

Assignment-5

RA Expressions

1.

Unoptimized Query-----

```
select distinct s.sid,s.sname,b.bookno,b.title
      from student s cross join book b
      inner join buys t on
                                ((s.sname ='Eric' or s.sname ='Anna')
                                and s.sid =t.sid and b.price>20 and t.bookno = b.bookno);
```

RA-----

$$\pi_{s.sid,s.sname,b.bookno,b.title}(S \bowtie_{s.sname='Eric' \vee s.sname='Anna' \wedge s.sid=t.sid \wedge b.price>20 \wedge t.bookno=b.bookno} T)$$

Optimized Query-----

```
select distinct s.sid,s.sname,b.bookno,b.title
      from (select s.sid,s.sname from student s where s.sname ='Eric' or s.sname ='Anna')s
      natural join buys t
      natural join (select b.bookno,b.title from book b where
b.price>20)b;
```

RA-----

$$S = \pi_{s.sid,s.sname}(s.sname='Eric' \vee s.sname='Anna' \ S)$$

$$B = \pi_{b.bookno,b.title}(b.price>20 \ B)$$

$$\pi_{s.sid,s.sname,b.bookno,b.title}(S) \bowtie T \bowtie B)$$

2.

Unoptimized Query-----

```
select distinct s.sid
      from student s
      cross join book b
      inner join buys t on ((s.sname = 'Eric' or s.sname = 'Anna') and
s.sid = t.sid and b.price > 20 and t.bookno = b.bookno);
```

RA-----

$$\pi_{s.sid}(S \bowtie_{s.sname='Eric' \vee s.sname='Anna' \wedge s.sid=t.sid \wedge b.price>20 \wedge t.bookno=b.bookno} T)$$

Optimized Query-----

```
select distinct q ssid
      from (select s.sid as ssid from student s where s.sname = 'Eric' or s.sname = 'Anna')q
      natural join buys t
      natural join (select b.bookno as bbookno from book b where b.price > 20)p ;
```

RA-----

$Q = \pi_{ssid}(s.name='Eric' \vee s.sname='Anna' S)$

$P = \pi_{bbookno}(b.price > 20 B)$

$\pi_{q ssid}(Q \bowtie T \bowtie P)$

3.

Unoptimized Query-----

select

distinct s.sid, b1.price as b1_price, b2.price as b2_price

from (select s.sid from student s where s.sname <> 'Eric') s

cross join book b2

inner join book b1 on (b1.bookno <> b2.bookno and b1.price > 60 and b2.price >= 50)

inner join buys t1 on (t1.bookno = b1.bookno and t1.sid = s.sid)

inner join buys t2 on (t2.bookno = b2.bookno and t2.sid = s.sid);

RA-----

$S = \pi_{s.sid}(s.sname <> 'Eric' S)$

$\pi_{s.sid, b1_price, b2_price}(S \times B2 \bowtie_{b1.bookno <> b2.bookno \wedge b1.price > 60 \wedge b2.price \geq 50}$

$B1 \bowtie_{t1.bookno=b1.bookno \wedge t1.sid=s.sid} T1 \bowtie_{t2.bookno=b2.bookno \wedge t2.sid=s.sid} T2)$

Optimized Query-----

select

distinct s.sid, b1.price as b1_price, b2.price as b2_price

from (select s.sid from student s where s.sname <> 'Eric') s

natural join buys t1

natural join (select b.bookno, b.price from book b where b.price > 60) b1

inner join ((select b.bookno, b.price from book b where b.price >= 50) b2 natural join buys t2)

on b1.bookno <> b2.bookno and t2.sid = s.sid;

RA-----

$S = \pi_{s.sid}(s.sname <> 'Eric' S)$

$B1 = \pi_{b.bookno, b.price}(b.price > 60 B)$

$B2 = \pi_{b.bookno, b.price}(b.price \geq 50 B)$

$\pi_{s.sid, b1_price, b2_price}(S \bowtie T1 \bowtie_{b1.bookno <> b2.bookno \wedge t2.sid=s.sid} (B2 \bowtie T2))$

4.

Unoptimized Query-----

select q.sid from (select

s.sid, s.sname from student s

except

select s.sid, s.sname from student s

inner join buys t on (s.sid = t.sid)

inner join book b on (t.bookno = b.bookno and b.price > 50)) q;

RA-----

$Q = \pi_{s.sid, s.sname}(S) - \pi_{s.sid, s.sname}(S \bowtie_{s.sid=t.sid} T \bowtie_{t.bookno=b.bookno \wedge b.price > 50} B)$

$\pi_{q.sid}$

Optimized Query-----

```
select s.sid from student s
except
select t.sid from
buys t
natural join (select b.bookno from book b where b.price>50)q;
```

RA-----

$Q = \pi_{b.bookno}(b.price > 50 B)$
 $\pi_{s.sid}(S) - \pi_{t.sid}(T \bowtie Q)$

5.

Unoptimized Query-----

```
select q.sid,q.sname
from (select s.sid, s.sname, 2007 as bookno
from student s
cross join book b
intersect
select s.sid, s.sname, b.bookno from student s
cross join book b inner join buys t on (s.sid=t.sid and t.bookno=b.bookno and b.price<25))q;
```

RA-----

$bookno = 2007$ in Q
 $Q = (\pi_{s.sid,s.sname,bookno}(SXB) \cap \pi_{s.sid,s.sname,b.bookno}(SXB \bowtie_{s.sid=t.sid \wedge t.bookno=b.bookno \wedge b.price < 25} T))$
 $\pi_{q.sid,q.sname}$

Optimized Query-----

```
select s.sid, s.sname from student s
natural join buys t
natural join (select b.bookno from book b where b.price<25 and b.bookno=2007 )p ;
```

RA-----

$P = \pi_{b.bookno}(b.price < 25 \wedge b.bookno = 2007 B)$
 $\pi_{s.sid,s.sname}(S \bowtie T \bowtie P)$

6.

Unoptimized Query-----

```
select distinct q.bookno
from (select s.sid,s.sname,b.bookno,b.title
      from student s cross join book b
      except
      select s.sid,s.sname,b.bookno,b.title from student s
      cross join book b
      inner join buys t on (s.sid=t.sid and t.bookno=b.bookno and b.price<20)
      )q;
```

RA-----

$Q = \pi_{s.sid, s.sname, b.bookno, b.title}(SXB) -$

$\pi_{s.sid, s.sname, b.bookno, b.title}(SXB \bowtie_{s.sid=t.sid \wedge t.bookno=b.bookno \wedge b.price < 20} T)$

$\pi_{q.bookno}$

Optimized Query-----

select distinct q.bookno

from

(select p.sid, c.bookno

from (select s.sid from student s) p cross join (select b.bookno from book b) c

except

select t.sid, q1.bookno

from

buys t

natural join (select b.bookno from book b where b.price < 20) q1

)q;

RA-----

$P = \pi_{s.sid}(S)$

$C = \pi_{b.bookno}(B)$

$Q1 = \pi_{b.bookno}(b.price < 20 B)$

$Q = \pi_{p.sid, c.bookno}(PXC) - \pi_{t.sid, q1.bookno}(T \bowtie Q1)$

$\pi_{q.bookno}$

7.

Unoptimized Query-----

select s.sid

from student s

except

(select s1.sid from student s1

inner join student s2 on (s1.sid <> s2.sid)

inner join buys t1 on (s1.sid = t1.sid)

union

select s1.sid

from student s1

inner join student s2 on (s1.sid <> s2.sid)

inner join buys t1 on (s1.sid = t1.sid)

inner join buys t2 on (t1.bookno = t2.bookno and t2.sid = s2.sid)

inner join book b on (t2.bookno = b.bookno and b.price = 80));

RA-----

$\pi_{s.sid}(S) - \pi_{s1.sid}(S1 \bowtie_{s1.sid <> s2.sid} S2 \bowtie_{s1.sid=t1.sid} T1) \cup$

$\pi_{s1.sid}(S1 \bowtie_{s1.sid <> s2.sid} S2 \bowtie_{s1.sid=t1.sid} T1 \bowtie_{t1.bookno=t2.bookno \wedge t2.sid=s2.sid} T2 \bowtie_{t2.bookno=b.bookno \wedge b.price=80} B)$

Optimized Query-----

```
select s.sid  
from student s  
except  
(select t1.sid from buys t1);
```

RA-----

$\pi_{s.sid}(S) - \pi_{t1.sid}(T1)$