E/R and DB Design Example with Solutions

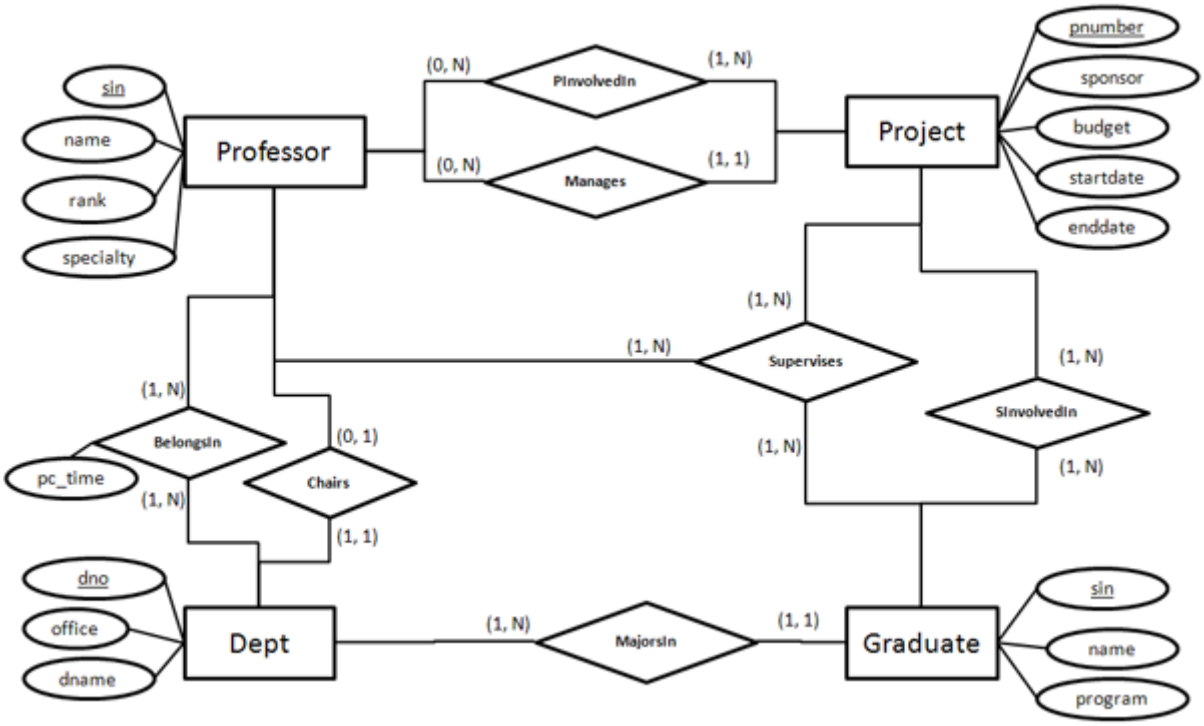
[Part A]

A university needs to develop an electronic system in order to administer information about who works in which research project. Here is the information that is provided to you by the university to help you design the database of the system:

- Professors have an SIN, a name, a rank, and a research specialty.
- Projects have a project number, a sponsor name (e.g., NSERC), a starting date, an ending date, and a budget.
- Graduate students have an SIN, a name and a degree program (e.g., M.S. or Ph.D.).
- Each project is managed by one professor (known as the project's principal investigator).
- Professors can manage and/or work on multiple projects.
- In each project one or more professors are involved (known as the project's co-investigators).
- In each project one or more graduate students are involved (known as the project's research assistants).
- When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number, a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors are associated with one or more departments, and for each department that they are associated with, a time percentage is associated with their job.
- Graduate students belong to one department in which they are working on their degree.

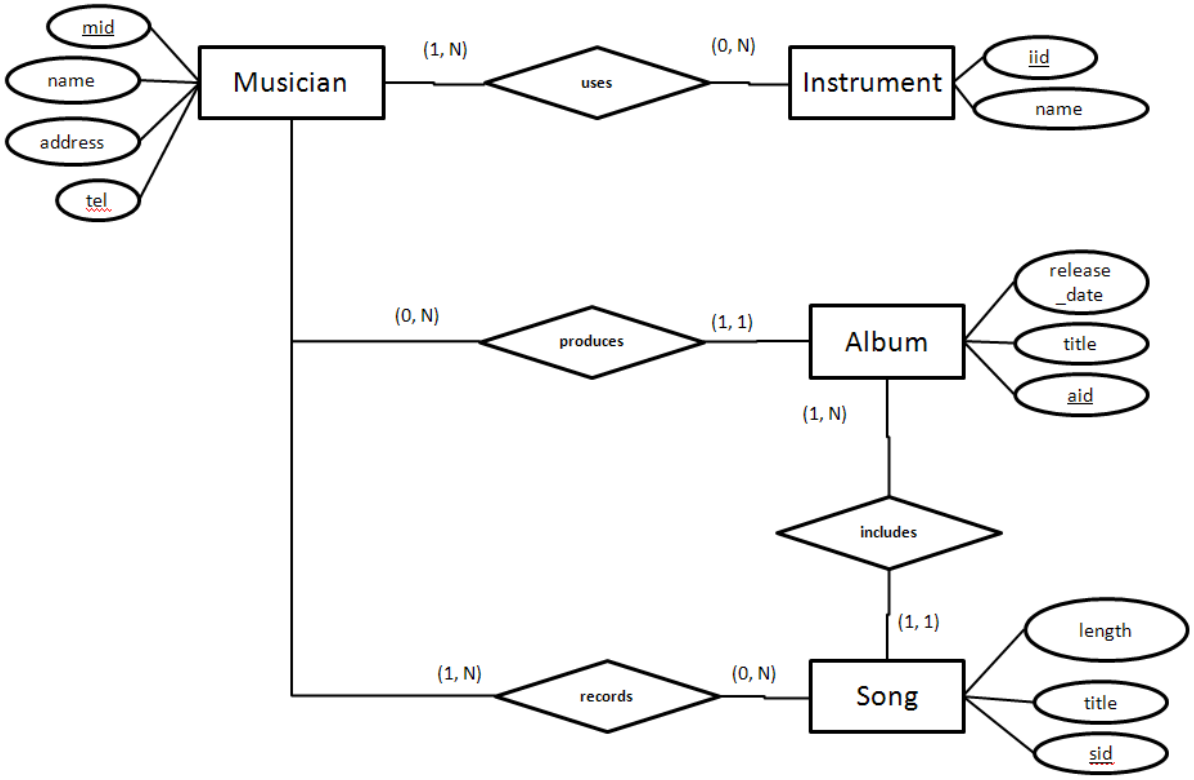
You are asked to design an Entity-Relationship Model (ER Diagram) for the electronic system. Use entities (rectangles), relationships (diamonds) and attributes (ovals) to model the information above. Clearly indicate primary keys (underlined attributes) and the cardinalities with which an entity participates in a relationship (express the participation of an entity to a relationship with a pair of (minimum, maximum) or alternatively, you can use the arrow notation of the textbook).

Solution


sin
name
rank
specialty
Professor
(0, N)
PInvolvedIn
(1, N)
(0, N)
Manages
(1, 1)
Project
pnumber
sponsor
budget
startdate
enddate
(1, N)
Supervises
(1, N)
(1, N)
SInvolvedIn
(1, N)
(1, N)
BelongsIn
pc_time
(1, N)
(0, 1)
Chairs
(1, 1)
dno
office
dname
Dept
(1, N)
MajorsIn
(1, 1)
Graduate
sin
name
program

[Part B]

Translate the Entity-Relationship Model (ER Diagram) given below into a logical model (DB Schema). For each relation in your schema, provide its name, attributes and keys (underlined attributes).



Solution

Musician

mid	name	address	tel

Album

aid	title	release_date	mid

Instrument

iid	name

Song

sid	title	length	aid

Records

mid	sid

Uses

mid	iid