no, name, address)
Car(registration_no, year, model)
Accident(registration_no, accident_date, driver_aadhar, damage_amount)
Owns(aadhar_no, registration_no)

(i) The *aadhar_no* of every person who owns one or more cars, none of which has been involved in a car accident.

RA:

$$\pi_{aadhar\_no} - \pi_{aadhar\_no}(Owns \bowtie Accident)$$

SQL:

SQL:

```
SELECT DISTINCT aadhar_no
FROM Owns
WHERE aadhar_no NOT IN (
    SELECT O.aadhar_no
    FROM Owns O, Accident A
    WHERE O.registration_no = A.registration_no
);
```

Alternative SQL using EXCEPT:

```
SELECT aadhar_no
FROM Owns
EXCEPT
SELECT O.aadhar_no
FROM Owns O, Accident A
WHERE O.registration_no = A.registration_no;
```

(ii) The name of all the car owners who have had all of their cars involved in an accident.

RA:

$$\pi_{\text{name}}(\text{Person} \bowtie (\pi_{\text{aadhar\_no}}(\text{Owns}) - \pi_{\text{aadhar\_no}}(\text{Owns} - (\text{Owns} \bowtie \text{Accident}))))$$

SQL:

```
SELECT O.aadhar_no
FROM Owns O, Accident A
WHERE O.registration_no = A.registration_no
EXCEPT
SELECT O.aadhar_no
FROM Owns O
WHERE O.registration_no NOT IN (SELECT A.registration_no
                                FROM Accident A)
```

(iii) The *aadhar_no* of every person, who owns a TATA or a MARUTI car.

RA:

$$\pi_{aadhar\_no}(Owns \bowtie \sigma_{model = TATA \vee model = MARUTI}(Car))$$

SQL:

```
SELECT O.aadhar_no
FROM Owns O, Car C
WHERE O.registration_no = C.registration_no AND
                (C.model='TATA' OR C.model='MARUTI')
```

(iv) The name of the driver and the amount of damage who participated in the most costly (single) accident.

RA:

$$\text{Let } M = \mathcal{G}_{\max(\text{damage\_amount})}(\text{Accident}) \text{ (aggregate function for max damage)}$$

$$\pi_{\text{name, damage\_amount}}(\text{Person} \bowtie_{\text{aadhar\_no}=\text{driver\_aadhar}} (\text{Accident} \bowtie_{\text{damage\_amount}=M.\max} M))$$

SQL:

```
SELECT Person.name, damage_amount
FROM Accident, Person
WHERE damage_amount IN (SELECT MAX(damage_amount)
                        FROM Accident)
                        AND Person.aadhar_no = Accident.driver_aadhar
```

(v) The registration_no of all the cars that have been involved in more than one accident in a calendar year. Do not return duplicates.

RA:

$$\pi_{\text{registration\_no}}(\sigma_{\text{count}>1}(\mathcal{G}_{\text{registration\_no, YEAR(accident\_date),COUNT(*)}}(\text{Accident})))$$

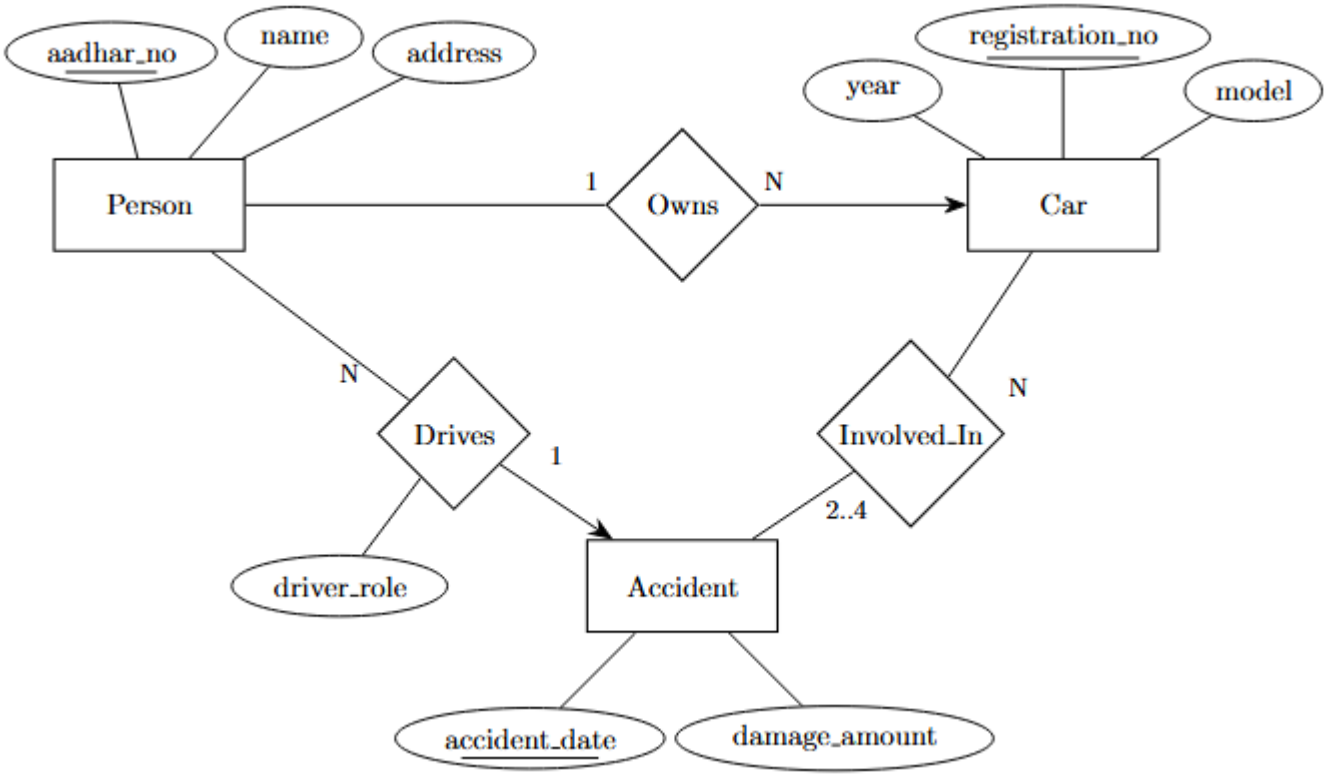
SQL:

```
SELECT registration_no
FROM Accident
GROUP BY registration_no
HAVING COUNT(accident_date)>1
```

2. Draw an ER-diagram to represent the database of cars and accidents as described in the previous question. Reflect the following constraints. **[5]**

A. A car has a single owner but an owner may own multiple cars.

B. An accident can involve at most 4 cars and a minimum of 2 cars.


aadhar_no
name
address
registration_no
year
model
Person
1
Owns
N
Car
N
Drives
1
Involved_In
N
2..4
driver_role
Accident
accident_date
damage_amount

ROUGH