CS-442 Homework 2

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I pledge my honor that I abided by the Stevens Honor System

1 Part I

1.1

Return the name of guests who have booked a hotel room in NYC in January 2017 (tips: "January 2017' = "Jan01, 2017 to Jan31, 2017").

$$\rho(AllJoins,\ Guest \bowtie Hotel \bowtie Room \bowtie Booking)$$

$$\pi_{gName}(\sigma_{fromDate>='Jan01' \wedge fromDate<='Jan31' \wedge year=2017 \wedge city='NYC'}(AllJoins))$$

1.2

Return the name of guests who have booked a hotel room of type "suite" in NYC for longer than 10 days.

$$\pi_{gName}(\sigma_{type='suite' \wedge hCity='NYC' \wedge noOfDays>10}(Guest \bowtie Hotel \bowtie Room \bowtie Booking))$$

1.3

Return the name of guests who never booked a hotel room for longer than 5 days.

$$\rho(AllGuests,\ \pi_{gId,gName}(Guest))$$

$$\rho(FiveDays,\ \pi_{gId,gName}(\sigma_{noOfDays>5}(Guest \bowtie Booking)))$$

$$\pi_{gName}(AllGuests - FiveDays)$$

1.4

Return the IDs of the hotels located in NYC which were not booked at all in the year 2017.

$$\pi_{hId}(\sigma_{hCity='NYC'}(Hotel)) - \pi_{hId}(\sigma_{year=2017}(Booking))$$

1.5

Return the ids of the guests who have booked at least one room of type "suite" in every hotel located in NYC.

$$\rho(NYCHotels,\ \pi_{hId}(\sigma_{hCity='NYC'}(Hotel)))$$

$$\pi_{gId}((Guest \bowtie (\sigma_{type='suite'}(Room) \bowtie Booking) \bowtie NYCHotels)/NYCHotels)$$

2 Part II

2.1

Find the name and age of all employees who work in both Hardware and Software departments.

```
SELECT E.name, E.age
FROM Emp E, Works W, Dept D
WHERE E.eid = W.eid AND D.did = W.did AND D.did='Hardware'
AND E.eid IN(
    SELECT E1.eid
    FROM Emp E1, Works W, Dept D
    WHERE E1.eid = W.eid AND D.did = W.did AND D.did='Software'
)
```

2.2

Find the id of managers who control the largest total amount of budget (note: each manager may manage multiple departments).

```
SELECT DISTINCT D.managerid
FROM Dept D
WHERE D.managerid NOT IN (
SELECT DISTINCT D2.managerid
FROM Dept D2, Dept D3
GROUP BY D2.managerid, D3.managerid
HAVING SUM(D2.budget) > SUM(D3.budget)
```

2.3

Find the id of the managers who manage only the departments of budget that is at least 1 million dollars.

```
SELECT D.managerid
FROM Dept D
GROUP BY D.managerid
HAVING EVERY(D.budget >= 1000000)
```

2.4

Find the name of all employees whose salary exceeds the budget of all the departments that the employee works in.

```
SELECT E.ename
FROM Emp E
WHERE E.salary > ALL(
    SELECT D.budget
    FROM Dept D, Works W
    WHERE D.did = W.did AND E.eid = W.eid
)
```

2.5

Find the name of managers who manage the department of the largest budgets.

```
SELECT DISTINCT E.ename
FROM Emp E, Works W, Dept D
WHERE D.did = W.did AND E.eid = W.eid AND D.budget = (
    SELECT MAX(D1.budget)
    FROM Dept D1
)
```

3 Part III

3.1 Relational Algebra

3.1.1

Return the id, addresses, asking_price, and selling_price of all houses that are sold at price less than the asking price.

$$\pi_{id,address,asking\_price,selling\_price}(\sigma_{selling\_price<asking\_price}(Sold \bowtie_{Sold.house\_id=House.id} House))$$

3.1.2

Return the names of all of (prospective) buyers who have not bought a house.

$$\pi_{name}(Buyer) - \pi_{name}(Buyer \bowtie_{Buyer.id=Sold.buyer\_id} Sold)$$

3.2 SQL Queries

3.2.1

For each postal code in which there were at least three houses sold, find the postal code and the average selling price of houses in that postal code.

```
SELECT H.postal_code, AVG(S.selling_price)
FROM House H, Sold S
WHERE S.house_id = H.id
GROUP BY H.postal_code
HAVING COUNT(*) >= 3
```

3.2.2

Find the addresses and asking prices of all houses that have at least 4 bedrooms and 2 bathrooms that have not been sold. Each (address, asking price) pair should appear only once.

```
SELECT DISTINCT H.address, H.asking_price
FROM House H
WHERE H.beds >= 4 AND H.baths >= 2 AND NOT EXISTS (
    SELECT *
    FROM Sold S
    WHERE S.house_id = H.id
)
```