

Practice Session – Relational Algebra and SQL Queries

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Example Database

Movies

Actors

Acts

Directors

Query-1

- Find movies made after 1997

$\sigma_{year > 1997}(\text{Movies})$

Query-2

- Find movies made by Hanson after 1997

$\sigma_{year > 1997 \wedge director = 'Hanson'}(Movies)$

Query-3

- Find all movies and their ratings

$\pi_{title, rating}(\text{Movies})$

Query-4

- Find all actors and directors

$$\pi_{actor}(Actors) \cup \pi_{director}(Directors)$$

Query-5

- Find Coen's movies with McDormand

$e_1 = \pi_{title}(\sigma_{actor='McDormand'}(Acts))$

$e_2 = \pi_{title}(\sigma_{director='Coen'}(Movies))$

$result = e_1 \cap e_2$

Query-6

- Find actors who have acted in all of Coen's movies

$\text{CMovies} = \pi_{\text{title}}(\sigma_{\text{director}='Coen'}(\text{Movies}))$

Example Database

employee(employee-name, street, city)

works(employee-name, company-name, salary)

company(company-name, city)

manages(employee-name, manager-name)

Query-1

- Find the names, street address, and cities of residence for all employees who work for 'First Bank Corporation' and earn more than \$10,000.

```
select employee.employee-name, employee.street,  
employee.city from employee, works  
where employee.employee-name=works.employee- name  
and company-name = 'First Bank Corporation' and salary  
> 10000)
```

Query-2

- Find the names of all employees in the database who live in the same cities as the companies for which they work.

```
select e.employee-name  
from employee e, works w, company c  
where e.employee-name = w.employee-name and e.city =  
c.city and w.company-name = c.company-name
```

Query-3

- Find the names of all employees in the database who live in the same cities and on the same streets as do their managers.

```
select p.employee-name  
from employee p, employee r, manages m  
where p.employee-name = m.employee-name and  
m.manager-name = r.employee-name and p.street =  
r.street and p.city = r.city
```

Query-4

- Find the names of all employees in the database who do not work for 'First Bank Corporation'. Assume that all people work for exactly one company.

```
select employee-name  
from works  
where company-name <> 'First Bank Corporation'
```

Query-5

- Find the names of all employees in the database who earn more than every employee of 'Small Bank Corporation'. Assume that all people work for at most one company.

```
select employee-name  
from works  
where salary > all (select salary  
from works  
where company-name = 'Small Bank Corporation')
```

Query-6

- Assume that the companies may be located in several cities. Find all companies located in every city in which 'Small Bank Corporation' is located.

```
select s.company-name
from company s
where not exists
((select city from company where company-name =
'Small Bank Corporation') except
(select city from company t where s.company-name =
t.company-name))
```

Query-7

- Find the names of all employees who earn more than the average salary of all employees of their company. Assume that all people work for at most one company.

```
select employee-name  
from works t  
where salary >  
(select avg(salary) from works s  
where t.company-name = s.company-name)
```


Query-8

- Find the name of the company that has the smallest payroll.

```
select company-name  
from works  
group by company-name  
having sum(salary) <= all (select sum(salary)  
from works  
group by company-name)
```

Self-Join

- The SQL **SELF JOIN** is used to join a table to itself as if the table were two tables; temporarily renaming at least one table in the SQL statement.
- **Syntax**

```
SELECT a.column_name, b.column_name...  
FROM table1 a, table1 b  
WHERE a.common_field = b.common_field;
```

Example

ID	NAME	AGE	CITY	SALARY	Manager_ID
1	Micheal	32	Halifax	2000\$	2
3	Bob	26	Toronto	5000\$	1
4	Alice	22	Vancouver	2500\$	2
5	Trishla	25	Halifax	3000\$	3

```
SQL> SELECT a.ID, b.Name as "Employee Name", a.Salary,  
a.Name as "Manager Name" , Manager_ID  
FROM Employee a, Employee b  
WHERE a.Manager_ID = b.ID;
```

Example - Answer

ID	Employee Name	SALARY	Manager Name	Manager_ID
	Micheal	2000\$	Lindsay	2
2	Lindsay	3000\$	--	--
3	Bob	5000\$	Micheal	1
4	Alice	2500\$	Lindsay	2
5	Trishla	3000\$	Bob	3

```
SQL> SELECT a.ID, b.Name as "Employee Name", a.Salary,  
a.Name as "Manager Name"  
FROM Employee a, Employee b  
WHERE a.Manager_ID = b.ID;
```

Assignment Gift!!!

Problem-2(a)

- Get the names of courses in the CS department

Solution:

$T \leftarrow \sigma(\text{Department}=\text{"CS"}) (\text{Course})$

$\text{Result} \leftarrow \pi(\text{Course_name})(T);$