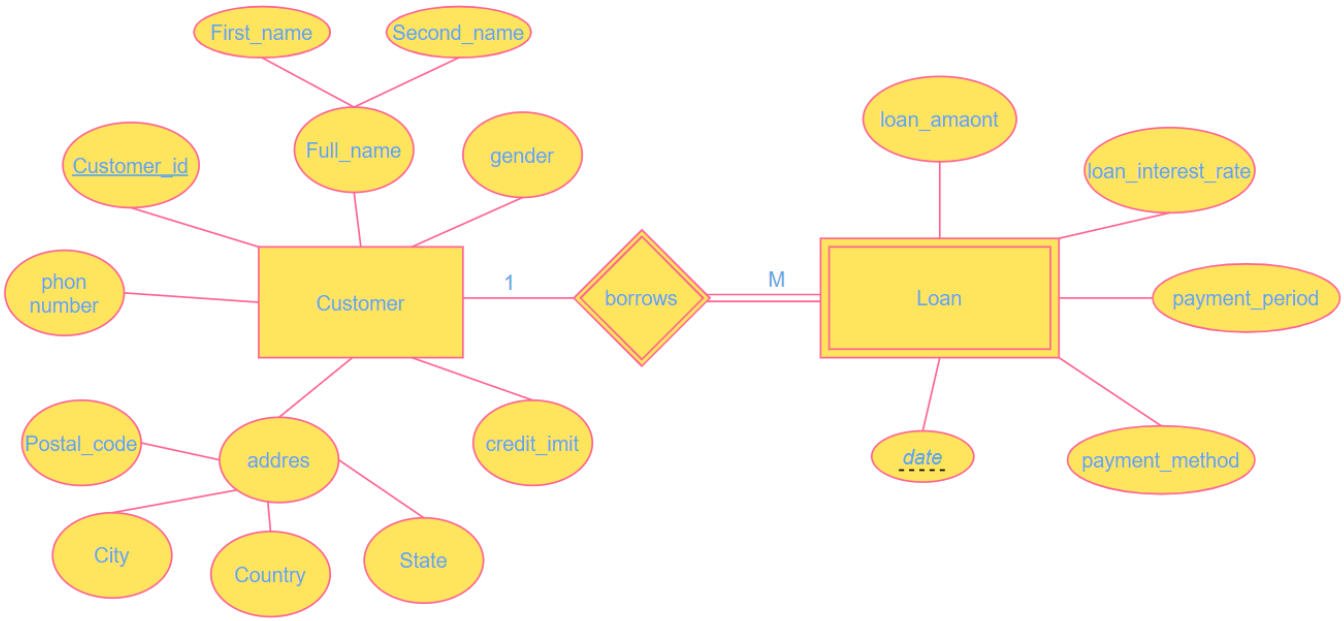
Task #1

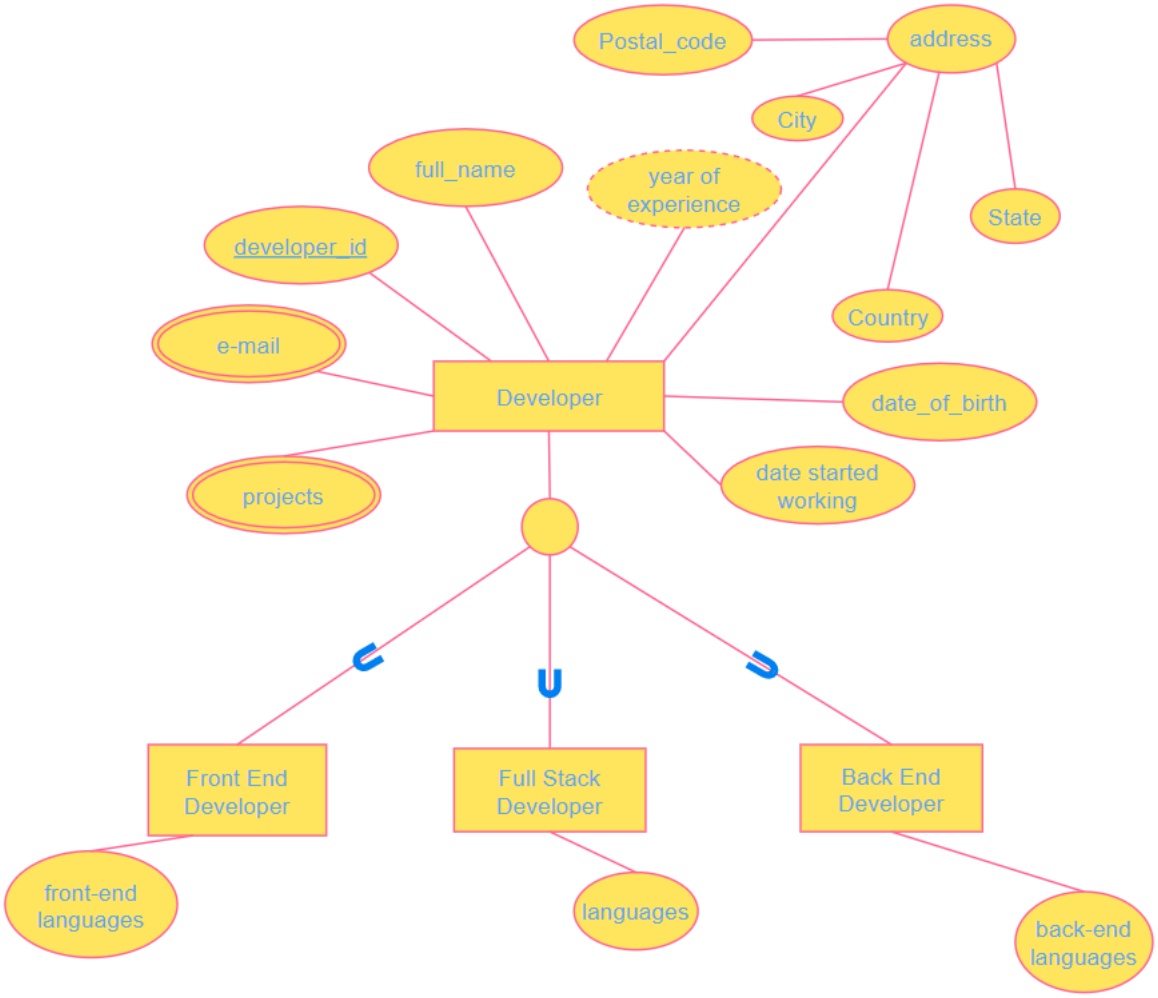
(10 points) Give one example of weak type entity and strong type entity with indicating relationship between them. Draw ER diagram for this. Make sure to use any real life examples, but DO NOT USE examples already covered in the lecture slides. Using examples from the lecture slides will result in 0 points for this task.



In my example, *Customer* is strong entity because not every customer has to borrow a loan, that's why we have a partial participation. But *Loan* here is weak entity. Because it doesn't have any primary key and every loan cannot be borrowed without a customer. So it means that we have a total participation. Even though it has not primary we can have a discriminator in order to uniquely identify our weak entity. In this example my discriminator will be the date attribute. In ER diagram we will indicate it by dashed line.

Task #2

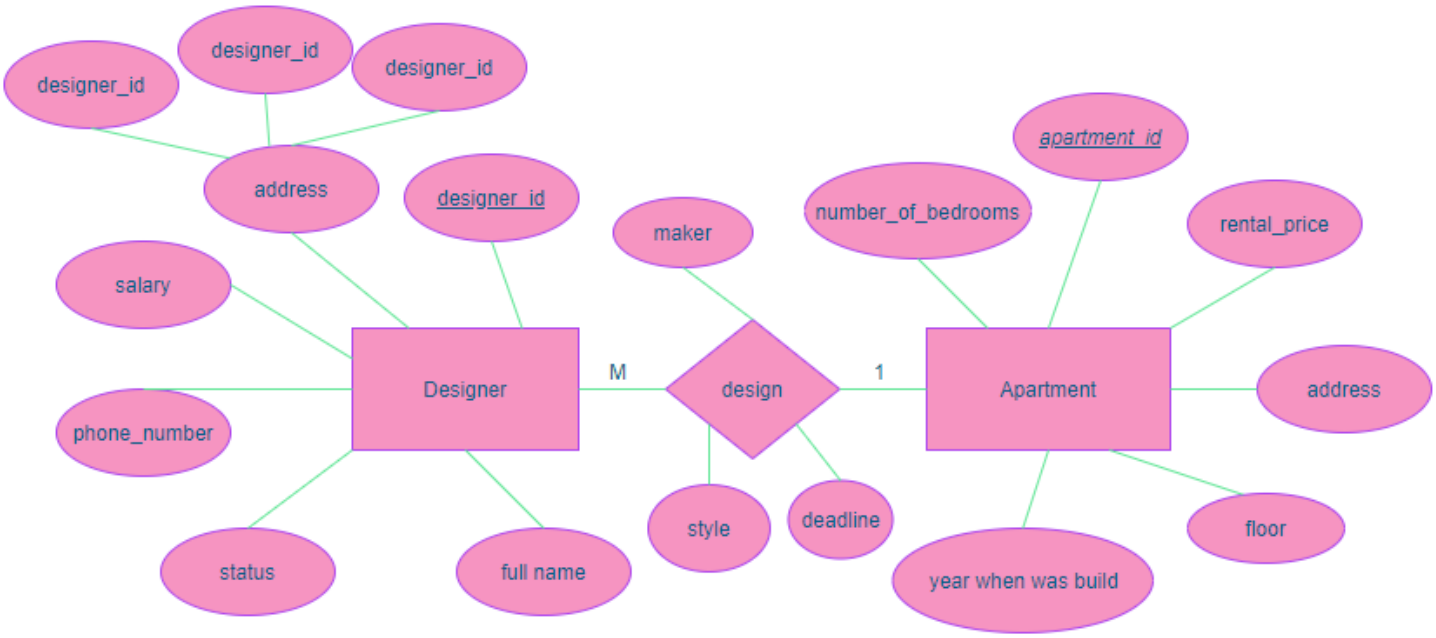
(10 points) Give one example of entity type hierarchy. Draw ER diagram for this. Indicate what is super-entity here and what are sub-entities here. DO NOT USE examples already covered in the lecture slides. Using examples from the lecture slides will result in 0 points for this task.

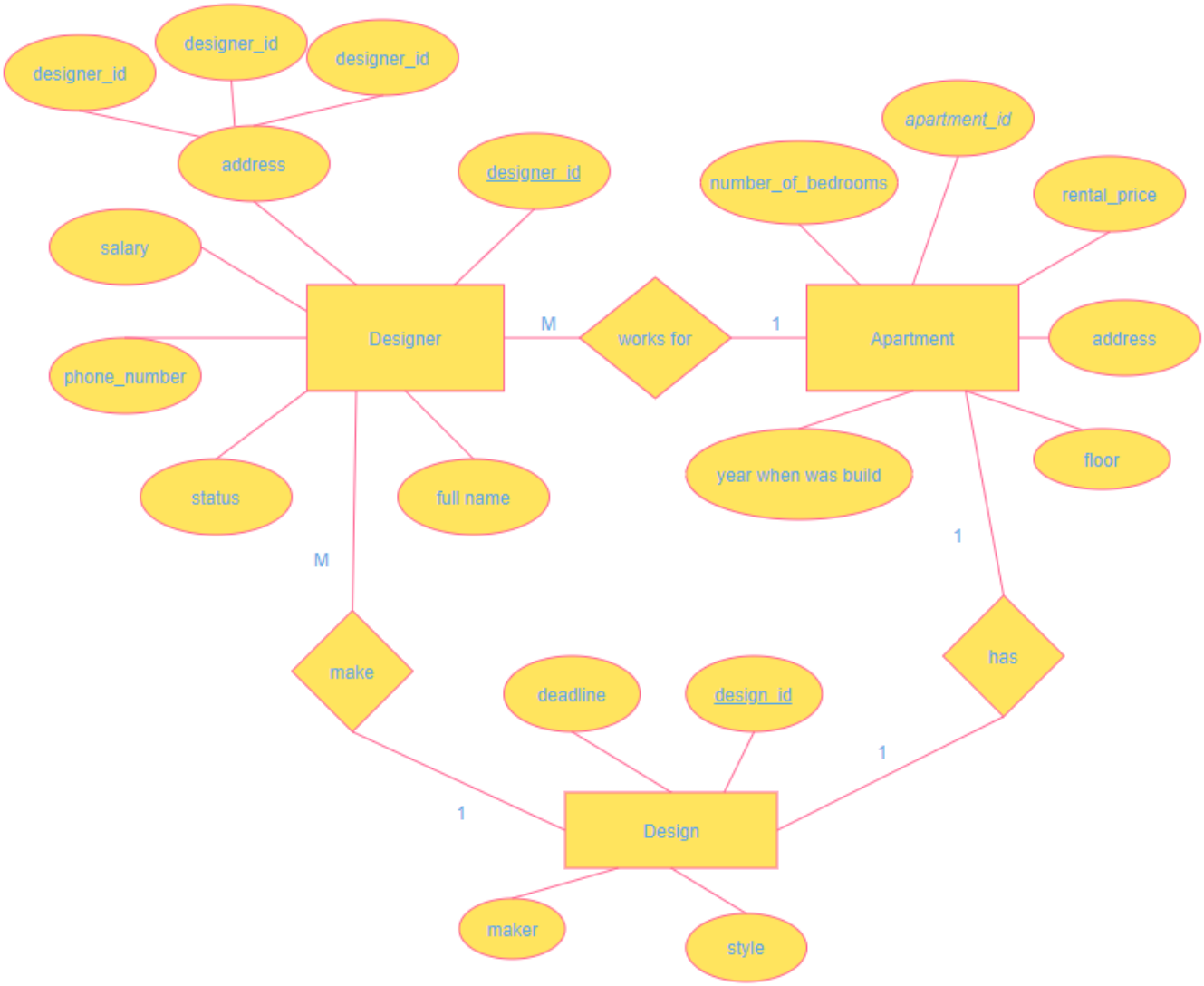


As you can see here in this ER diagram '*Developer*' entity is super-entity, logically other left '*Front End Developer*', '*Full Stack Developer*' and '*Back End Developer*' are sub-entities. Here I also used examples of multivalued attributes (projects, e-mail) which is represented be double oval, composite attributes (full name, address), and derived attributes (year of experience) which is represented by dashed oval.

Task #3

(10 points) Give one example of the case when the object can be considered as entity **or** as relationship. Draw both versions of the cases when the object is depicted as entity and second version when the object is depicted as relationship. DO NOT USE examples already cover in the lecture slides. Using examples from the lecture slides will result in 0 points for this task.

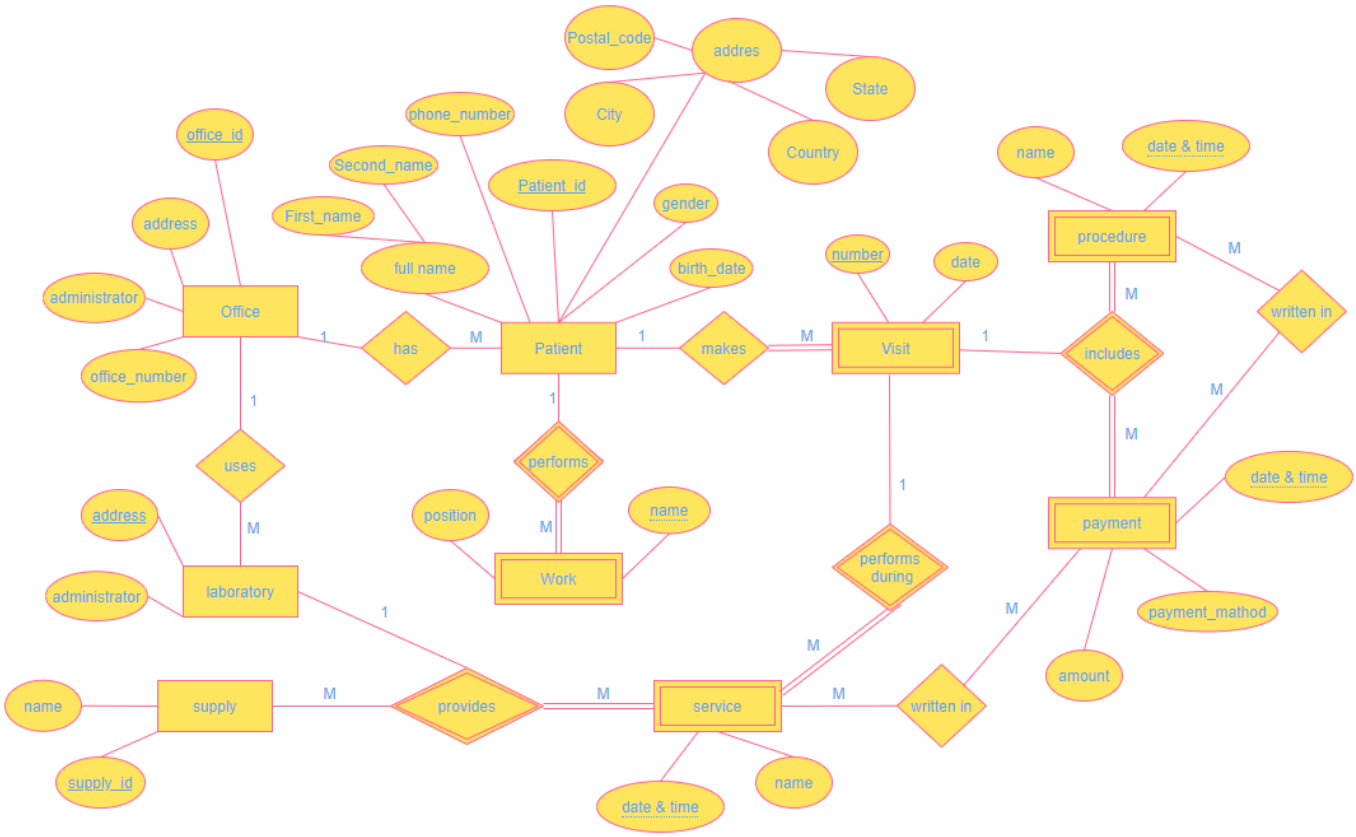




To be honest, it was quite challenging problem. For this assignment I am considering 'Design' as relationships in the first example. And in the second example 'Design' as entity. It can play sometimes a role of relation, but sometimes we can look at as entity.

Task #4

(15 points) A dentist's office needs to keep information about patients, the number of visits they make to the office, work that must be performed, procedures performed during visits, charges and payments for treatment, and laboratory supplies and services. Assume there is only one dentist, so there is no need to store information about the dentist in the database. There are several hundred patients. Patients make many visits, and the database should store information about the services performed during each visit and the charges for each of the services. There is a standard list of charges, kept outside the database. The office uses three dental laboratories that provide supplies and services, such as fabricating dentures. Draw a complete E-R diagram for this example.
*Make sure to indicate all primary keys, weak-strong entities, total participations, etc.

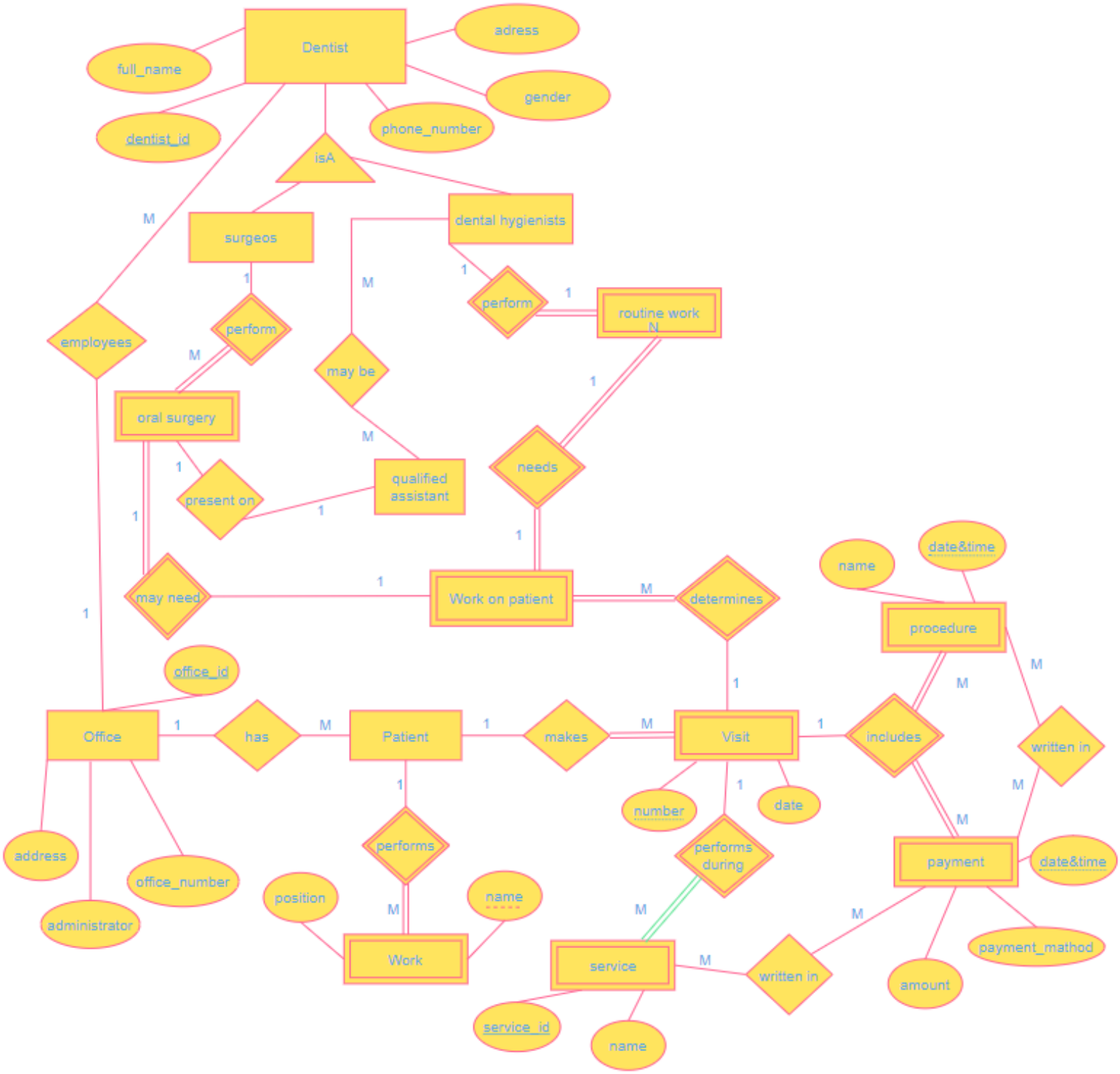


Before starting to draw the diagram I thought what I could consider as Entity, Relation and Attribute. After we need to think which is weak or strong, their primary keys or discriminator, and about their partial or total participation. Finally, to indicate their cardinality.

And my entities are: Patient, Work, Visit, Procedure, Payment, Office, Laboratory, Supply, and Service. (9entity). Of course, Patient is going to be an entity, because he is like our main character in this ER diagram. And I am considering Work as weak entity, because any Patient can exist without performing work, and not every People has to have work, that's why here we have partial participation. But Work cannot exist in the database without the Patient which performs that work, and here comes our total participation. Next, here at first sight Visit looks like to be a Relation, but after reading I saw that Visit cannot be a relation because it has more information that needs to be provided but it has to be weak because without patient we don't need a Visit entity. Next I am considering Procedure, Payments and Service as weak entities, with the same reason as Work. In order the Procedure, Payment and Service to exist we need Patient to make a Visit. Other remaining Office, Laboratory and Supply are strong entities and they have their own primary key. And we have another total participation between laboratory – provides- service. Laboratory can exist without providing any service, but Service need Laboratory to be provided. About partial keys of my weak entities: Service, Procedure and Payment weak entities has the same meaningful partial key which is time-date. By this attribute I am sure that we can distinguish those entity instances from another. For Work I took name as discriminator. About cardinality. All of them in one-to-many relationship. And we have binary and ternary degree of relationships. I didn't take charges here because in the given task there written that list of charges are kept outside of the database. (I will explain about 'written in' relationship in the next task).

Task #5

(15 points) Develop an EE-R diagram for the dental group described in task #4, but expand it by assuming that some of the dentists are surgeons, who can perform oral surgery. Also assume some of the professionals are dental hygienists, who can perform routine work such as cleaning and taking X-rays. A patient typically begins an ordinary visit by starting with a dental hygienist who performs routine work, and then a dentist who does a checkup during the same initial visit. The work needed is usually determined at this visit. If follow-up visits are required, each of the next visits will be with one dentist. If a patient requires oral surgery, at least one of his or her visits must be with one of the surgeons, even though the rest of the work needed might be performed by his or her regular dentist. When surgery is performed, there must be a qualified assistant present. Only some of the hygienists are qualified to assist in surgeries. Assume this database does not keep track of appointments, only of actual visits, work, billing, and payments.



I can definitely say that this one is the hardest from other. It really needs logical thinking. That's why it calls logical model in dbms. Here I included additional entities, relations and attributes for dental group. So, we have hierarchy type because we have two types of dentist which is Surgeons and Dental hygienists, And qualified Assistant. In my diagram I added 3 independent strong entities which means they don't need anything in order to exist in our database. When the office is going to employee them in that time they are going to be added to db. And other 'Work on Patient', 'Oral surgery', 'Routine work' are weak entities because in order to exist they need their parent entities. In order to have work on patient we for sure need patient to make a visit to the office. Without it we can't insert work to db. In order to oral surgery and routine work to be added in the record(db.) we need the dentists, without them it is not possible we write about them.

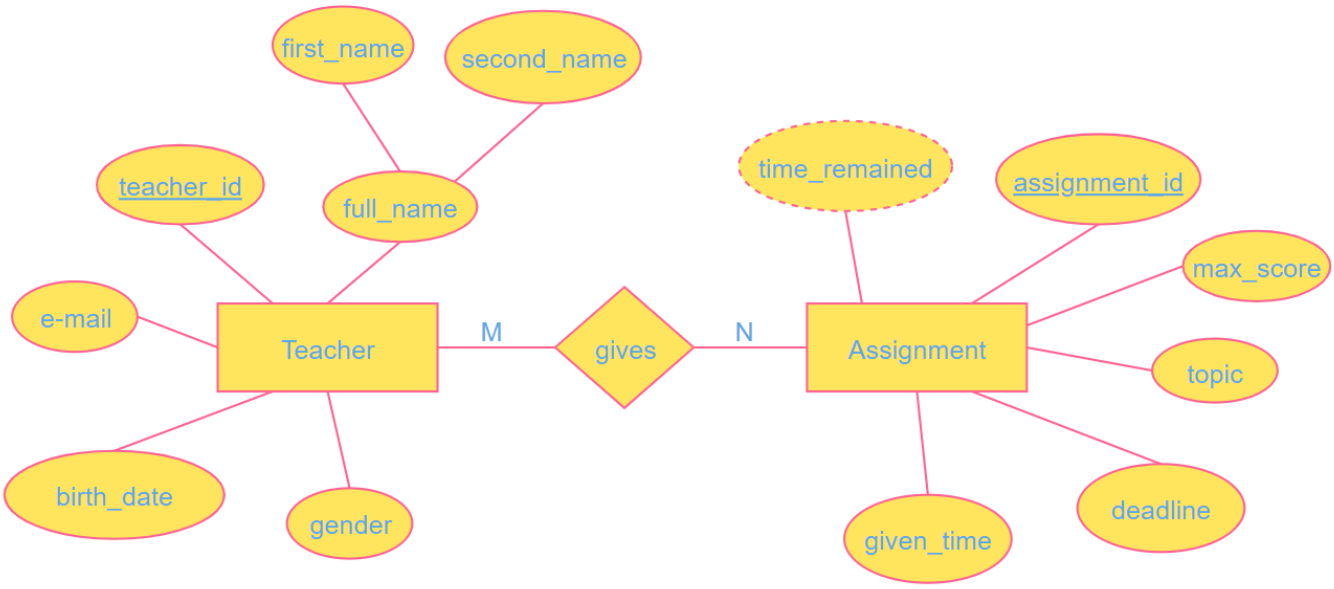
I think, in order to represent diagram, we can think of some situations. Situations like I am a Patient and the first thing I am going to make is Visit. Visit is weak because without me Visit entity cannot exist. The easiest case is I am just going to make a visit and return back to home for some reasons. It means that I don't have (Visit entity) any total participation. If am going to do something, I do not know maybe some services, which is going to be written in payment entity or have some procedures which is also will be written in our payment entity. So in my one Visit I can make a lot of payments.

Then in my visit they can determine the work that needs to be done on me, or even I can know in advance what I need (I might know that I need surgery, but if it is my first visit I will not know, that's why we have partial participation between work and surgery). As routine work needs all the time when I will come to the office I represented by one line.

Here we also can represent isA relation be using circle and inheritance symbol but I liked that way.

Task #6

(5 points) Give example of derived attribute not covered on a lecture, show its graphical representation. Using examples from the lecture slides will result in 0 points for this task.



Well, first of all, let's answer what derived attribute is. A derived attribute is an attribute whose value is calculated from other attributes. In ER diagram we represent it using dashed oval. In physical database derived attributes do not exist, because we can calculate them using other attributes when it needed. In my example, derived attribute is 'time_remained'.