COMP 3311: Database Management Systems

Tutorial 3 Relational Algebra (RA) and Structured Query Language (SQL)

Name: (1) MENG (Last/Family (PRINT)) / Zeyuan (Given/First (PRINT)) **Student#:** (1) 20761727

Name: (2) LIU / Jianmeng **Student#:** (2) 20760163

Submission: Upload this exercise worksheet by 11.59pm Friday (4 Mar) (Only one student needs to upload)

Employee(empId, employeeName, street, city)
Works(empId, companyName, salary)
Company(companyName, city)
Manages(employeeEmpId, managerEmpId)

Exercise 1: Find the names of employees who earn more than $10,000 and live in Hong Kong.

RA:

$$\pi_{\text{employeeName}}\left(\sigma_{\text{salary}>10{,}000 \wedge \text{city}='\text{HongKong}'}\left(\text{Employee} \bowtie \text{Works}\right)\right)$$

SQL:

```
select Employee.employeeName
from Employee natural join Works
where salary > 10000 and city = 'Hong Kong';
```

Exercise 2: Find the names of the employees who are not managers.

RA:

$$\pi_{\text{employeeName}}\left(\left(\pi_{\text{empId,employeeName}}(\text{Employee})\right) - \left(\pi_{\text{empId,employeeName}}(\text{Employee} \bowtie_{\text{Employee.empId=Manages.managerEmpId}} \text{Manages})\right)\right)$$

SQL:

```
select employeeName
from ((select employeeId, employeeName
       from Employee)
      minus
      (select employeeId, employeeName
       from Employee, Manages
       where Employee.empId = Manages.managerEmpId)
      );
```

Exercise 3: Find the names of all persons who work for First Bank Corporation and live in the city where the company is located.

RA: $\pi_{\text{employeeName}}\left(\left(\text{Employee} \bowtie \text{Works}\right) \bowtie \left(\sigma_{\text{companyName}='\text{FirstBankCorporation}'}(\text{Company})\right)\right)$

SQL:

```
select employeeName
from Employee natural join Works natural join Company
where companyName='First Bank Corporation';
```

Exercise 4: Construct only SQL queries to find all cities where employees live or where companies are located.

```
select city from Employee
union
select city from Company;
```

Exercise 5: Construct only SQL queries to find the names of all employees who work (in at least one company) and the city of the company in ascending order of employee names.

```
select employeeName, C.city
from Employee E, Works W, Company C
where C.companyName=W.companyName
    and E.empId=W.empId
order by employeeName asc;
```

Exercise 6: Construct only SQL queries to find the names and cities of employees who work for exactly one company.

```
select employeeName, city
from Employee E
where 1 = (select count(*)
           from Works
           where empId=E.empId);
```