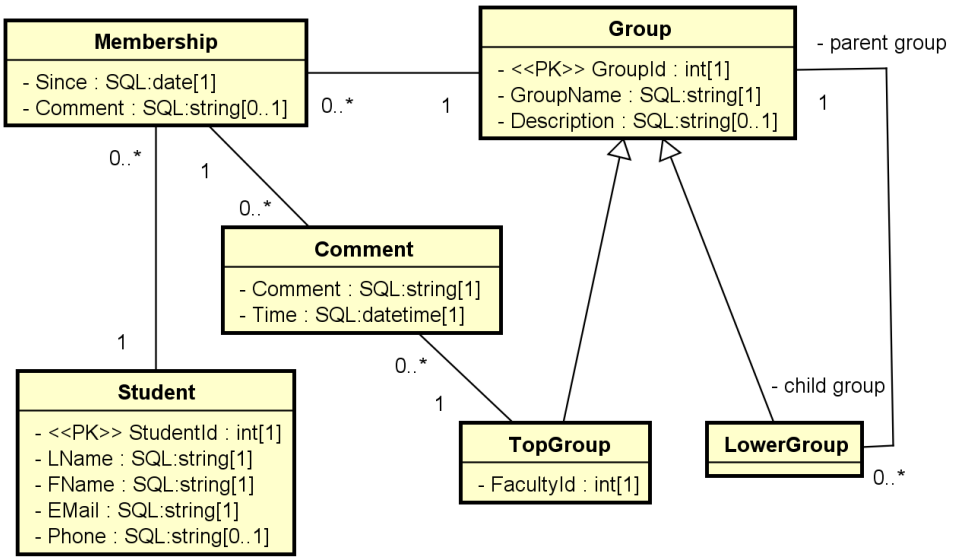
CSCI 5333 DBMS

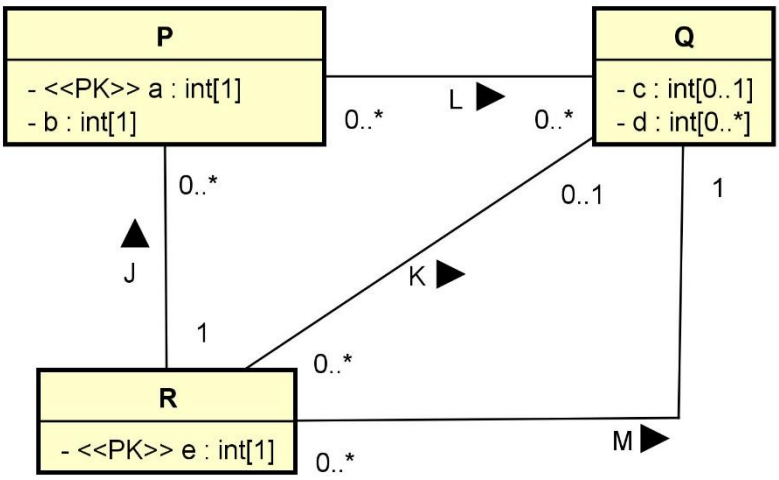
Fall 2021

Suggested Solution to Mid-Term Examination

(1) For example (data types not required):



(2) For example:



P(<u>a</u>,b,e) : • CK: a • FK: e references R(e) • Non-nullable: a, b, e • Note:	Q(<u>QId</u>,<u>c</u>): • CK: QId • FK: • Non-nullable: QId • Note: A surrogate key QId is created.
R(<u>e</u>,K_QId,M_QId): • CK: e • FK: (1) K_QId references Q(QId), (2) M_QId references Q(QId), • Non-nullable: e, M_QId • Note:	QD(<u>QId, d</u>): • CK: (1) QId,d • FK: QId references Q(QId) • Non-nullable: QId,d
L(<u>a,QId</u>): • CK: (1) a, QId • FK: (1) a references P(a), (2) QId references Q(QId) • Non-nullable:	

(3)

(a) F (b) F (c) T (d) T
(e) T (f) T (g) T

(4) One (e.g. AB) or three (e.g. ABC, ABD, and ACD)

(5) For example,

(a) $\pi_{SNamer\ Status}(\sigma_{SCity='Dallas'}(Supplier)\ |x|\ \pi_{SNum}(Supply\ |X|\ \pi_{PNum}(\sigma_{Color='Green'}(Part))))$

or

```
project [sname, status]
((select [scity ='Dallas'] (supplier))
 join
 ((project [snum] (supply))
  join
  (select [color='Green'] (part))));
```

(b) $\pi_{PNum}(Supply\ |x|\ \pi_{SNum}(\sigma_{SCity='Houston'}(Supplier))) - \pi_{PNum}(Supply\ |x|\ \pi_{SNum}(\sigma_{SCity='Dallas'}(Supplier)))$

or

```
(project [pnum] (supply
 join (select [scity='Houston'] (supplier))))
minus
```

```
(project [pnum] (supply
  join (select [scity='Dallas'] (supplier))));
```

(c) $\pi_{\text{PName, Weight}}(\sigma_{\text{SCity ='Houston' or Status > 10}}(\text{Supplier}) \mid X \mid \text{Supply} \mid x \mid \text{Part}))$

or

```
project [pname, weight]
(((project [snum] (select [scity='Houston'] (supplier)))
 union
(project [snum] (select [status>10] (supplier))))
join
supply
join
part);
```

(6)

(a)

{(sname, status) | (snum, sname, 'Dallas', status) ε Supplier, (snum, pnum, _) ε Supply, (pnum, _, 'Green',_) ε Part}

(b)

{(snum) | (snum, pnum1, _) ε supply, (snum, pnum2, _) ε supply, (pnum1, _, 'Blue', _) ε Part, (pnum2, _, 'Blue', _) ε Part, pnum1 <> pnum2}

(7)

(a)

```
SELECT DISTINCT s.sname, s.status
FROM supplier AS s INNER JOIN supply AS u ON (s.snum = u.snum)
INNER JOIN part AS p ON (and u.pnum = p.pnum)
WHERE s.scity = 'Dallas'
AND p.color = 'Green';
```

(b)

```
SELECT DISTINCT u.pnum
FROM supplier AS s INNER JOIN supply AS u ON (s.snum = u.snum)
WHERE  s.scity = 'Houston'
AND pnum NOT IN
        (SELECT DISTINCT u.pnum FROM supplier AS s2 INNER JOIN supply AS s2 ON (s2.snum = u.snum)
        WHERE s2.scity = 'Dallas');
```

(c)

```
SELECT DISTINCT u1.pnum
FROM supplier AS s INNER JOIN supply AS u1 ON (s.snum = u1.snum)
        INNER JOIN part AS p1 ON (u1.pnum = p1.pnum)
        INNER JOIN supply AS u2 ON (s.snum = u2.snum)
        INNER JOIN part AS p2 ON (u1.pnum = p2.pnum)
WHERE p1.pnum <> p2.pnum
AND p1.color='Blue'
AND p2.color = 'Blue';

-- alternatively:

SELECT DISTINCT u.snum
FROM  supply AS u INNER JOIN part AS p (u.pnum = p.pnum)
WHERE p.color='Blue'
GROUP BY u.snum
HAVING COUNT(p.pnum) >= 2;
```