

Database Design Exercise Set 1

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. For each situation, draw an ER diagram that describes it, and 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.
- b. Professors can teach the same course in several semesters, but only the most recent such offering needs to be recorded.

Assume the above Situation (b) applies in all subsequent situations. Then, draw an ER diagram that describes each of the following situations:

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

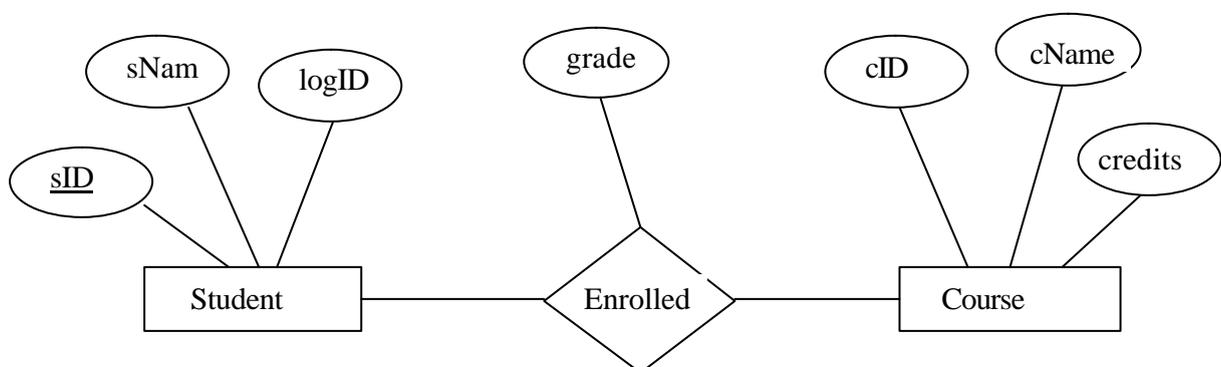
Exercise 2

Consider the following company DB. It stores information about employees (identified by SIN, with salary and phone attributes) and departments (identified by dept ID, with department name and budget as attributes). Employees work in departments. The DB records the interval during which an employee works for a department. Draw an ER diagram that describes each of the following situations.

- a. Employee is not allowed to work in a department for two or more intervals.
- b. Employee is allowed to work in a department for one or more intervals.

Exercise 3

Consider the following ER diagram. List all superkeys, candidate keys, and primary keys for entity sets Students and Courses, and for relationship set Enrolled.



ANSWERS

1a) Entity sets

- professor: with SIN underlined as the primary key,
- course: with CID underlined as the primary key,
- semester: with SID underlined as the primary key.

Relationship set

- teaches : associates professor, course and semester. No other attributes. The cardinality constraint is m-to-m. There is a single candidate key of the teaches relationship: {SIN, CID, SID}. The participation constraint can be anything; let say that it is total on professor and course entity sets.

1b) Semester does not need to be an entity set here. Teaches is a binary relation between professor and course. Semester is attribute of teaches. The key of teaches is {SIN, CID}.

1c) This means total participation from professors and total participation from courses. Because it is still m-to-m, the candidate key remains {SIN, CID}.

1d) This time the relationship is 1-to-1. There are now two candidate keys: either {SIN} or {CID}.

2a) Entity sets

- employee : with SIN as the primary key;
- department with DID as the key.

Relationship set

- works-in : with the attribute interval.
m-to-m relationship with the candidate key being {SIN, DID}.

2b) Need another entity set for intervals (invent your own key). works-in will be a ternary relationship with the candidate key being {SIN, DID, interval's key}.

3) For Student: sID is a superkey, candidate key and primary key. Any superset of sID is a superkey.

For Course: cID is a superkey, candidate key and primary key. Any superset of cID is a superkey.

Enrolled is a m-to-m relationship. {sID, cID} is the candidate key for Enrolled, and its primary key. Both {sID, cID} and {sID, cID, grad} are superkeys.