

CS143: Database Systems

Homework #2

1. Assume the following tables for this problem:

```
Employee(person-name, age, street, city)
Work(person-name, company-name, salary)
Company(company-name, city)
Manage(person-name, manager-name)
```

A person's name is unique, but a person may work for more than one company. A company name is unique, but a company may be located in more than one city.

- (a) Write a query in SQL to find the names of such companies that all of their employees have salaries higher than \$100000.
 - (b) Write the same query in Relational Algebra.
 - (c) Compare the results of (a) and (b), are they the same? Why?
2. Assume the database of the previous problem and write the following queries in SQL. You should use at least one subquery in each of your answers and write each query in two significantly different ways (e.g., using different operators such as **EXISTS**, **IN**, and **SOME**)
- (a) Find the name(s) of the employee(s) whose *total* salary is higher than those of all employees living in Los Angeles.
 - (b) Find the name(s) of the manager(s) whose *total* salary is higher than that of at least one employee that they manage.
3. Assume the following tables for this problem:

```
MovieStar(name, address, gender)
MovieExec(name, address, company, netWorth)
```

- (a) We want to find the names and addresses of all female movie stars (**gender** = 'F' in the **MovieStar** relation) who are also movie executives with a net worth over \$1,000,000 (**netWorth** > 1000000 in the **MovieExec** relation).
 - i. Write the query using **INTERSECT** operator.
 - ii. Write the query without using **INTERSECT** operator.
 - (b) We want to find the movie stars who are not movie executives.
 - i. Write the query using **EXCEPT** operator.
 - ii. Write the query without using **EXCEPT** operator.
4. Assume the following tables for this problem:

```
ComputerProduct(manufacturer, model, price)
Desktop(model, speed, ram, hdd)
Laptop(model, speed, ram, hdd, weight)
```

A computer product is either a desktop or a laptop.

- (a) Find the average speed of all desktop computers.
- (b) Find the average price of all laptops with weight below 2kg.
- (c) Find the average price of PC's and laptops made by "Dell."
- (d) For each different CPU speed, find the average price of a laptop.
- (e) Find the manufacturers that make at least three different computer models.

5. Assume the computer-product database of the previous problem, and write the following database modifications.

- (a) Using two INSERT statements, insert a desktop computer manufactured by HP, with model number 1200, price \$1000, speed 1.2Ghz, 256MB RAM, and an 80GB hard drive.
- (b) Using two DELETE statements, delete all desktops manufactured by IBM with price below \$1000. (*Comments: Be careful with the order of your two DELETE statements.*)
- (c) For each laptop made by Gateway, add one kilogram to the weight. (*Hint: The WHERE clause in a UPDATE statement may contain complex conditions, including subqueries.*)

1. (a) (SELECT company-name
FROM Work)
EXCEPT
(SELECT company-name
FROM Work
WHERE salary <= 100000);
(b) $\Pi_{\text{company-name}}(\text{Work}) - \Pi_{\text{company-name}}(\sigma_{\text{salary} \leq 100000}(\text{Work}))$
(c) Yes, they are the same because the EXCEPT operator will remove all duplicates before returning.

2. (a) SELECT person-name
FROM Work
GROUP BY person-name
WHERE SUM(salary) > ALL
(SELECT SUM(salary)
FROM Employee, Work
GROUP BY person-name
WHERE Employee.person-name=Work.person-name
AND city='Los Angeles');
SELECT person name
FROM Employee
WHERE NOT EXISTS
(SELECT person-name
FROM Employee, Work
GROUP BY person-name
WHERE (Employee.person-name=Work.person-name
AND city='Los Angeles')
HAVING SUM(salary) >= (SELECT SUM(salary)
FROM Employee, Work
WHERE Employee.person-name=Work.person-name));
(b) SELECT manager-name
FROM Manage
WHERE
(SELECT SUM(salary)
FROM Work, Manage
GROUP BY manager-name
WHERE Work.person-name=Manage.manager.name)>SOME
(SELECT SUM(salary)
FROM
(SELECT person-name, SUM(salary)
FROM Work
GROUP BY person-name) S
WHERE S.person-name=Manage.person-name);
SELECT manager-name
FROM Manage
WHERE EXISTS
(SELECT *
FROM
(SELECT person-name, SUM(salary) totSal1
FROM Work
GROUP BY person-name) S1,
(SELECT person-name, SUM(salary) totSal2
FROM Work
GROUP BY person-name) S2
WHERE Manage.manager-name=S1.person-name
AND Manage.person-name=S2.person-name
AND S1.totalSal1>S2.totSal2);

3. (a) i. (SELECT name, address
FROM MovieStar
WHERE gender='F')
INTERSECT
(SELECT name, address
FROM MovieExec
WHERE netWorth>1000000);
ii. SELECT name, address
FROM MovieStar, MovieExec
WHERE gender='F' AND netWorth>1000000
AND MovieStar.name=MovieExec.name
AND MovieStar.address=MovieExec.address;
(b) i. (SELECT name
FROM MovieStar)
EXCEPT
(SELECT name
FROM MovieExec);
ii. SELECT name
FROM MovieStar
WHERE name NOT IN
(SELECT name
FROM MovieExec);

4. (a) SELECT AVG(speed)
FROM Desktop;
(b) SELECT AVG(price)
FROM ComputerProduct, Laptop
WHERE ComputerProduct.model=Laptop.model
AND weight<2;
(c) SELECT AVG(price)
FROM ComputerProduct
WHERE manufacturer='Dell';
(d) SELECT AVG(price)
FROM ComputerProduct, Laptop
WHERE ComputerProduct.model=Laptop.model
GROUP BY speed;
(e) SELECT manufacturer
FROM ComputerProduct
GROUP BY manufacturer
HAVING COUNT(*)>=3;

5. (a) INSERT INTO ComputerProduct VALUES('HP', 1200, 1000);
INSERT INTO Desktop VALUES (1200, 1.2, 256, 80);
(b) DELETE FROM Desktop
WHERE model IN
(SELECT model
FROM ComputerProduct
WHERE manufacturer='IBM'
AND price < 1000);
DELETE FROM ComputerProduct
WHERE manufacturer='IBM'
AND price<1000
AND model NOT IN (SELECT model
FROM Laptop);
(c) UPDATE Laptop
SET weight = weight+1
WHERE model IN
(SELECT model
FROM ComputerProduct
WHERE manufacturer='Gateway');