Databases 1, Huiswerk 7

1. Beschouw het volgende relatieschema:
   $R = \{A, B, C, D, E, F\}$ en $F = \{A \to BC, D \to EF, CE \to AF\}$. Bereken een lossless-join decompositie die in BCNF is en die uit 4 deelrelaties bestaat.

2. Hieronder staan een aantal vragen in relationele algebra. Identificeer welke van de 25 biervragen dit betreft, en vertaal ze naar SQL.

   (a) $\Pi_d(V \bowtie S \bowtie ((\Pi_d(L) \times \Pi_b(L)) - L))$
   (b) $\Pi_d(V) - \Pi_d(V - \Pi_{d,k}(S \bowtie L))$
   (c) $L \div \Pi_b(S)$
   (d) $\Pi_b(S) - \Pi_b(S - \Pi_{k.b}(V \bowtie L))$

3. Hieronder staan een aantal vragen in SQL. Identificeer welke van de 25 biervragen dit betreft. (Als je nog tijd over hebt, vertaal ze dan naar de relationele algebra.)

   (a)
```
select w.d
from V as w
except
select v.d
from V as v
where v.k in
( select s.k
  from S as s
  where s.b not in
  ( select l.b
    from L as l
    where l.d = v.d
  )
)
```
   (b)
```
select w.d
from V as w
except
select v.d
from V as v
where v.k in
( select s.k
  from S as s
  where s.b in
  ( select l.b
    from L as l
    where l.d = v.d
  )
)
```
   (c)
```
select l1.d, l2.d
from L as l1, L as l2, S as s1, S as s2
where s1.k = s2.k and l1.b = s1.b and l2.b = s2.b
```

(d)
```
select v1.d, v2.d
from V as v1, V as v2
where not exists
( select *
  from V as v3, V as v4
  where v3.k = v4.k and v3.d = v1.d and v4.d = v2.d and not exists
  ( select l1.b, l2.b
    from L as l1, L as l2, S as s1, S as s2
    where l1.d = v1.d and l2.d = v2.d and s1.k = v3.k and s2.k = v4.k
      and l1.b = s1.b and l2.b = s2.b
  )
)
```

(e)
```
select v.d
from V as v
where v.k in
( select s.k
  from S as s
  where s.b in
  ( select l.b
    from L as l
    where l.d = v.d
  )
)
```

(f)
```
select t.k
from S as t
except
select s.k
from S as s
where s.b not in
( select l.b
  from L as l, V as v
  where l.d = v.d and v.k = s.k
)
```

(g)
```
select s.k
from S as s
where not exists
( select v.d
  from V as v
  where v.k = s.k and not exists
  ( select l.b
    from L as l
    where l.d = v.d and l.b = s.b
  )
)
```