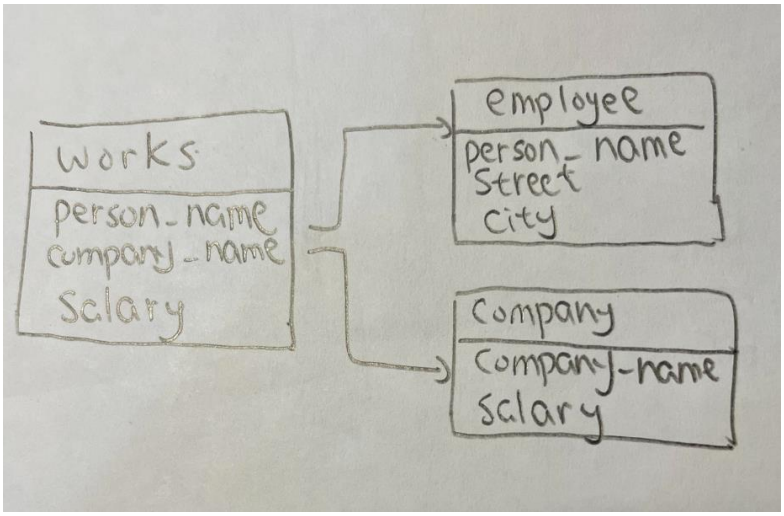
employee (*person_name*, *street*, *city*)
company (*company_name*, *city*)
works (*person_name*, *company_name*, *salary*)

Figure 1. An Employee database.

A simple Employee database is shown in Figure 1. Please answer Questions 1-3 based on this schema.

1. (20%) The attribute *person_name* is defined as the primary key of the *employee* relation for simplicity (假設沒有兩個人同名), and the attribute *company_name* is defined as the primary key of the *company* relation. The *works* relation describes which company(s) a person works for and the associated salary(s). Please determine what the **best** primary key of the *works* relation should be based on the following two assumptions, respectively. Note that you need to explain your answer.
   (a) An employee can work for only one company in this database.
   我覺得works的primary key是person_name
   因為沒有人同名且每個人只能在一間公司上班能保證每條
   記錄在關聯中都是唯一的且容易辨別跟查詢雇員的資料
   (b) An employee might work for many companies in this database.
   我覺得works的primary key是person_name跟company_name
   因為如果單靠person_name不能確保每條紀錄在關聯中是唯一的
   (員工可能也在其他公司有工作)所以要加上company_name來確保
   完整性跟一致性

2. (20%) Suppose that the primary key of the *works* relation is (person_name, company_name).
   (a) Identify the two appropriate foreign keys of the *works* relation.
   (b) Construct a schema diagram for this database.
   (a) works 的 person_name 引用了 employe 的 person_name
   代表 works(person_name)是 foreign key
   works 的 company_name 引用了 company 的 company_name
   代表 works(company_name)。
   (b)



3. (40%) Suppose that the primary key of the *works* relation is the attribute *person_name*. Give an expression in the relational algebra for each of the following queries, respectively.

(a) Find the name of each employee who lives in the city “Miami”.

π (employee.city=”Miami”)(employee)

(b) Find the name of each employee who lives in the city “Miami” and whose salary is greater than $100000.

π (employee.city=”Miami”^works.salary>100000)(employee ⋈ works)

(c) Find the name and the city of residence of each employee who works for “FirstBank”.

π (employee.person_name, employee.city)(σ(works.company_name = "FirstBank"))(employee ⋈ works)

(d) Find the name of each employee who does NOT work for “FirstBank”.

π (employee.employee_name) (σ not (company.company_name = "FirstBank") (employee ⋈employee.city = company.city (company)))

4. (20%) 請回答下述有關SQL的問題。You need to list the references (e.g., URLs) you used.

(a) ISO最新通過的SQL標準版本為何? (答案的格式應該是SQL:XXXX，其中XXXX代表年分。)並請列出至少兩項新增之處 (與上一標準版本相比)

SQL:2023

- 差別 1.支援 JSON 格式的資料處理
- 2.支援對大型資料庫的分散式查詢

(b) Microsoft SQL Server專用的SQL語言名稱

Transact-SQL。

(c) Oracle專用的SQL語言名稱。

PL/SQL

Note: Please submit your homework in a single PDF file to Tronclass before 2023/10/8 23:59.