Experiment No.: 01

Title: Formulation of a problem definition and Drawing ER /EER diagram.

Batch: A3   **Roll No.: 16010423099**   **Experiment No.: 01**

Aim: Formulation of a problem definition for specific real world DMS system and Drawing ER/EER diagram for the same.

Resources needed: MS-office

Theory:

Entity relationship model is a data model which represent the overall logical structure of database and it is very useful in mapping the meanings and interactions of real world enterprises onto a conceptual schema.

The E-R model employs three basic notations:

Entity sets: An entity set is a set of entities of the same type that share the same properties .(an entity is a real world object)

Relationship sets: Relationship set is a set of relationships of the same type.(relationship is an association among several entities)

Attributes: Attributes are properties of entity set used to describe it. Different types of attributes are composite, multivalued, derived and simple.

In **extended E R model** we have three additional concepts:

Specialization: The process of designating the subgroupings within an entity set is called specialization(finding specialized attributes)
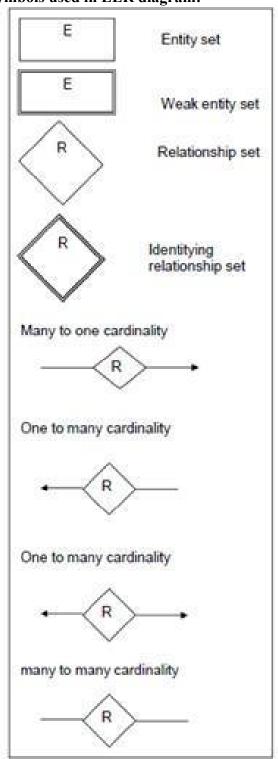
e.g. in entity set person we have two types of entities like customer and employee. Both are person but employee have specialized attribute salary and customer have rating.
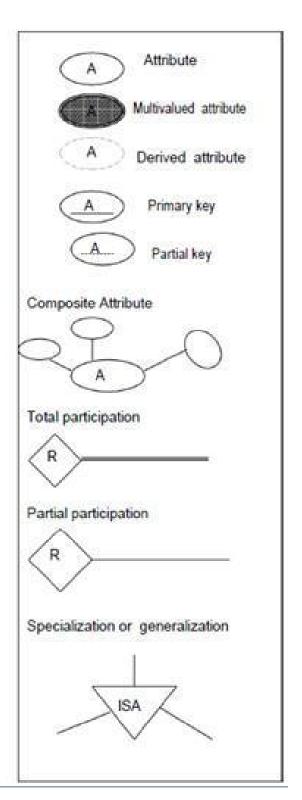
Generalization: It is a top down design process in which multiple entity sets are synthesized into a higher level entity set on the basis of common features.

e.g. customer entity set and employee entity set both have common attributes like name, address, age which can be used as attributes of higher level entity set person.

Aggregation: it is an abstraction through which relationships are treated as higher level entities.

The most important use of the E-R diagram is it represents some constraints like total and partial participation, one to one, many to many, many to one, one to many mapping etc.

Symbols used in EER diagram:

Symbol	Meaning
E	Entity set
E	Weak entity set
R	Relationship set
R	Identifying relationship set
Many to one cardinality	R →
One to many cardinality	← R
One to many cardinality	← R →
many to many cardinality	R

Symbol	Meaning
A	Attribute
A	Multivalued attribute
A	Derived attribute
A	Primary key
A	Partial key
Composite Attribute	A
Total participation	R
Partial participation	R
Specialization or generalization	ISA

Procedure:

Identify the real world objects to start drawing the diagram
1. Entity – An real world object which can be converted into table name.
2. Entity type – It defines the collection of similar type of entities.
3. Attributes – Properties of entity which describes the entity. Attributes are of different types
    a. Atomic Attributes
    b. Composite Attributes
    c. Single valued attributes
    d. Multivalued Attributes
    e. Derived Attributes
4. Relationship – When one entity refers to another entity type a relationship exists between the two entities.
5. Relationship types – A relationship type R among n entity types defines a set of associations among entities of other types.
6. Weak entity – the entity depends on another entity is called as weak entity.
7. Specialization – this is process of defining a set of subclasses of an entity type .It is derived from a super class depending upon different attributes.
8. Generalization – It is the process of abstraction in which we suppress the differences among several entity types grouping some entities and eliminating common features. We generalize them into a single super class.
    a. Disjoint – In this, entity can be a member of any one of the subclass
    b. Overlap – In this, entity can be a member of more than one subclass.
    c. Total – All the entities are member of any one of the subclasses.
    d. Partial – Entity is not a member of any one the subclass.
9. Union – the subclass represent collection of objects.

This detailed problem statement gives the clarification about the database design.
This is tool to find out missing functional dependencies to convert the schema to the appropriate normal form.

Formulate the problem definition to get the detailed description of the problme domain so that entities can be easily identified from the problem definition.

There are many components used into EER.
1. First find out the real world objects as entities.
2. Find out the attributes which will describe the object.
3. Find the relationships and the participation constraints.
4. Apply object oriented fundamentals and get the specialization and generalization objects.
5. Draw the diagram.

Results: (Document printout/handwritten)

1. Problem definition
2. ER/EER diagram

Example:

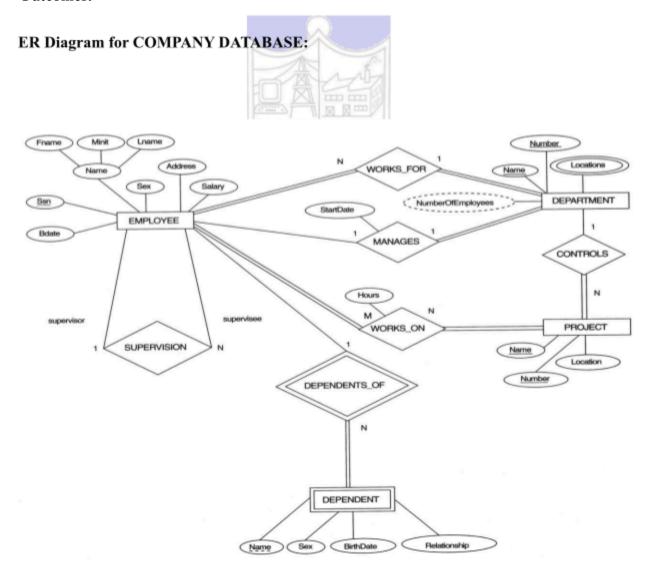Problem Definition for COMPANY database system

The company is organized into DEPARTMENTs. Each department has a name, number and an employee who *manages* the department. We keep track of the start date of the department manager.

Each department *controls* a number of PROJECTs. Each project has a name, number and is located at a single location.

It stores each EMPLOYEE's social security number, address, salary, gender, and birthdate. Each employee *works for* one department but may *work on* several projects. It keep track of the number of hours per week that an employee currently works on each project. We also keep track of the *direct supervisor* of each employee.

Each employee may *have* a number of DEPENDENTs. For each dependent, we keep track of their name, gender, birthdate, and relationship to employee.
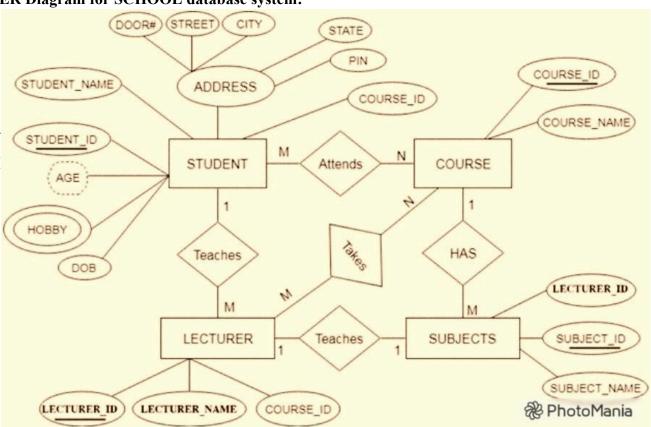
Outcomes:

ER Diagram for COMPANY DATABASE:

Results: (Document printout/handwritten)
Problem Definition for SCHOOL database system:

The educational institution manages a database system to handle information related to STUDENTS, COURSES, LECTURERS, and SUBJECTS. Each student is enrolled in one or more courses and can be associated with multiple subjects. Each course consists of various subjects, and each subject is taught by a specific lecturer. The system maintains details such as student ID, course name, lecturer information, and subject credits, facilitating the management of enrollments, subject assignments, and lecturer allocations. This structure ensures efficient tracking of academic progress and resource management within the institution.

ER Diagram for SCHOOL database system:

Q1: Differentiate between total and partial participation with example.
Total participation means every entity in a set must be associated with at least one entity in another set. For example, in a university, if every student must enroll in at least one course, that's total participation. Partial participation means some entities might not be associated at all. For instance, not every course might have students enrolled, so the course entity has partial participation.

Q2: Differentiate between primary key and unique key.
A primary key uniquely identifies each record in a table and cannot have null values. There can only be one primary key per table. A unique key also ensures uniqueness but can allow one null value.

Conclusion:
Applied data models to real world scenarios by understanding entity relationship diagrams.