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Question One – Relational Algebra

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

$$\Pi_{iId}(\sigma_{cost \geq 25}(Class))$$

2. **(10 marks)** 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.

$\Pi_{name}(Member \bowtie (\Pi_{mId}(Member) - \Pi_{mId}(Enrols \bowtie (\sigma_{type = \text{"kickboxing"}}(Class)))))$

3. **(10 marks)** 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.

$\Pi_{mId,name}(Enrol \bowtie Member \div \Pi_{cId}(Class \bowtie (\sigma_{name = \text{"Lana"}}(Instructor))))$

4. **(10 marks)** Find the members who have the same name as some other member. Show the names of those members

$\Pi_{name}(\sigma_{m1.mID \neq m2.mID \wedge m1.name = m2.name}(\rho_{m1(mID, name)}(Member) \times \rho_{m2(mID, name)}(Member)))$

Participants

PK	residencyNo.
	name gender address date_of_birth
AK	emails

Trainer

PK	tr_residencyNo.
	tr_name tr_gender tr_address tr_email qualifications
AK	national_insuranceNo.

CalBurnPP

phealth_and_safety

1...* Managed

1...1 Managed

Attended

Session

PK	sessionID
	date time

Conducted 1...*

exercise_duration

Comprised

Exercise

PK	exerciseID
	ex_name
AK	ex_type

1...1

1...* Offers

can use

1...* Involved

Equipment

PK	equipmentID
FK	eq_name
AK	body_focus

0...*

1...*

Location

PK	locationID
FK	loc_name loc_address
AK	phoneNo.

Weight_Machine

maxWeight
minWeight

Pools

depth
capacity
length

Bicycles

model
type

Running_Machines

maxSpeed
incline