CPE 365	Introduction to Databases	Fall 2012

Homework 1

Due: Tuesday, October 30, in class

Problem 1 *Consider the following relations:*

R:

A	B	C
b	c	3
a	c	2
c	a	3
b	b	1
c	a	4
b	a	2

S:

A	B	C
c	c	2
c	a	3
b	b	1
a	b	3
b	c	3
a	a	1
c	a	2

T:

B	D	E	F
a	a	1	2
c	d	2	4
b	b	3	2
d	b	3	2
a	d	2	3
b	c	4	1
d	a	1	4

W:

C	D
1	a
2	b
3	c
4	d

For each of the following queries: (1) compute the answer, (2) draw the query tree.

a. $R \cap S$

b. $S - R$

c. $R - S$

d. $\pi_{A,B}(R)$

e. $\pi_{B,A}(R) \cup \pi_{B,A}(S)$

f. $\pi_{C,B}(R) - \pi_{C,B}(S)$

g. $\pi_C(W) \times \pi_B(S) \times \pi_F(T)$

h. $\sigma_{B=c}(R)$

i. $\sigma_{A \neq B}(S)$

j. $\pi_{B,D}(\sigma_{F \leq E}(T))$

k. $\sigma_{A=D}(\pi_A(R) \times W)$

l. $\sigma_{A=b \wedge C>1}(R) \cup \sigma_{B=b \vee C<3}(S)$

m. $\sigma_{\neg(D=a)}(T)$

n. $\pi_{A,B,R.C,D}(\sigma_{R.C=W.C}(R \times W))$

o. $W \bowtie R$

p. $W \bowtie_{R.C=W.C} R$

q. $T \bowtie_{F=C} W$

r. $R \bowtie S$

s. $R \bowtie_{R.B=S.A} S$

t. $(R \bowtie T) \bowtie \pi_{A,C,D}(S \bowtie W)$

u. $\pi_{T1.D,T2.B}(T \bowtie_{T1.D=T2.B} T)$

v. $\pi_{B,D,E}(\sigma_{F>C}(T \bowtie W))$

w. $\pi_{A,B}(R \bowtie_{R.C \neq S.C} S) \bowtie \sigma_{D=a}(T)$

x. $\pi_A(\pi_B(\pi_C(R \cup S)))$

y. $\sigma_{A \neq a}(S) \bowtie \sigma_{D \neq c}(W)$

z. $\sigma_{C=1}(R) \bowtie \sigma_{C=2}(S)$

Problem 2 *Consider the following database:*

bands:

Id	Name	Formed_in	Country
1	``Pink Floyd''	1965	``UK''
2	``King Crimson''	1969	``UK''
3	``Can''	1968	``Germany''
4	``Doors''	1967	``USA''
5	``Velvet Underground'	1967	``USA''

albums:

AId	Title	BandId	Year
1	``Meddle''	1	1970
2	``Animals''	1	1977
3	``Red''	2	1974
4	``Landed''	3	1975
5	``Soundtracks''	3	1970
6	``Beat''	2	1982
7	``The Doors''	4	1967
8	``Strange Days''	4	1967
9	``Loaded''	5	1970

musicians:

MId	Name	BandId	From	To
1	``Roger Waters''	1	1966	1983
2	``Syd Barrett''	1	1966	1968
3	``Robert Fripp''	2	1969	2002
4	``Adrian Belew''	2	1981	2002
5	``Irmin Schmidt''	3	1968	1978
6	``Michael Karoli''	3	1968	1978
7	``Jim Morrison''	4	1967	1971
8	``Lou Reed''	5	1967	1973

Notes: (a) BandID is a *foreign key* on bands in both relations where this attribute appears. (b) Consider all attributes indicating years to be integers with appropriate comparison operators applicable. (c) In what follows we assume that if a musician is listed as being in the band during a year in which an album was recorded, the musician played on it. (d) First attribute of each relation is its primary key.

If you need to refer to relation names in queries you can use A for albums, B for bands and M for musicians.

Translate the following queries into Relational Algebra and compute their answers based on the given database.

1. Find all musicians who played with their band in year 1970. Output the names of the musicians.
2. Find all musicians who played with their band in year 1970. Output the names of the musicians and the name of the band they played in.
3. Find all musicians who played for `‘‘Can’’`. Output the names of the musicians and the years they played in the band.
4. Find all musicians who played in the band `‘‘Pink Floyd’’` in the year 1971. Output the names of the musicians.
5. Find all musicians who played in their band in the band's year of inception. Output the names of the musicians and the names of the bands.
6. Find the band that released the album `’’Loaded’’`. Report the name of the band.
7. Find the band in which `‘‘Michael Karoli’’` played. Report the name of the band.
8. Find all albums recoreded by bands from USA. For each record output its name, year and the name of the band that recorded it.
9. Find all musicians who participated in recording of the album `‘‘Meddle’’`. Output the names of the musicians.
10. Find all `‘‘Pink Floyd’’` band members who did NOT participate in the recording of the album `‘‘Meddle’’`. (note: a musician did not participate in a recording of an album if he did not play in the band that year).
11. Find all bands that recorded two albums in the same year. For each band, output its name, titles of both albums and the year of their release.
12. Find all bands in which `’’Irmin Schmidt` DID NOT play. Output the names of the bands.
13. Find all albums recorded by the bands who had at least one musician leave befire 1972. Output the name of the album and the year of release.
14. Find all albums recorded by `‘‘King Crimson’’` before `‘‘Adrian Belew’’` joined the band. Report the album titles and years.
15. Find all albums on which `‘‘Lou Reed’’` played. Report the title of the album, the name of the band that recorded it and the year of the album's release.