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Assignment 2 - Part 1

Relational Algebra

1. $\pi_{\{cid,name,email,address,phone,stuno\}}(Customers \bowtie_{\{cid\}} Students)$

2. $\pi_{\{name,empno,address\}}\sigma_{\{local=<null>\}}(Customers \bowtie_{\{cid\}} Employees)$

3. $\pi_{\{startTime,expireTime,name\}}(Permits \bowtie_{\{owner=cid\}} Customers)$

4. $\pi_{\{cid,name\}}(Customers \bowtie_{\{cid=owner\}} Permits)$

5. $\pi_{\{startTime,purchaseTime,name\}}\sigma_{\{expireTime >= '2019-06-30'\}}(Customers \bowtie_{\{cid=owner\}} Permits)$

6. $\pi_{\{name,email\}}(Customers) - \pi_{\{name,email\}}(Customers \bowtie_{\{cid=owner\}} Permits)$

7. $\pi_{\{name,email\}}(Customers \bowtie_{\{cid=owner\}} Permits)$
   $- \pi_{\{name,email\}}(Customers \bowtie_{\{cid=owner\}} (Permits \bowtie_{\{pid\}} Registration))$

8. $\pi_{\{plate,ticketTime,violation\}}\sigma_{\{fine > paidAmount\ OR\ (fine > 0\ AND\ paidAmount = <null>)\}}(Tickets)$

9. $\pi_{\{name\}} - \pi_{\{name\}}\sigma_{\{ticketTime >= startTime\ AND\ ticketTime <= expireTime\}}($
   $Customers \bowtie_{\{cid=owner\}} (Permits \bowtie_{\{pid\}} (Registration \bowtie_{\{plate\}} Tickets)))$

10. $\pi_{\{name\}}(\pi_{\{name,cid\}}(Customers)$
    $- \pi_{\{name,cid\}}(Customers \bowtie_{\{cid=owner\}}$
    $(\pi_{\{owner\}}(Permits \bowtie_{\{pid\}} (\pi_{\{pid\}}\sigma_{\{count(pid) > 1\}}\Upsilon_{\{pid,count(pid)\}}($
    $Permits \bowtie_{\{pid\}} Registration)))$
    $\cup (\pi_{\{owner\}}(Permits) - \pi_{\{owner\}}(Permits \bowtie_{\{pid\}} Registration))))$

Datalog

1. R1(cid, name, email, address, phone, stuno):-
   Students(cid,stuno)
   and Customers(cid, name, email, address, phone);

2. R2(name, empno, address):-
   Employees(cid, empno, N)
   and N is null
   and Customers(cid, name,__, address,__);

3. R3(startTime, expireTime, name):-
   Permits(__, startTime, expireTime, owner,__)
   and Customers(owner, name,__,__,__);

4. R4(cid, name):-
   Customers(cid, name,__,__,__)
   and Permits(__,__,__, cid,__);

5. R5(startTime, purchaseTime, name):-
   Permits(__, startTime, exprieTime, owner, purchaseTime)
   and Customers(owner, name,__,__,__)
   and expireTime >= '2019-06-30';

6. R6(name, email):-
   Customers(cid, name, email,__,__)
   and ¬Permits(__,__,__, cid,__);

7. R7(name, email):-
   Customers(cid, name, email,__,__)
   and Permits(pid,__,__, cid,__)
   and ¬Registration(__, pid);

8. R8(plate, ticketTime, violation):-
   Tickets(__, plate, ticketTime,__, violation, fine, paidAmount)
   and (fine > paidAmount
    or (fine > 0
        and paidAmount is null));

9. R9(name):-

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    Customers(cid, name,__,__,__)
and ¬(Permits(pid,__,__, cid,__)
      and Registration(plate, pid)
      and Tickets(__, plate,__,__,__,__,__));
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10. R10(name):-

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    Customers(cid, name,__,__,__)
and ¬((Permits(pid,__,__, cid,__)
       and ¬(Redistration(__,pid))
      or (Permits(pid,__,__, cid,__)
          and Registration(A, pid)
          and Registration(B, pid)
          and A != B));
```