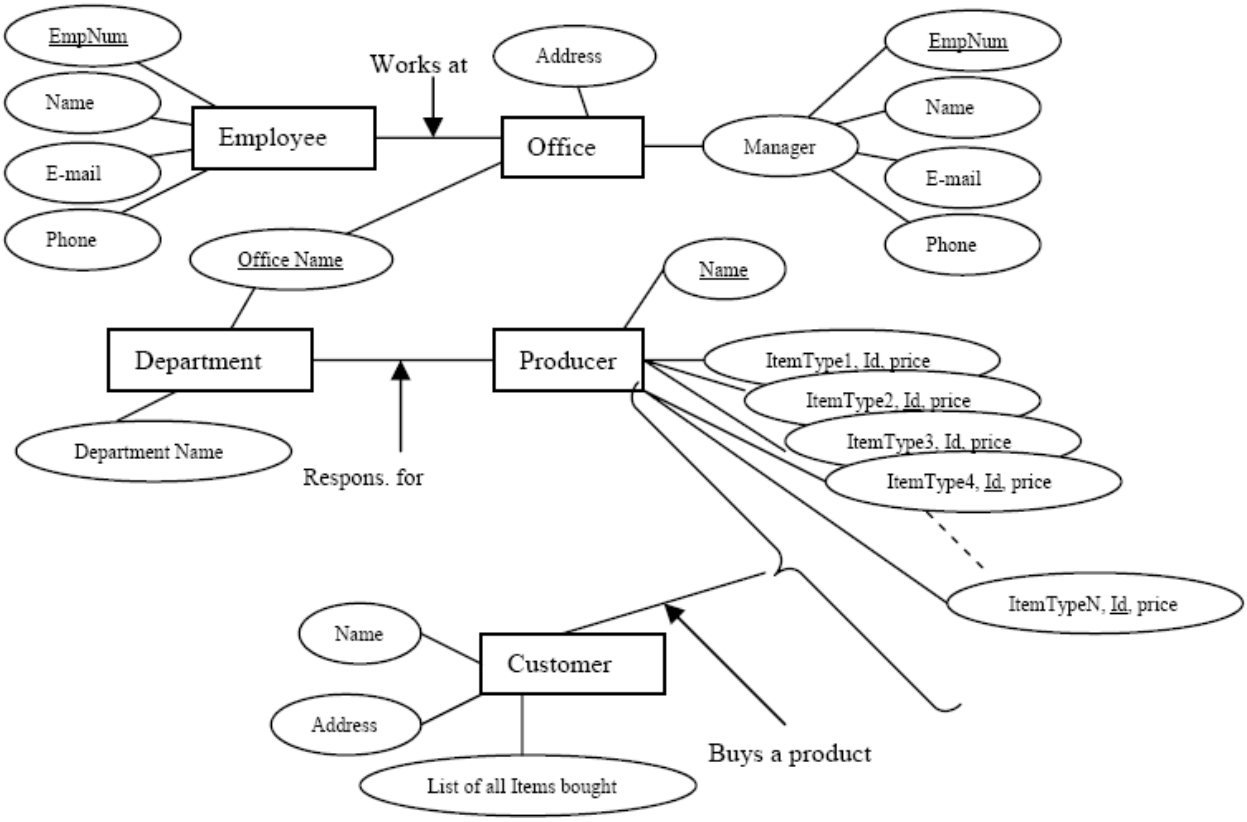
Database technology (preuzeto u originalu sa materijala Oracle Academy)

1. ER/EER modelling (8p)
While correcting database exams, the teachers come across the following (not so successful) attempt to create an ER/EER diagram. The diagram is supposed to model a company buying products from producers and selling to customers. Please give a careful explanation to all mistakes you find in the diagram and create a new, correct ER/EER diagram that is a better solution to the problem you think the student was trying to solve according to the figure below.



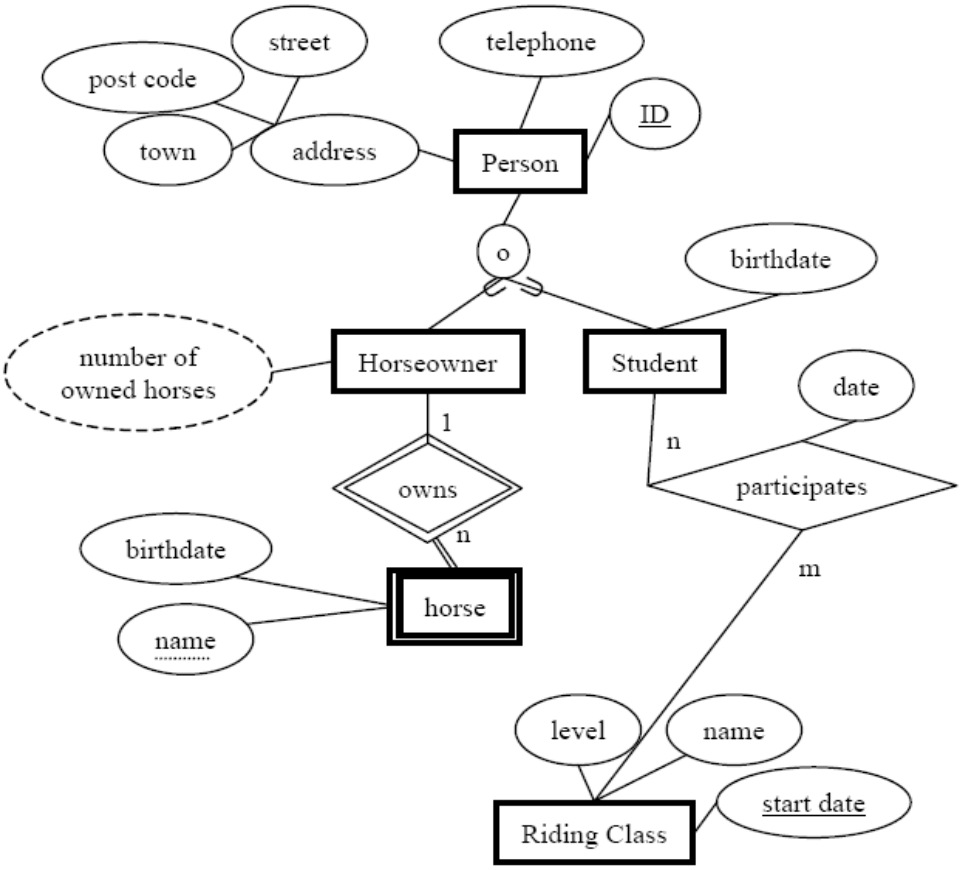
Answer

1p per found error, max 6p

- Relations are represented by a square with a name in it.
- You can't connect entities with attributes.
- All entities must have a key attribute.
- Attributes can be composite, but they can't have attributes of their own.
- Entities can't share attributes
- The "Office name" attribute does not have anything to do with a department.
- The "Office name" attribute should be on the "Office" entity.
- It's not possible to model the items like this, an entity can only have a finite number of attributes.
- The Customer attribute "List of all…" should not be an attribute on customer.
- "List of all…" should be an N:M relation.

2p for a correct ER-diagram

2. EER to relations (6p)
This EER-diagram describes the mini-world of a riding school. There are people (e.g. employees), horseowners that own horses, and students that—at certain dates—participate in riding classes. Translate the EER-schema to a relational schema. Explain and motivate how the mapping is done.



Answer

This EER-diagram describes the mini-world of a riding school. There are people (e.g. employees), horseowners that own horses, and students that—at certain dates—participate in riding classes.

Person	ID	telephone	street	postcode	Town

Horseowner	ID
	Person(ID)

The number of owned horses is a derived attributed and not reflected in the created tables. It can be calculated by joining the Horseowner and Horse table.

Student	*ID*	Birthdate
	Person(ID)	

Horse	*OwnerID*	Name	Birthdate
	Horseowner(ID)		

RidingClass	start_date	name	Level

Participate	*StudentID*	*Class_startdate*	Date
	Student(ID)	RidingClass(startdate)	

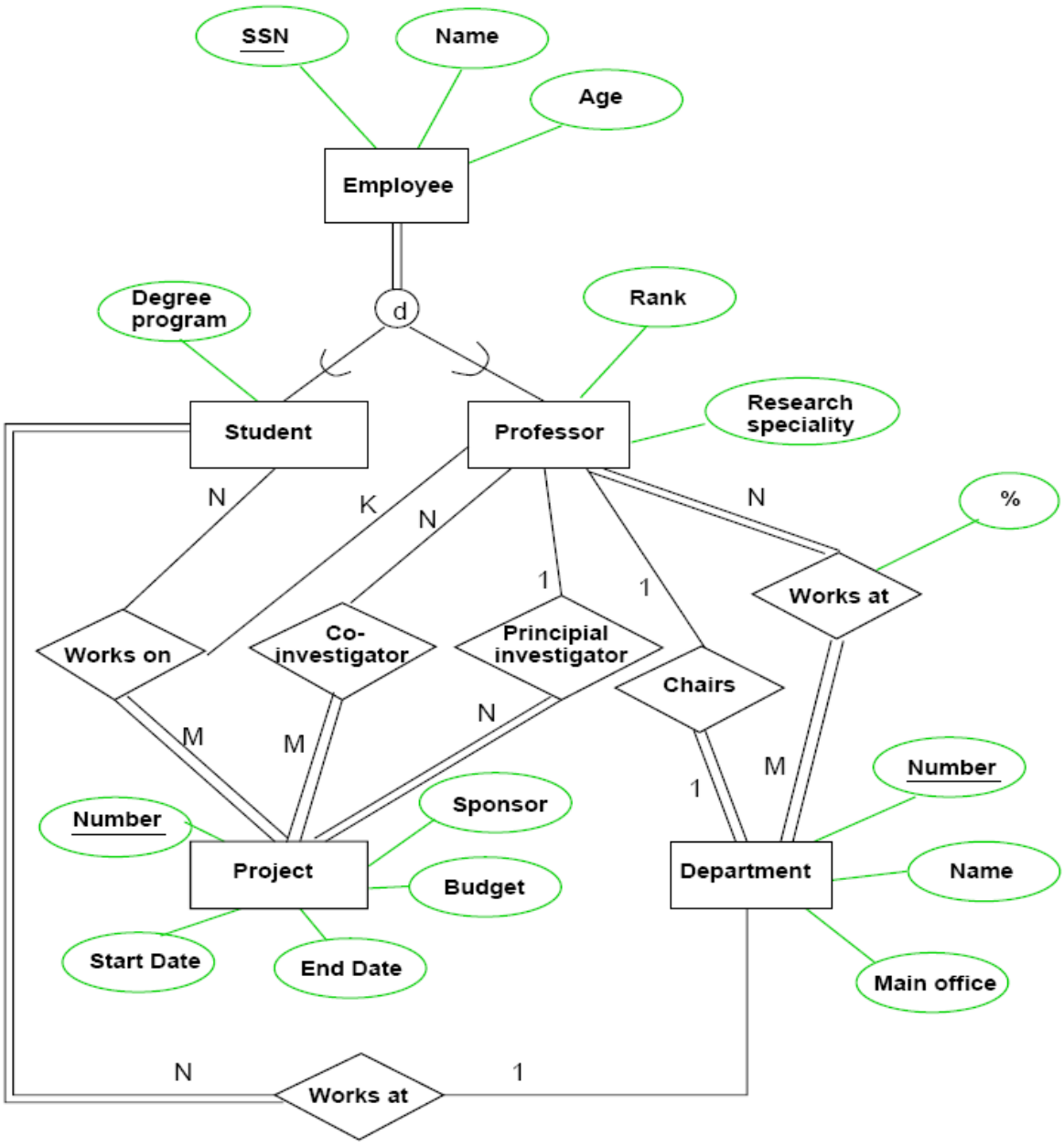
3. ER/EER Modelling (7p)

Consider the following information about a university database:

· Professors have an SSN, a name, an age, a rank, and a research specialty.

· Projects have a project number, a sponsor name, a starting date, an ending date, and a budget.
· Graduate students have SSN, a name, an age, 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).
· Each project is worked on by one or more professors (known as the project's coinvestigators).
· Professors can manage and/or work on multiple projects.
· Each project is worked on by one or more graduate students (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 work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
· Graduate students have one major department in which they are working on their degree.
Create an ER/EER diagram that fulfils the above requirements and motivate your suggestions. The exercise will be assessed both according to correct ER/EER syntax and whether you have made a good design.

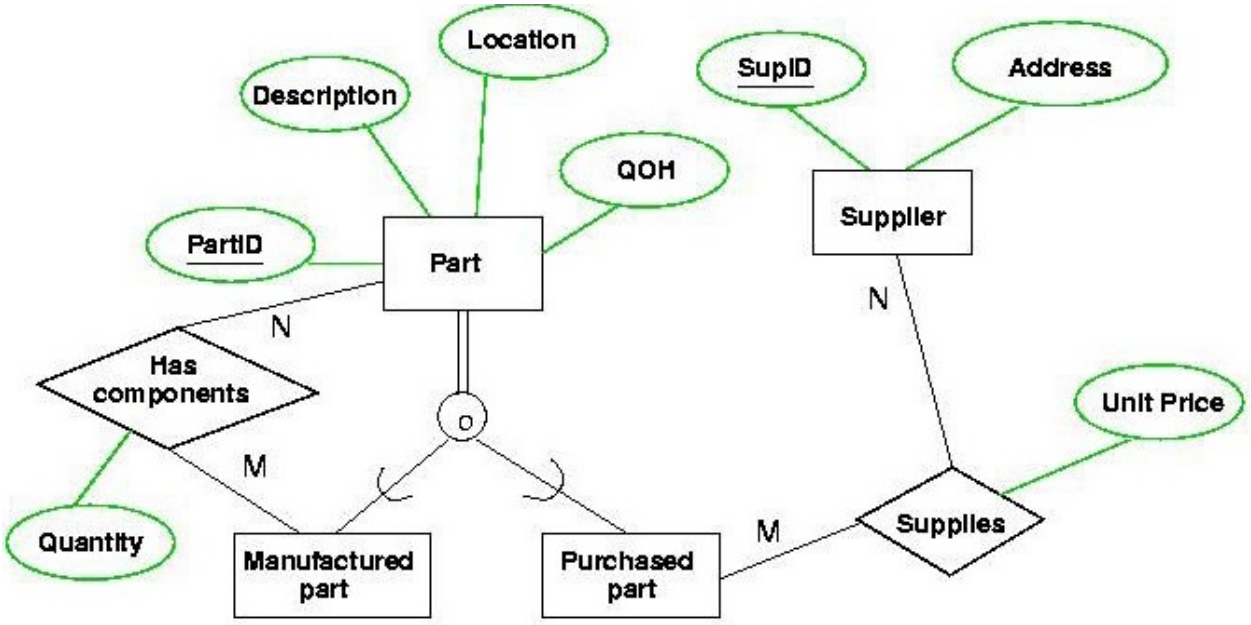
Answer
Here is a possible solution:



Additional comments/assumptions:
· It has been assumed that sets of students and professors are disjoint.

· **"Works on" is a ternary relation.** This allows for relating a particular student to a particular supervisor in the context of a particular project.
· It has been assumed that one professor can be a head of at most one department.
· Every department has its chairman, and at least one professor (the chairman) employed, thus two total relationships (double lines).
· Each project has a principal investigator, one or more co-investigators and students working on it, therefore total participation relationships.
· Every student has a major department she/he works in, but it's not clear whether the students work in every department, thus in the "Works at" relationship a double line from "Student" side and a single one from the department side.

4. EER to relational schema (4p)
Translate the following EER diagram to a relational schema. Explain how the mapping is done and if you choose to do anything differently than in the book make sure that you give a good motivation. Remember that it is not just the finished relational schema that determines your result it is just as much about your assumptions and motivations.



Answer (a possible solution):

Entity Types:
Part(PartID, Description, Location, QOH, ManPart, PurPart)
Supplier(SupID, Address)

"Part" stored in one table with flags for different subclasses (ManPart, PurPart), since they are overlapping.

Relationships:

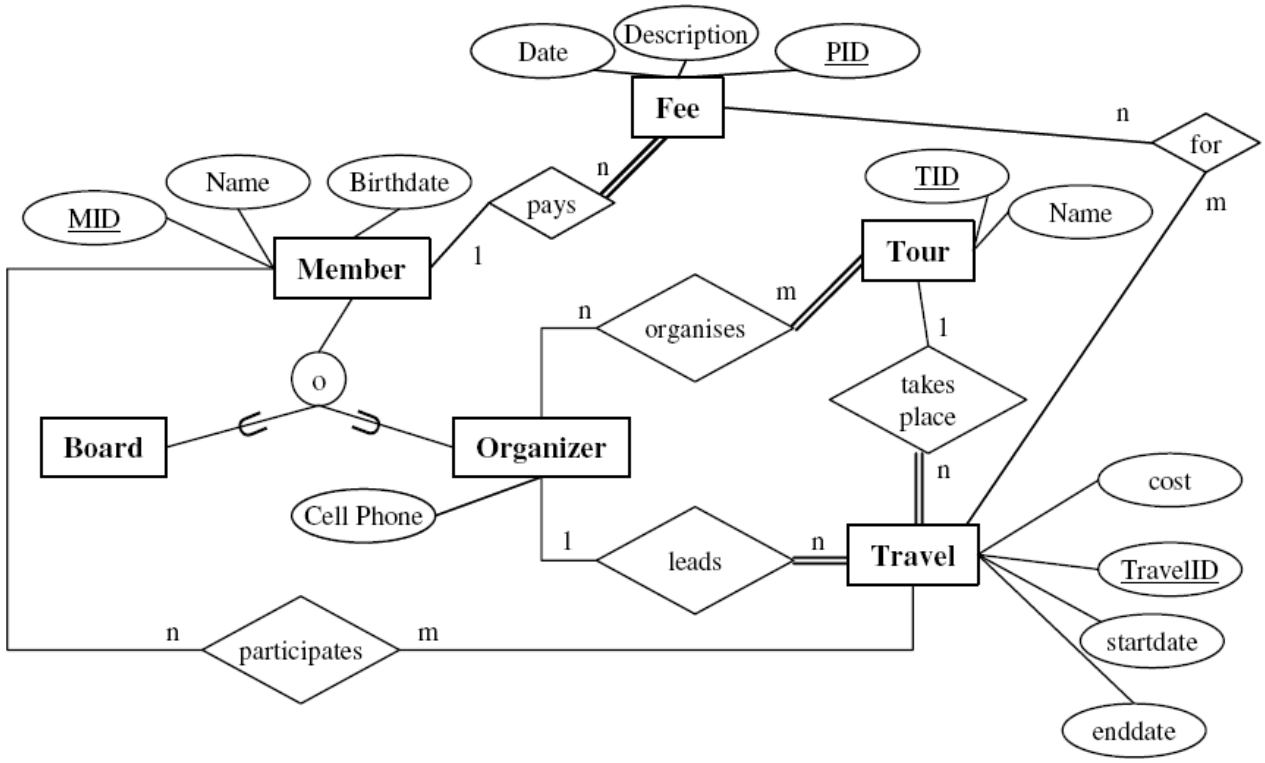
HasComponents(PartID, CompID, Quantity)
Both, PartID and CompID reference Part(PartID)

Supplies(SupID, PartID, UnitPrice)
SupID references Supplier(SupID) and PartID references Part(PartID)

5**. EER-modelling (6p)**
The club *Travel-Often-And-A-Lot* organises shorter and longer tours for its members. Help them make a model of their mini world.
Travel-Often-And-A-Lot has members. Each member is represented by her/his full name, address, and birth date. Some members belong to the board of *Travel-Often-And-A-Lot.* Some members are organizers (of tours). Organizers must be stored with their cell phone number so that they can be reached anytime. Organizers organize tours. Sometimes a tour is organized by several organizers.
Each tour is denoted by a name, e.g. "Museums of Paris, 2004" or "Iceland, 2005". Tours can take place multiple times.

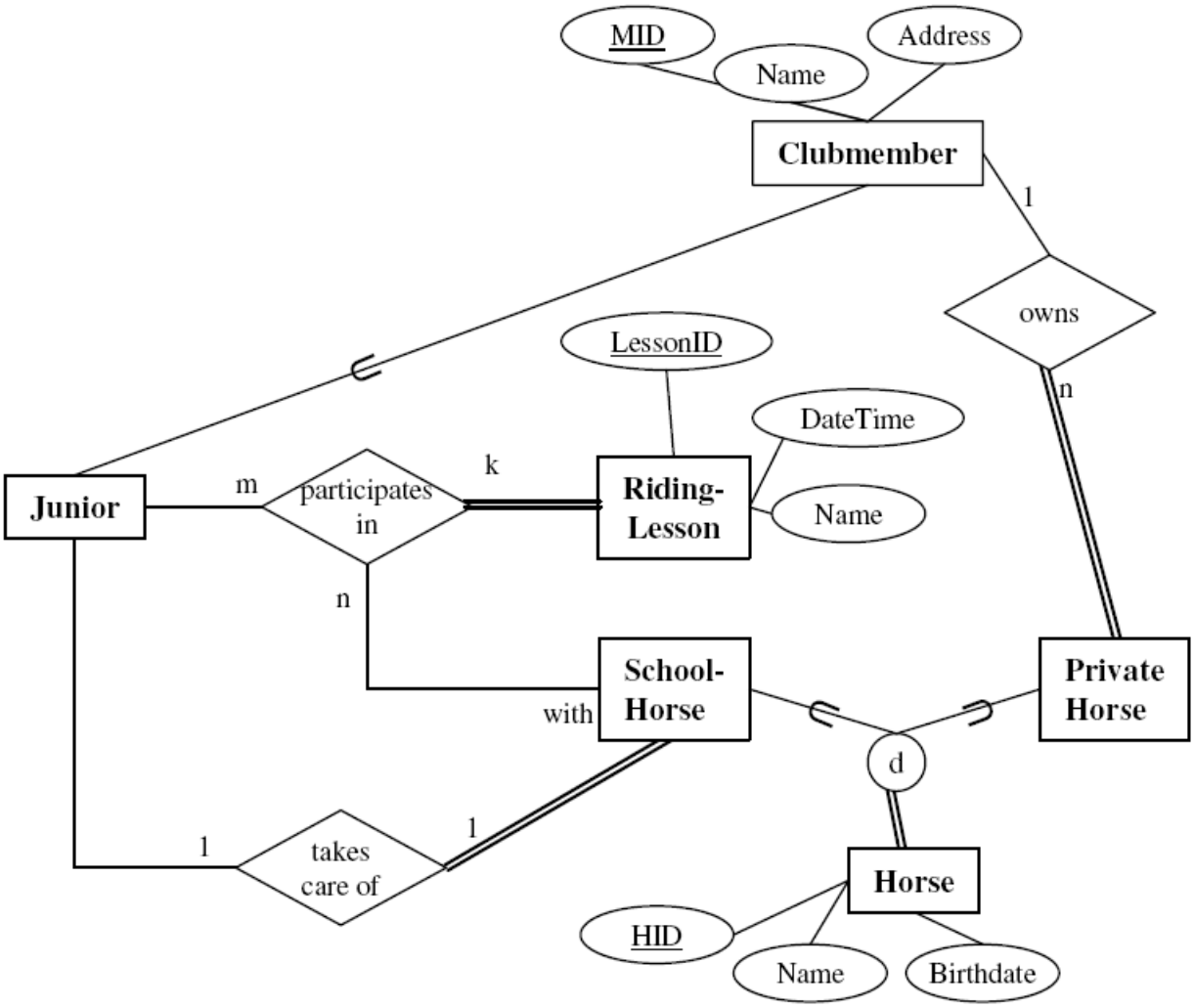
"Museums of Paris, 2004", for instances, takes place twice: May 22nd to May 29th, 2004 and June 5th to June 12th, 2004. The cost of a tour depends on the date, e.g. "Museums of Paris, 2004" was cheaper in May than in June. Each *travel* – such as "Museums of Paris, 2004" at June 5th to June 12th, 2004 – is lead by one organizer.
Members participate in travels.
Travel-Often-And-A-Lot wants to keep track of the payments made by its members. A payment can e.g. be the annual club fee, a donation, ***etc.*** but also the payment for a travel.
Mind the subtle distinction between tour *and* travel.
Draw the EER-diagram for this mini world description. State any additional assumptions that you make.

Example solution (one of many):



6. EER -> Relations (4p)

The following EER diagram describes a riding club. The ternary relationship *participates-in with* should be read as "A junior member *participates in* a riding lesson *with* a school horse".
a) Translate the given EER-diagram into relational tables.
Mark primary keys with a single underline, foreign keys with a dash underline and a pointer to which other attribute the foreign key refers. (3p)
b) How does one enforce total participation (the double lines) in the relational schema? Comment on this in your relational schema for each occurrence of a total participation. (1p)



One possible solution:

Clubmember(MID, Name, Address)
Junion(*MID*)

PrivateHorse(PHID, Name, Birthdate, *OwnerMID)*
SchoolHorse(SHID, Name, Birthdate, *JuniorMID*)
RidingLesson(LessonID, DateTime, Name)
Participates(*JuniorMID, LessonID, SHID*)

Total class participation represented by subclass translation. OwnerMID NOT NULL Constraint. JuniorMID NOT NULL Constraint

Enforce by e.g. stored procedure/trigger that a riding lesson is populated as soon as it is created.

7. EER modeling (6p)

Symphonic Band is an orchestra that plays different types of concerts. The orchestra's popularity is growing fast and they are starting to have problems to keep track of the musicians that should play in each concert as well as the musical works that are most suitable for the concert. Help the orchestra to create a database model, as a first step to implement a database, so that the orchestra can keep track of both musicians and musical works. The database model must represent the following points:

The orchestra plays three types of concerts: church concerts, private parties, and outdoor concerts.

The orchestra plays three types of music: classical, popular, and american folk. The orchestra always plays classical music in their church concerts. The orchestra always plays american folk on private parties. Finally, the orchestra plays a blend of the three types of music when playing outdoor.

It should be possible to find in the database the music works that are suitable for each type of concert so that the repertoire can be easily planned well in advance.

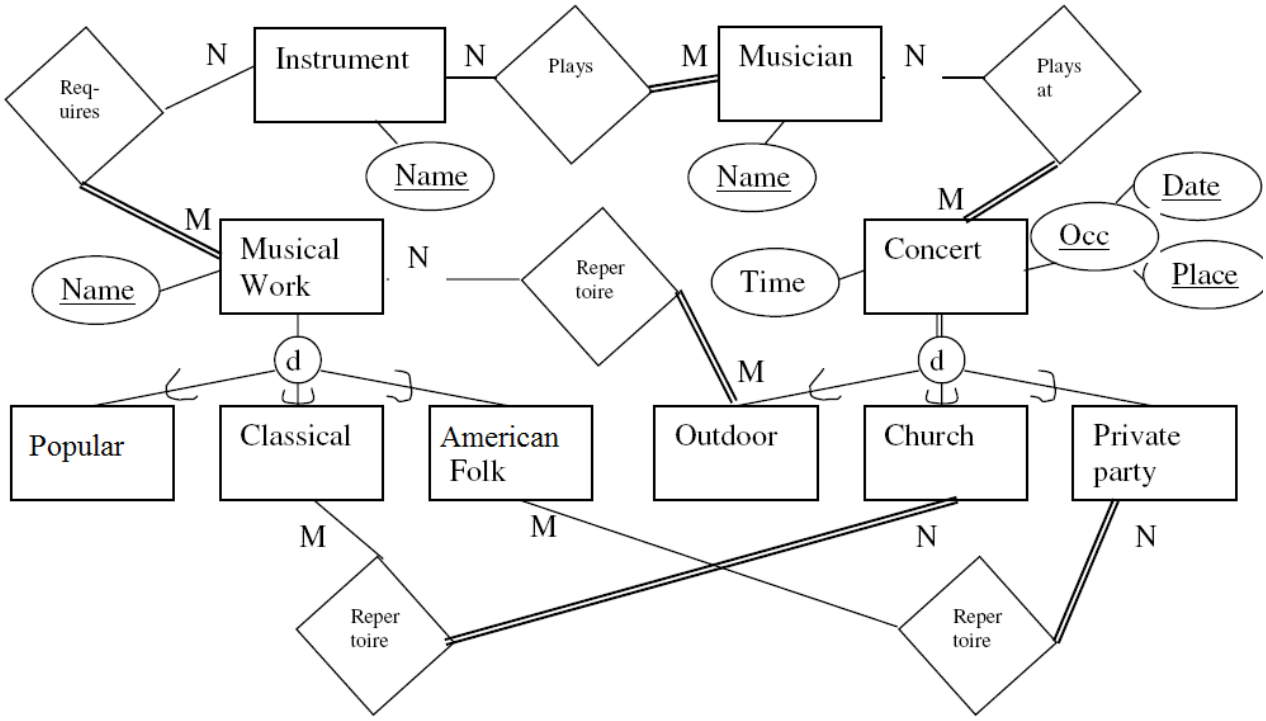
For each musical work, the database should store which musical setting (i.e. The instruments) are required to play the work.

The database should store information for each coming concert. The information should include the place, date and time of the concert as well as the type of concert and the repertoire that will be played.

For each musician in the orchestra, the database should store his/her name, the instrument that he/she plays, and in which of the coming concerts he/she will participate.

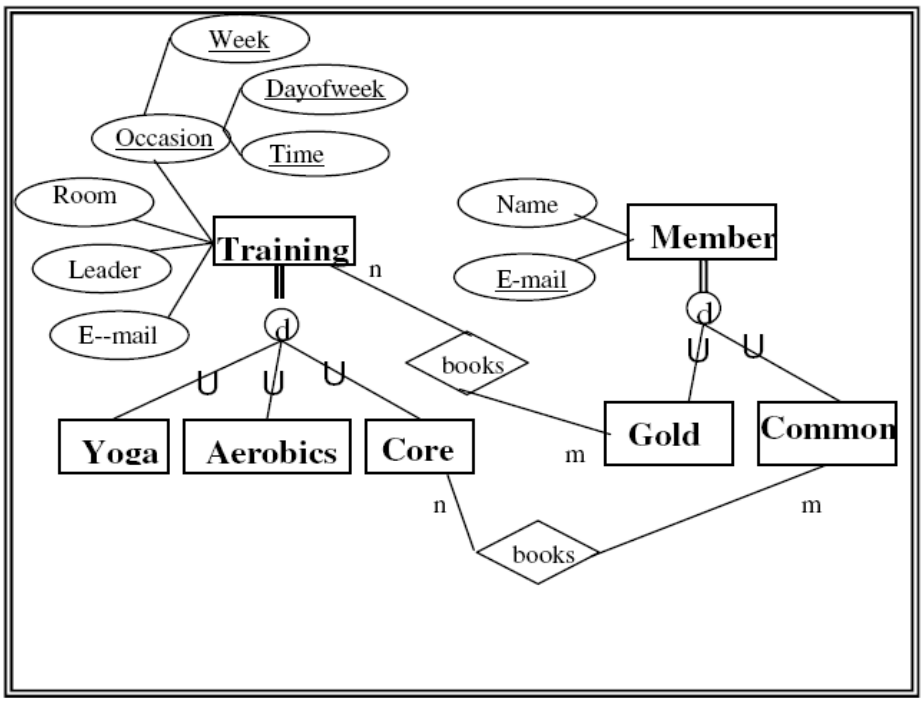
Draw an EER diagram for the orchestra's database. If you make further assumptions, please state and motivate them.

Answer



8. The EER diagram below describes the database of a training center, including information about its members, training activities and bookings. Each member is identified through his/her e-mail address. Gold-members can book any training activity, while common members can only book core-activities. For each training activity, the database stores the schedule (week, week day, and time), the room, the leader and the e-mail of the leader. Each leader leads several activities per week, but the same activities every week.

Translate the EER diagram into a relational model. Mark each primary key with a straight underline, and each foreign key with a dotted underline. For the foreign keys, mark the attributes that are referred by the foreign keys by means of arrows.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Occasion
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