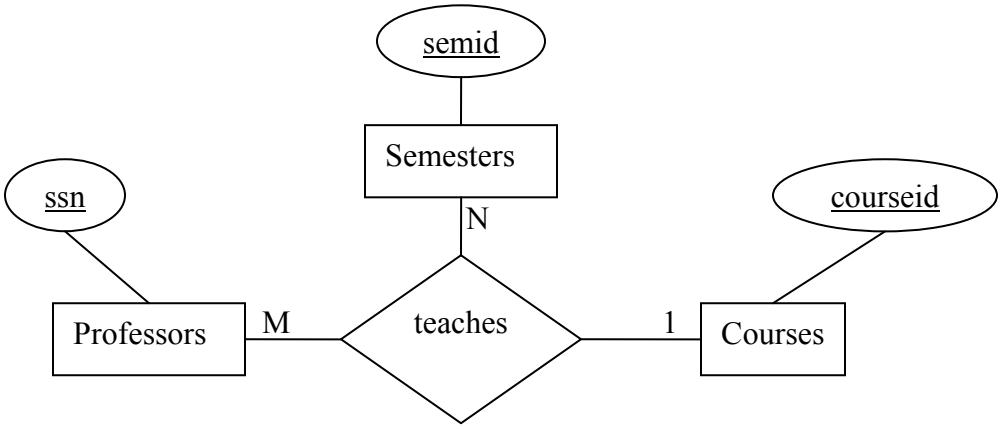
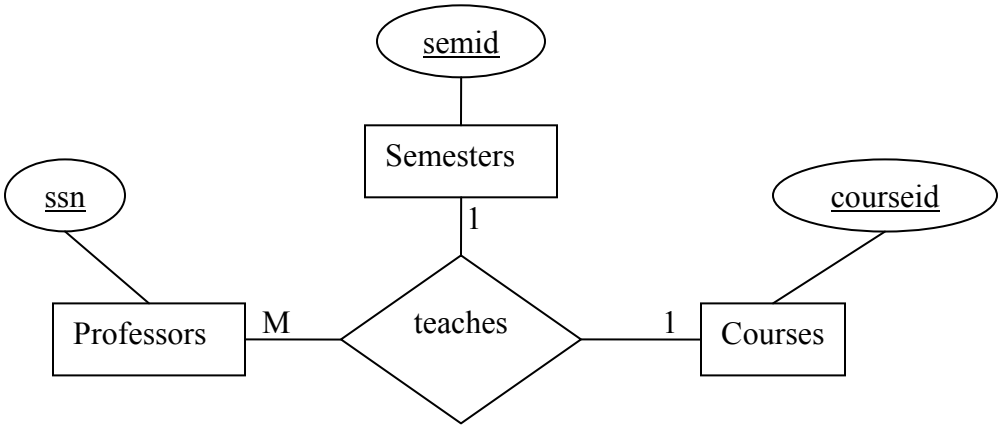
Cs166 Fake Solutions

1) A university database contains information about professors (identified by social security number, or SSN), courses (identified by courseid), and semesters (identified by semid). Professors teach courses during semesters, each of the following situations concerns the Teaches relationship set. For each situation, draw an ER diagram that describes it (assuming no further constraints hold).

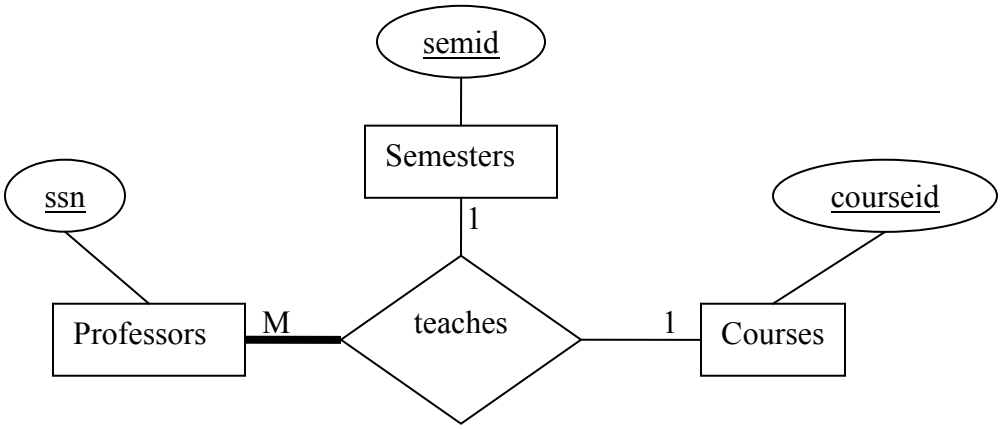
a) Professors can teach the same course in several semesters, and each offering must be recorded.



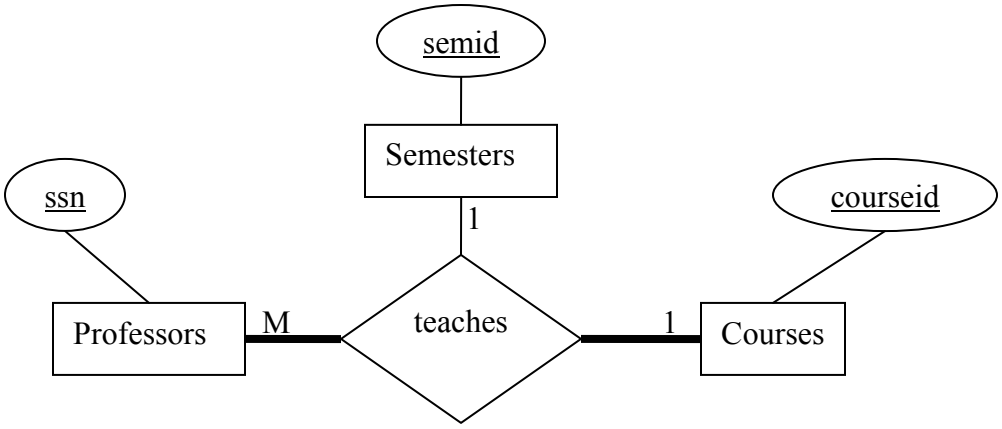
b) Professors can teach the same course in several semesters, and only the most recent such offering needs to be recorded. (Assume this condition applies in all subsequent questions.)



c) Every professor teaches exactly one course (no more, no less).



d) Every professor teaches exactly one course (no more, no less), and every course must be taught by some professor.



2) Consider the following schema:

Suppliers(*sid:* integer, *sname:* string, *address:* string)
Parts(*pid:* integer, *pname:* string, *color:* string)
Catalog(*sid:* integer, *pid:* integer, *cost:* real)

Write the following queries in relational algebra.
Assume $\rtimes$ is the join symbol.

a) Find the names of suppliers who supply some red part.

$$\pi_{sname}\left(\pi_{sid}\left(\left(\pi_{pid}\sigma_{color='red'}\text{Parts}\right)\rtimes\text{Catalog}\right)\rtimes\text{Suppliers}\right)$$

b) Find the sids of suppliers who supply some red or green part.

$$\pi_{sid}\left(\pi_{pid}\left(\sigma_{color='red' \text{ or } color='green'}\text{Parts}\right) >< \text{Catalog}\right)$$

c) Find the sids of suppliers who supply some red and some green part.

$$\rho\left(\text{R1}, \pi_{sid}\left(\left(\pi_{pid}\sigma_{color='red'}\text{Parts}\right) >< \text{Catalog}\right)\right)$$

$$\rho\left(\text{R2}, \pi_{sid}\left(\left(\pi_{pid}\sigma_{color='green'}\text{Parts}\right) >< \text{Catalog}\right)\right)$$

$$\text{R1} \cap \text{R2}$$

d) Find the sids of suppliers who supply every part.

$$\left(\pi_{sid,pid}\text{Catalog}\right) / \left(\pi_{pid}\text{Parts}\right)$$

e) Find the sids of suppliers who supply every red or green part.

$$\left(\pi_{sid,pid}\text{Catalog}\right) / \left(\pi_{pid}\sigma_{color='red' \text{ or } color='green'}\text{Parts}\right)$$

3) Consider the schema presented in problem 2. Write the following queries in SQL.

a) Find the name of every part.

```
SELECT   P.pname
FROM   Parts P
```

b) Find the pname and cost of all parts supplied by “BMI Supply”.

```
SELECT   P.pname, C.cost
FROM   Parts P, Catalog C, Suppliers S
WHERE   S.sname=’BMI Supply’ and P.pid=C.pid and S.sid=C.sid
```

c) Find the sids of suppliers who supply some red and some green part.

```
SELECT   C.sid
FROM   Parts P, Catalog C
WHERE   P.color=’red’ and P.pid=C.pid
          and EXISTS ( SELECT   P2.pid
                              FROM   Parts P2, Catalog C2
                              WHERE   P2.color=’green’ and C2.sid=C.sid
                                        and P2.pid=C2.pid )
```

d) Find the sids of suppliers who only supply blue parts.

```
( ( SELECT   C.sid
    FROM   Catalog C, Parts P
    WHERE   C.pid=P.pid and P.color='blue' )
 EXCEPT
  ( SELECT   C2.sid
    FROM   Catalog C2, Parts.P2
   WHERE   C2.pid=P.pid and P.color <> 'blue' ) )
```

e) Find the sids of suppliers who supply every part.

```
SELECT   C.sid
FROM   Catalog C
WHERE   NOT EXISTS ( SELECT   P.pid
                     FROM   Parts P
                     WHERE   NOT EXISTS ( SELECT   C1.sid
                                          FROM   Catalog C1
                                          WHERE   C1.sid=C.sid
                                                  and C1.pid=P.pid ) )
OR

SELECT   S.sid
FROM   Suppliers S
WHERE   NOT EXISTS ( ( SELECT   P.pid
                       FROM   Parts P )
                     EXCEPT
                     ( SELECT   C.pid
                       FROM   Catalog C
                       WHERE   C.sid=S.sid ) )
```