HW2 DATABASE

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1. Breifly explain the following concepts using your own Example.

- Relational data model → Digital data based on the relational model of data. ex. the relationship between seller and customer
- Super key → attribute that unique to identify data
- Candidate key → minimal set of superkey (use less attribute)
- Primary key → one of candidate key, should be the attribute that can't change.
- Foreign key → attribute that are relationship with another table
- Difference of Superkey, Candidate key, Primary key, foreign key

→ Superkey use many attribute as it's unique, but candidate key has to use less. primary is one of candidate key. Foriegn key is use to define relationship with another table

- Difference of Database Instance and database system
  → Schema is the formal description of the structure of database whereas Instance is the set of information currently stored in a database at a specific time
- Difference of Referencing relation and Referenced relation
  → Referencing relation is the table that have foreign key and referenced relation is the table that foreign key appear to be primary key
- Difference of Cartesian Product and Join operation
  → Cartesian product allow the result to have multiple attribute with same description but Join will eliminate one copy of duplicate attribute.

(2) Give your own example to show relation between Primary key, candidate key, and Foreign key

StudentID	Name	Class No.
62101	Atom	6/1
62102	Boom	6/1
62103	Cat	6/2
62104	Duck	6/3

Candidate key → StudentID or Name (both are unique)
Primary key → ID (can't change)
Foriegn key → Name and Class No. (Cup to another table to compare)

3. Consider the following expressions, which use the result of a relational algebra operation as the input to another operation. For each expression, explain in words that the operation does.

a. $\sigma_{year \geq 2009}(takes) \bowtie student$

⇨ filter takes year ≥ 2009 join with student

b. $\sigma_{year \geq 2009}(takes \bowtie student)$

⇨ Join takes with student, filter year ≥ 2009

c. $\Pi_{ID, name, course\_id}(student \bowtie takes)$

⇨ Student join with takes set ID, name, course_id

4. Consider the relational database of the following figue. Give an expression in the relation algebra to express each of the following queries

employee (person_name, street, city)

works (person_name, company_name, salary)

company (company_name, city)

- find names of all employees who live in "Maimi"

⇨ Π person_name (σ city = "Maimi" (employee))

- find names of all employees whose salary is > 100,000

⇨ Π person_name (σ salary > 100,000 (employee))

- find the names of all employees who live in "Maimi" and whose salary is greater than 100,000

⇨ Π person_name (σ salary > 100,000 , city = "Maimi" (employee))

- find names of all employees who work for "First Bank Corp."

⇨ Π person_names (σ company_name = "First Bank Corp." (works))

- find names and cities of residence of all employees who work for "First Bank Corporation"

  ⇨ Π person_name, city (employee $\bowtie$ (σ company_name = "First Bank Corporation" (work)))

- find the names, street address, and cities of residence of all employees who work for "First bank Corp" and earn more then 10,000

  ⇨ Π person_name, street, city (σ salary > 10,000 , company_name = "First Bank Corporation (employee $\bowtie$ work))