

COMP518 Assignment 1

Question One

Consider the following relational database schema in a fitness centre which offers

taught classes. Underlined attributes represent the primary keys of each relation:

- 1.Instructor(iId,name,email,address,speciality)
- 2.Member(mId,name,email,since)
- 3.Class(cId,cName,iId,type,cost)
- 4.Enrols(mId,cId)

Write the relational algebra expressions for the following queries:

1. **Find the instructors who teach at least one class that cost at least 25. Show the IDs (iIds) of those instructors.**

Answer:

σHere, instructor who teach at least one class that cost at least 25, which means the cost should be greater than or equal to 25.

- So, $\sigma_{cost} \geq (\text{Class})$
- To show (iIds) of the instructor

$$\pi_{iId}(\sigma_{cost} \geq (\text{Class}))$$

2. **Find the members who have not enrolled in any ‘kickboxing’ classes. Show the names of those members. Note that ‘kickboxing’ is a type of class.**

Answer:

- To find members not enrolled in kickboxing.
- Let us first find people who enrolled in Kicking.

$$\sigma_{type = 'kickboxing'}(\text{Class})$$

- In the next step we join the “kickboxing”(Class) to Enrols. So, we can get the enrolment of the kickboxing classes.

$$\sigma_{type = 'kickboxing'}(\text{Class}) \bowtie (\text{Enrols})$$

$$\pi_{type}(\sigma_{type = 'kickboxing'}(\text{Class}) \bowtie (\text{Enrols}))$$

To Find the members who are not enrolled

The expression for members who are not enrolled in Kickboxing is

$$\pi_{name} (Member) - \pi_{mId, name}(\sigma_{type = 'kickboxing'}(Class) \bowtie (Enrol))$$

3. Find the members who have enrolled in all classes taught by instructor whose name is ‘Lana’. Show the names and IDs (mIds) of those members.

Answer:

- Let’s consider class taken by Lana as C_{Lana}
- Class taught by Lana $\sigma_{name = 'Lana'}(Instructor) \bowtie Class$
- $C_{Lana} = \pi_{cls}(\sigma_{name = 'Lana'}(Instructor) \bowtie Class)$
- To find total number of members enrolled in Lana Class, Lets find the members not attended by Lana
- $\pi_{mId}(Members) - \pi_{mId}(C_{Lana} \bowtie Enrols)$
- Then we can now subtract the members from Class not taken by Lana

$$\pi_{mId, name}(Members) - ((\pi_{mId}(Members) - \pi_{mId}(C_{Lana} \bowtie Enrols)))$$

4. Find the members who have the same name as some other member. Show the names of those members.

Answer:

$$\begin{aligned} & \pi_{name}(\sigma_{count}(name) > 1(Member)) \\ & \pi_{name}(\sigma_{count(name)} > 1(Member)) \\ & \pi_{name}(\sigma_{name \in (result)(Meember)}) \end{aligned}$$

Question Two

Based on the information above, draw an ER or (E)ER diagram that models as many concepts and constraints as possible. You should use the notations discussed in the lectures and in your textbook. Use only binary relationships. Solutions with ternary, or higher degree, relationships will be marked down.

Answer:

