Batch: A2 Roll No.: 1911027
Experiment / assignment / tutorial No. 1
Grade: AA / AB / BB / BC / CC / CD /DD

Signature of the Staff In-charge with date

Title: Problem Definition and Design of Extended-Entity-Relationship diagram

Objective: To define a Database Problem and Design an EER diagram for a business domain.

Expected Outcome of Experiment:

CO 1: Design entity-relationship diagrams to represent different database application scenarios.

Books/ Journals/ Websites referred:

1. G. K. Gupta :"*Database Management Systems*", McGraw – Hill
2. Korth, Slberchatz, Sudarshan : "Database Systems Concept", 6th Edition , McGraw Hill
3. Elmasri and Navathe, "Fundamentals *of Database Systems*", 5thEdition, PEARSON Education.

Dia Software: A software to Design ER Model

Dia is one of the convenient open source tool which runs on multiple platforms including Linux, Windows and MacOS.Dia has a number of "sheets" each of which includes diagram objects for different modeling tools, such as UML, ER diagrams, flowcharts, etc.

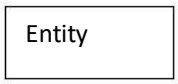
The ER tool has objects for entities, relationships, attributes (using the oval notation), edges, and so on. The properties boxes for each of these elements allow you to specify cardinality constraints, total participation, identifying relationship, etc.

It supports many common formats to store diagrams such as jpeg, png, eps, etc.

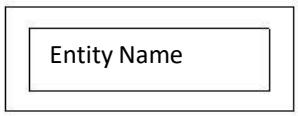
Pre Lab/ Prior Concepts:

The ER data model was developed to facilitate the database design by allowing specification of an enterprise schema that represents the overall logical structure of the database. The ER model is one of the several data models. The semantic aspect of the model lies in its representation of the meaning of the data. The ER model is very useful many database design tools drawn on concepts from the ER model. The ER model employs 3 basic notations: entity set, relationship set and attributes.

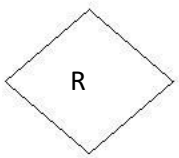
Symbols Used in ER Notation

1. 

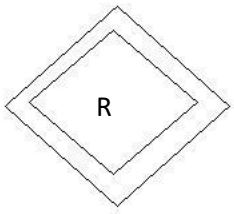
Entity set: An entity is a set of entities of the same type that share the properties or attributes.

2. 

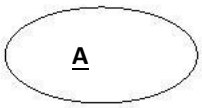
Weak entity set: An entity set may not have sufficient attributes to form a primary key. Such an entity set is termed as weak entity set.

3. 

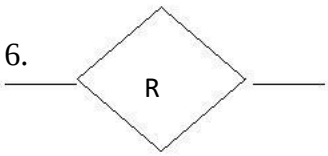
Realtionship Set: A relationship is an association among several entities. A relationship set is a set of relationship of the same type.

4. 

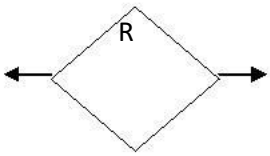
Identification relationship set for weak entity set: The relationship associating the weak entity set with the identifying entity set is called the identifying relationship.

5. 

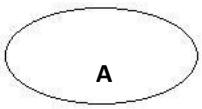
Primary key: The primary key is used to denote a candidate key that is chosen by the database designers as the principal means of identifying entities within an entity set.

6. 

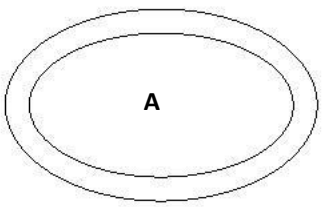
Many to Many relationship

7. 

One to One relationship

8. 

Attribute

9. 

Multi valued Attribute

Extended Entity Relationship Diagram:

The EER model includes all of the concepts introduced by the ER model. Additionally it includes the concepts of a subclass and superclass (Is-a), along with the concepts of specialization and generalization. Furthermore, it introduces the concept of a union type or category, which is used to represent a collection of objects that is the union of objects of different entity types. EER model also includes EER diagrams that are conceptual models that accurately represent the requirements of complex databases.

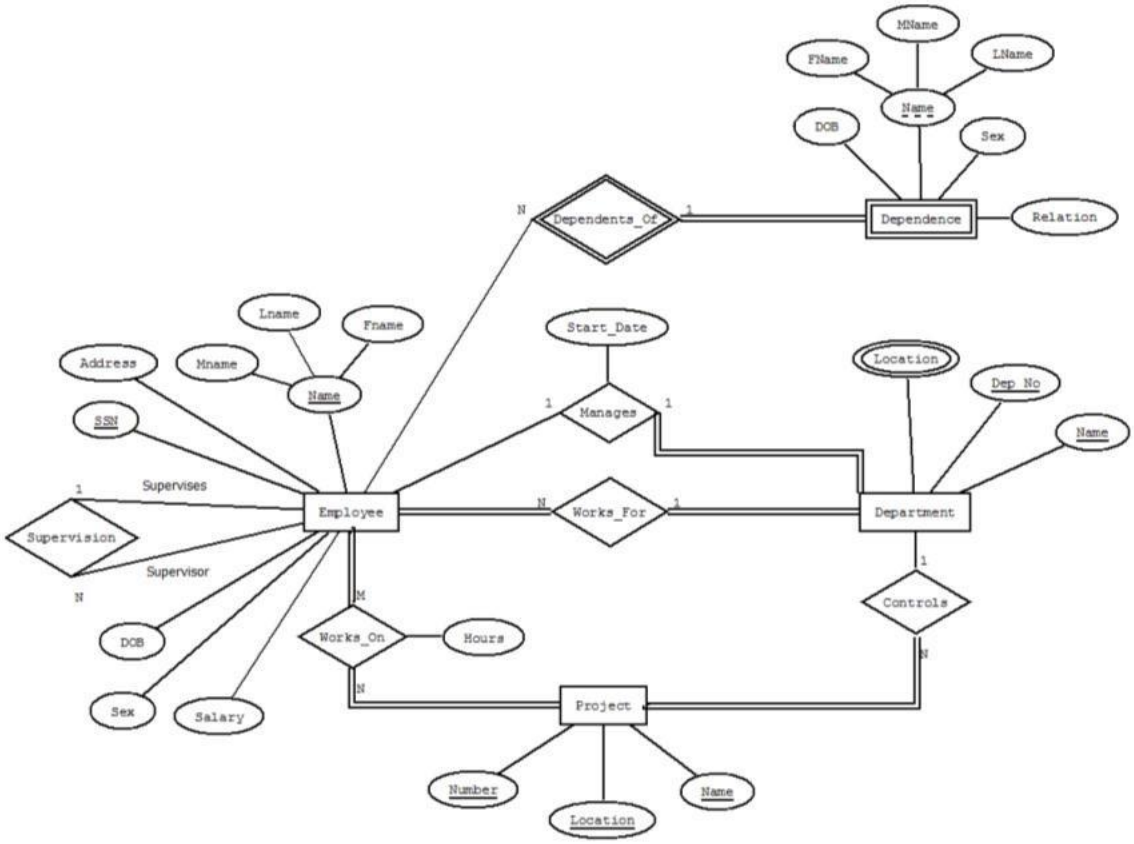
Example Case Study: List the data requirements for the database of the company which keeps track of the company employee, department and projects. The database designers provide the following description

1. The company is organized into departments. Each department has unique name, unique number, and particular employee to manage the department. We keep track of the start date and the employee begins managing the department. The department has several locations.
2. The department controls a number of projects each of which has a unique name, unique number and a single location.
3. We store each employee names social security number, address, salary, sex and dob. An employee is assigned one department but may work on several projects which are not necessarily controlled by the same department. We keep track of the department of each employee works on each project and for insurance purpose. We keep each dependents first name, sex, dob and relation.

Procedure for doing the ER diagram experiment

1. Identifying the Entities (Strong and weak entities)
2. Identify attributes of the Entity (keys, partial key, simple, composite, multivalued, derived)
3. Identify relationship(recursive)
4. Identify the structural constraints of the relationship (cardinality ratio, participation constraints**)**

ER- Diagram for company Case Study Database:



Problem Definition: Now a days as technology is advancing in the healthcare sector so is the intensity and frequency of diseases. So the need for medicine is increasing at a non-linear rate, our pharma sector on the other side was struggling to cope with the accelerating need in the past. The scenario is different now and so is the problem. We currently have a good production rate of these medicines, but as we know as one problem is solved another is ready to make its way.
In this technological era we suppose things to be done as fast as possible.

Now consider a person who wants a particular medicine. He goes to some medical shops and inquires about the medicine, there is a good amount of chance that he might find the medicine without wasting much time roaming around 4-5 medical shops. If he finds the medicine in a medical shop say 'x' and the price is say 'a', and he purchases the medicine. And somewhere around him nearby there is another medical store that is providing the same medicine for a discounted rate. The person has not made an optimized purchase. But on the contrary if he does not find the medicine then what?

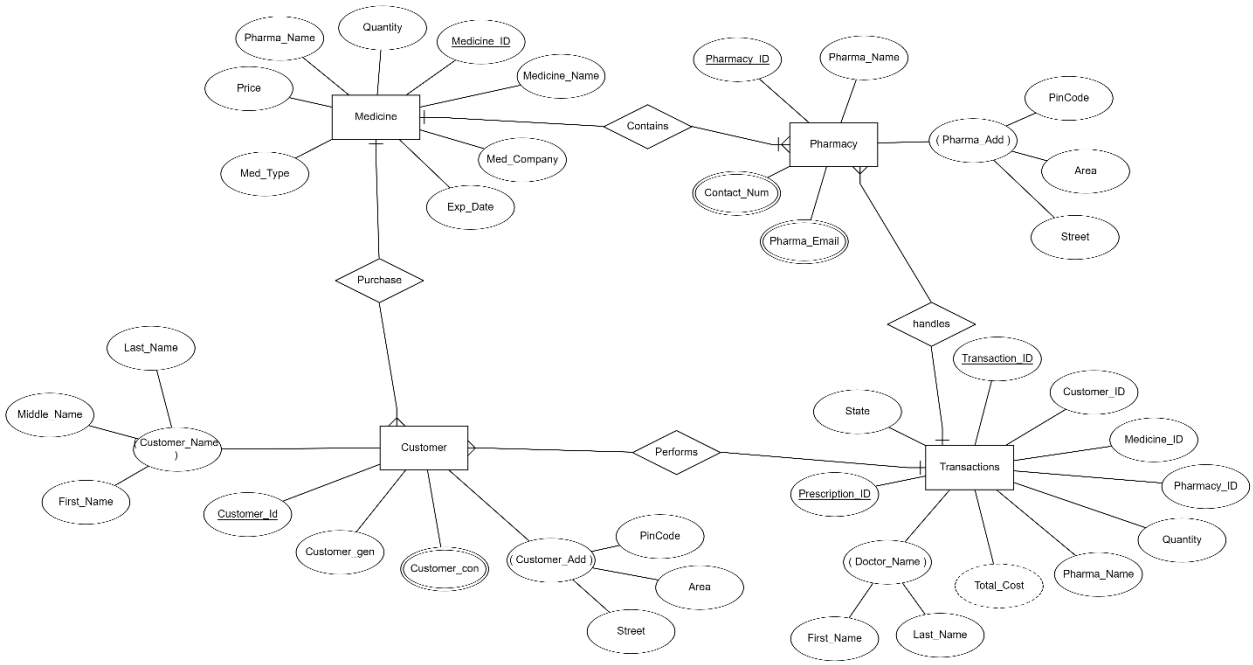
Another case being, if there are only senior citizens staying in a house then, how feasible it is for them to go and purchase medicine each time they need it?

So therefore we came up with an idea to sell medicines and deliver it to a particular customer at his/her door step. The ideas goes like this, we first take information of a particular customer to store it into our database. We then gather a list of all the medicine shops (Mainly major ones to ensure availability of all medicines at any given time). Now our customer could order any medicine he wants through our portal. When he/she does so and searches for a particular medicine our system would first of all list all the medical shops that have this particular medicine available. After which our system would also recommend that particular medical which is providing the medicine at the least price thus giving our customer a better purchase.

There are many advantages of this type of systems like lower prices of medicines, availability of medicines i.e. if medicines are not available in one of the shops than it can be made available to the customer from another shop as well, price comparison of medicine is also possible.

There is no doubt that there are many advantages and benefits of online medicine delivery system but disadvantages are also there. There are many illiterate people who can’t do such things efficiently. There are many fake prescription related issues that are also present in the current scenario which would adversely affect the health of people. By ordering medicines online some additional costs are also added to the final amount.

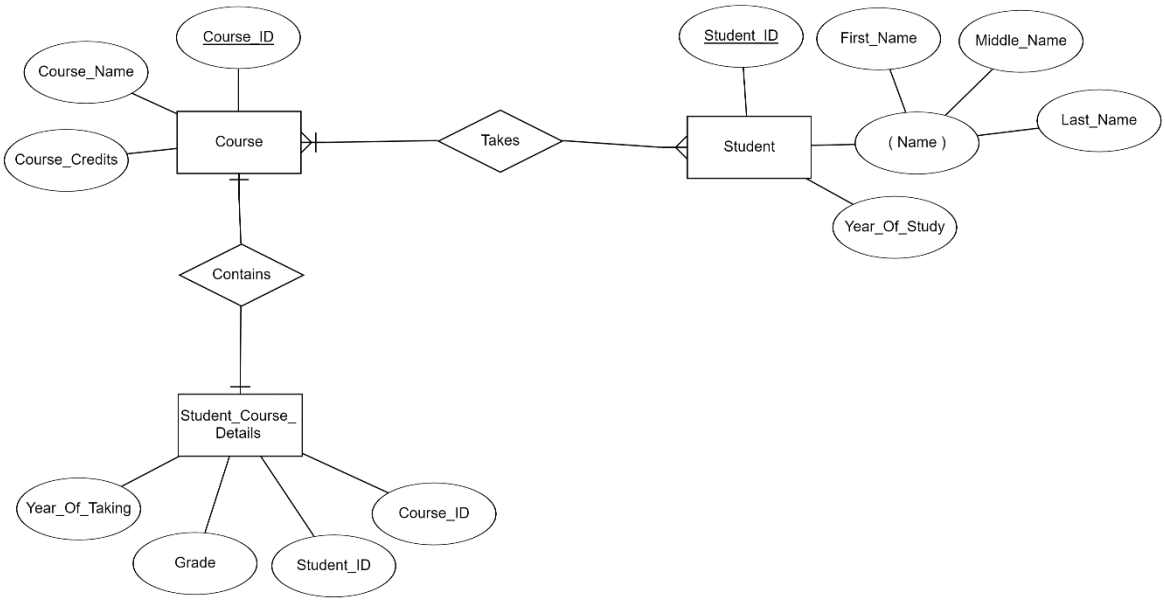
Design of EER:


Pharma_Name
Quantity
Medicine_ID
Price
Medicine_Name
Medicine
Med_Type
Med_Company
Exp_Date
Contains
Pharmacy_ID
Pharma_Name
Pharmacy
Contact_Num
Pharma_Email
(Pharma_Add)
PinCode
Area
Street
Purchase
handles
Last_Name
Middle_Name
(Customer_Name)
First_Name
Customer
Customer_Id
Customer_gen
Customer_con
(Customer_Add)
PinCode
Area
Street
Performs
Transactions
Transaction_ID
Customer_ID
State
Medicine_ID
Prescription_ID
Pharmacy_ID
Quantity
(Doctor_Name)
Total_Cost
Pharma_Name
First_Name
Last_Name

Post Lab Descriptive Questions (Add questions from examination point view)

1. In the Academic database a Grade is issued to each STUDENT for each COURSE taken and stored in the STUDENT COURSE DETAIL entity. A STUDENT may decide to re-take a COURSE to better their GRADE. The administration would like to keep a record of the old/previous Grade as well as the new Grade. Show ER diagram to include historical Grades if the students should have them.

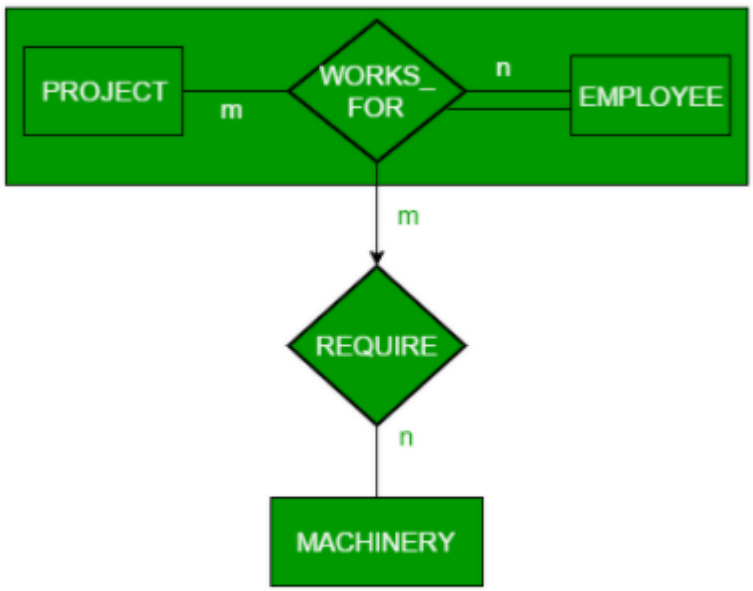
ANS)



2. Discuss the concept of aggregation. Give an example. How to represent aggregation in ER model (if aggregation is not supported in EER diagram) .

ANS) An ER diagram is not capable of representing relationship between an entity and a relationship which may be required in some scenarios. In those cases, a relationship with its corresponding entities is aggregated into a higher level entity. In aggregation, the relation between two entities is treated as a single entity. In aggregation, relationship with its corresponding entities is aggregated into a higher level entity.

For Example, Employee working for a project may require some machinery. So, REQUIRE relationship is needed between relationship WORKS_FOR and entity MACHINERY. Using aggregation, WORKS_FOR relationship with its entities EMPLOYEE and PROJECT is aggregated into single entity and relationship REQUIRE is created between aggregated entity and MACHINERY.



Aggregation

3. Two separate banks which decide to merge. Both banks use same ER database schema(Assume the ER diagram). If the merged bank is to have a single database, there are several potential problems:
    - The possibility that two original banks have branches with the same name
    - The possibility that some customers are customers of both original banks
    - The possibility that some loan or account numbers were used at both original banks

    Discuss for each of these potential problems , why there is indeed potential difficulty in database based on ER model. Propose a solution to a problem. For your solution, explain any changes that would have to be made and describe what their effect would be on the ER database schema and the data.

ANS) To solve the problems caused by the merger, no schema changes are required. Merge the customer entity sets removing duplicate tuples with the same social security field. Before merging the branch entity sets, prepend the old bank name to the branch-name attribute in each tuple. The employee entity sets can be merged directly, and so can the payment entity sets. No duplicate removal should be performed. Before merging the loan and account entity sets, whenever there is a number common in both the banks, the old number is replaced by a new unique number, in one of the banks. Next the relationship sets can be merged. Any relation in any relationship set which involves a tuple which has been modified earlier due to the merger, is itself modified to retain the same meaning. For example let 1611 be a loan number common in both the banks prior to the merger and let it be replaced by a new unique number 2611 in one of the banks, say bank 2. Now all the relations in borrower, loan-branch and loan-payment of bank 2 which refer to loan number 1611 will have to be modified to refer to 2611. Then the merger with bank 1's corresponding relationship sets can take place.