

CS 630 HOMEWORK 1 - DATA BASE MANAGEMNET SYSTEMS

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1. Question 1 (30 points) Consider a database schema with three relations:
Books(bid:integer, bname:string, author:string, pubyear:integer, pubcompany:string)
Students(sid:integer, sname:string, age:real, state:string)
Reads(sid:integer, bid:integer, year:integer) (The primary keys are underlined in each relation. A book is uniquely identified by bid. A student is uniquely identified by sid. If a student reads a book, a record will be present in the Reads relation, with that sid and bid and the year the book was read.) and the following relations instances:

Given table info

Students

Sid	sname	age	state
20	Mary	21	MA
10	anne	20	NY
30	joe	21	MA
40	mary	21	VT
60	linda	23	MA

Reads

sid	bid	year
20	101	2020
20	102	2021
30	103	2020

Books

bid	bname	author	pubyear	pubcompany
102	ulysses	joyce	1920	simon
101	Lord of rings	tolkien	1954	allen
103	other book	joyce	1920	penguin

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a.

bid	bname	author	pubyear	pubcompany
102	ulysses	joyce	1920	simon
103	other book	joyce	1920	penguin

b.

author	pubyear
joyce	1920
joyce	1920

c.

(sid)	sname	age	state	(sid)	bid	year
20	mary	21	MA	20	101	2020
20	mary	21	MA	20	102	2021

d.

(sid)	sname	Age	state	(sid)	bid	year
20	mary	21	MA	20	101	2020
20	mary	21	MA	30	103	2020
30	joe	21	MA	20	101	2020
30	joe	21	MA	30	103	2020
60	linda	23	MA	20	101	2020
60	linda	23	MA	30	103	2020

e.

bid	name	author	pubyear	pubcompany
102	ulysses	joyce	1920	simon
101	lords of rings	tolkien	1954	allen

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f.

sid	sname	age	state	bid	year	bname	author	pubyear	pubcompany
20	Mary	21	MA	102	2021	ulysses	joyce	1920	simon
30	joe	21	MA	103	2020	other book	joyce	1920	penguin

2.

a) Find the information about movies produced by 'WB' or 'Universal' studios.

$$\sigma_{(\text{studio}='WB') \vee (\text{studio}='Universal')} \text{Movies}$$

b) Find the names of actors who are older than 25 and are from state VT.

$$\pi_{aname} \left(\sigma_{(age > 25) \wedge (state='VT')} \text{Actors} \right)$$

c) Find the names and ages of the actors who played only in movies only in 2015.

$$\pi_{aname, age} ((\text{Actors}) \bowtie (\text{Playsin}) \bowtie (\sigma_{(year='2015')} \text{Movies})) - \pi_{aname} ((\text{Actors}) \bowtie (\text{Playsin}) \bowtie (\sigma_{(year \neq '2015')} \text{Movies}))$$

d) Find the names, age and city of actors who are from Boston MA and played some movies produced by 'Universal' studio.

$$\pi_{aname, age, city} ((\text{Actors}) \bowtie (\text{Playsin})) \bowtie (\sigma_{(\text{studio}='Universal')} \text{Movies}) \sigma_{(\text{city}='Boston') \wedge (\text{state}='MA')} (\text{Actors}) \bowtie (\text{Playsin}) \bowtie \text{Movies})$$

e) Find the name and age of the actors who played in movies both in 2012 and 2018.

$$\pi_{aname, age} \left(\sigma_{(year='2012')} \text{Playsin} \right) \bowtie \pi_{aid} \left(\sigma_{(year='2018')} \text{Playsin} \right)$$

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f) Find the names of the actors older than 30 who played in a movie produced by 'WB' studio in 2018.

$$\pi_{aname}((\sigma_{(age>30)}Actors) \bowtie (Playsin) \bowtie (\sigma_{(studio='WB' \wedge year=2018)}Movies))$$

g) Find the information about actors and movies they played in. The result should contain the name and age of actors and the name of movies.

$$\pi_{aname,age,mname}((Actors \bowtie Playsin \bowtie Movies))$$

h) Find the names and ages of actors from MA who played as character 'Batman'.

$$\pi_{aname,age}((\sigma_{(state='MA' \wedge character='Batman')}Actors \bowtie Playsin \bowtie Movies))$$

i) Find the name and age of actors who played in movies produced by 'Paramount' (in any year) and never played in any movie produced by 'WB' in year 2020.

$$\pi_{aname,age} \left((Actors \bowtie Playsin \bowtie (\sigma_{(studio='Paramount')}Movies)) \right) - \\ \pi_{aname,age} (Actors \bowtie Playsin \bowtie (\sigma_{(studio='WB' \wedge year=2018)}Movies))$$

j) Find names of movies in which actors from both MA and NY states played.

$$\pi_{mname}((Actors \bowtie Playsin \bowtie Movies) \bowtie (\sigma_{(state='MA')}Actors) \bowtie (\sigma_{(state='NY')}Actors))$$

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3.

a) Find the information about the youngest students.

Students - $\pi_{sid,sname,age,state}(\sigma_{age1 > age2}(\rho_{(sid1,sname1,age1,state1)}(Students) \times \rho_{(sid2,sname2,age2,state2)}(Students)))$

b) Find the information about the books that are either published in 2010 or 2020.

$\sigma_{pubyear = 2010 \vee pubyear = 2020}(Books)$

c) Find the names, pub year and pub company of the oldest books.

$\pi_{bname,pubyear,pubcompany}(Books - \rho_{B1}(bid, bname, pubyear, pubcompany) \sigma_{B1.pubyear < B2.pubyear}(B1 \times B2))$

d) Find the names of the students from MA who read some books both in 2015 and 2018.

$\pi_{sname}(\sigma_{state = 'MA'}(students) \cap \pi_{sid}(\sigma_{year = 2015}(Reads)) \cap \pi_{sid}(\sigma_{year = 2018}(Reads)))$

e) Find the names of the books that were read by all students.

$\pi_{(bname)}((\pi_{(bid)}Books) / (\pi_{(bid)}Reads)) \bowtie Books$

f) Find the names, pubyear and pubcompany of the books that were read by all students from MA.

$\pi_{bname,pubyear,pubcompany}(\pi_{bid}(Reads) / \pi_{sid}(\sigma_{state = 'MA'}(Students))) \bowtie Books$