CPE 365	Introduction to Databases	Fall 2007

Homework 3

Due: Tuesday, October 16, 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	4
a	b	3
b	c	3
a	a	1

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. $\sigma_{\neg(E=3)}(T)$

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 albums recoreded by bands from USA. For each record output its name, year and the name of the band that recorded it.
5. Find all musicians who participated in recording of the album `‘‘Meddle’’`. Output the names of the musicians.
6. Find all bands that recorded two albums in consecutive years. For each band, output its name, titles of both albums and the years of their release.
7. Find all bands in which any musician *but* `’’Irmin Schmidt` played. Output the names of the bands.
8. 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.