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### **Exercise 1**

A university DB contains information about professors (identified by SIN) and courses (identified by course ID). Professors teach courses; each of the following situations concerns the Teaches relationship set.

List all candidate keys of the Teaches relationship set.

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

**Ans: - course\_id and sin**

- b. Professors can teach the same course in several semesters, but only the most recent such offering needs to be records. Assume the above Situation (b) applies in all subsequent situations.

**Ans: - course\_id, sem, sin.**

List all the keys possible in each of the following situations.

- a. Every professor teaches a course, and every course is taught by some professor.

**Ans: - course\_name, course\_id, sin, prof\_name**

- b. Every professor teaches exactly one course, and every course is taught by exactly one professor.

**Ans: - sin, course\_name**

**Output:**

```
MySQL 8.0 Command Line Client
mysql> DESC COURSES;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| COURSE_ID | int | NO | PRI | NULL | |
| COURSE_NAME | varchar(20) | YES | | NULL | |
| COURSE_DURATION | varchar(20) | YES | | NULL | |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> DESC SEMESTER_1;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| COURSE_ID | int | YES | MUL | NULL | |
| SIN_OF_PROF | int | YES | | NULL | |
+-----+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> ALTER TABLE SEMESTER_1 ADD COLUMN FOREIGN KEY (SIN_OF_PROF) REFERENCES PROFESSORS(SIN);
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'FOREIGN KEY (SIN_OF_PROF) REFERENCES PROFESSORS(SIN)' at line 1
mysql> ALTER TABLE SEMESTER_1 FOREIGN KEY (SIN_OF_PROF) REFERENCES PROFESSORS(SIN);
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'FOREIGN KEY (SIN_OF_PROF) REFERENCES PROFESSORS(SIN)' at line 1
mysql> ALTER TABLE SEMESTER_1 ADD COLUMN(FOREIGN KEY (SIN_OF_PROF) REFERENCES PROFESSORS(SIN));
Query OK, 0 rows affected (0.05 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> DESC SEMESTER_1;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| COURSE_ID | int | YES | MUL | NULL | |
| SIN_OF_PROF | int | YES | MUL | NULL | |
+-----+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql>
```

```
MySQL 8.0 Command Line Client
mysql> DESC PROFESSORS;
ERROR 1146 (42S02): Table 'university.professors' doesn't exist
mysql> DESC PROFESSORS;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| name | varchar(40) | YES | | NULL | |
| sin | int | NO | PRI | NULL | |
| COURSE_ID | int | YES | MUL | NULL | |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> DESC COURSES;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| COURSE_ID | int | NO | PRI | NULL | |
| COURSE_NAME | varchar(20) | YES | | NULL | |
| COURSE_DURATION | varchar(20) | YES | | NULL | |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> DESC SEMESTER_1;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| COURSE_ID | int | YES | MUL | NULL | |
| SIN_OF_PROF | int | YES | | NULL | |
+-----+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> ALTER TABLE SEMESTER_1 ADD COLUMN FOREIGN KEY (SIN_OF_PROF)_
```