Batch:-B-2   **Roll No:-**16010122151
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", 6_{th} 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.
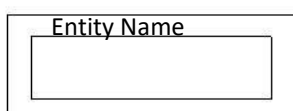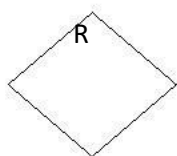
Symbols Used in ER Notation

1.
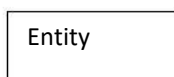
| Entity |

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

2.

| Entity Name |

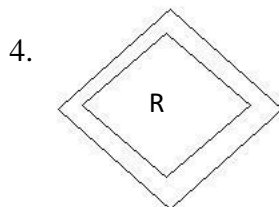**Weak entity set:** An entity set may not have sufficient attributes to form a primary key. Such an entity set is termed as weak entity set.
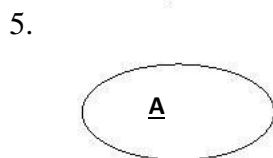
3.

R (diamond shape)

Relationship Set: A relationship is an association among several entities. A relationship set is a set of relationship of the same type.
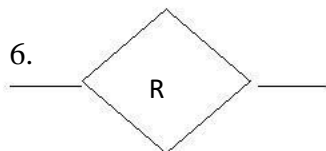
4.

Identification relationship set for weak entity set: The relationship associating the weak entity set with the identifying entity set is called the identifying relationship.
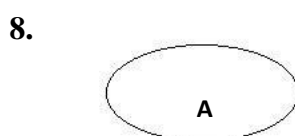
5.

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.
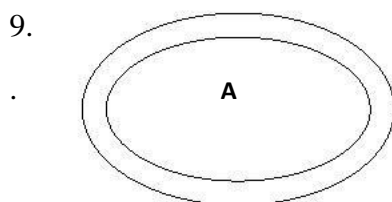
6.

Many to Many relationship

7.
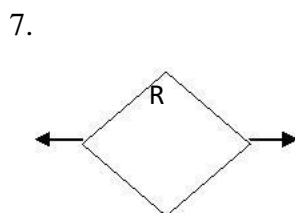
One to One relationship

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)

   • Identify the structural constraints of the relationship (cardinality ratio, participation constraints)

ER- Diagram for company Case Study Database:
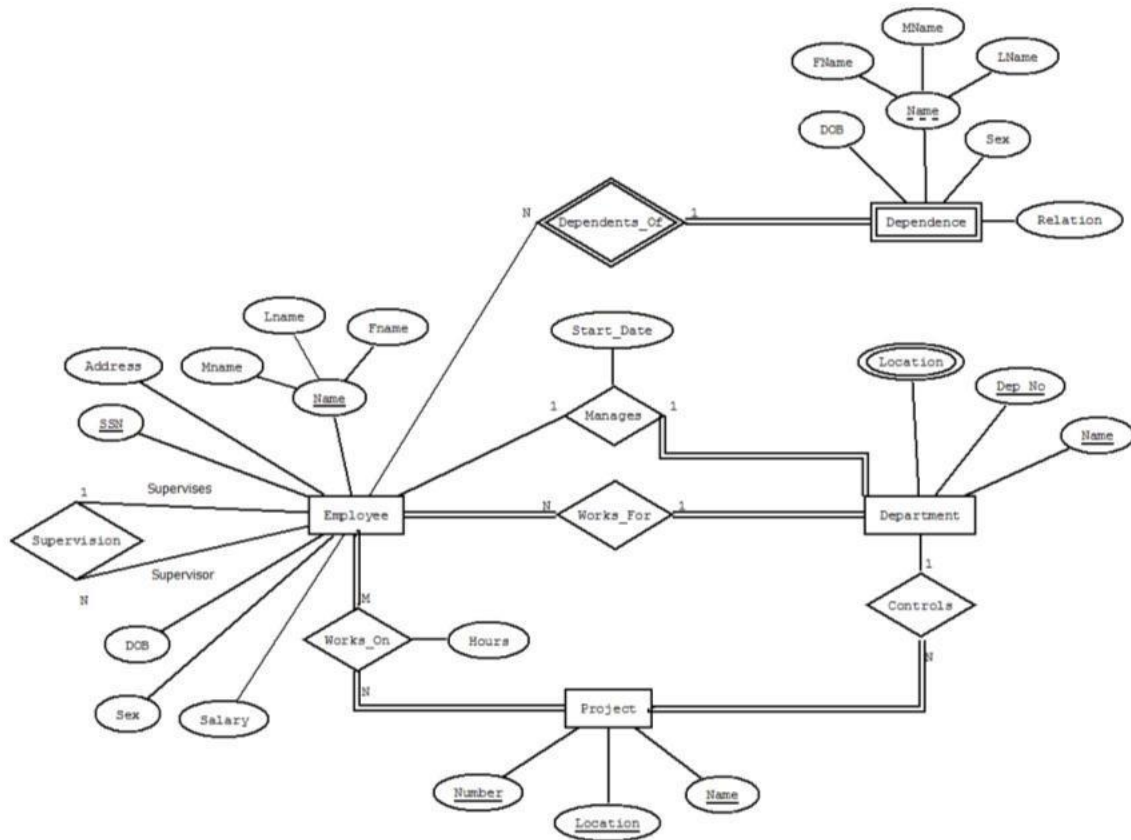
Department of Computer Engineering

Problem Definition:-

Our bank is experiencing rapid growth, expanding its services, customer base, and branch network. However, our current data management system struggles to keep pace. Loan tracking is difficult , and branch operations lack seamless integration. This fragmented data environment hinders efficient decision-making, personalized customer service, and overall operational effectiveness.

Design of EER:-
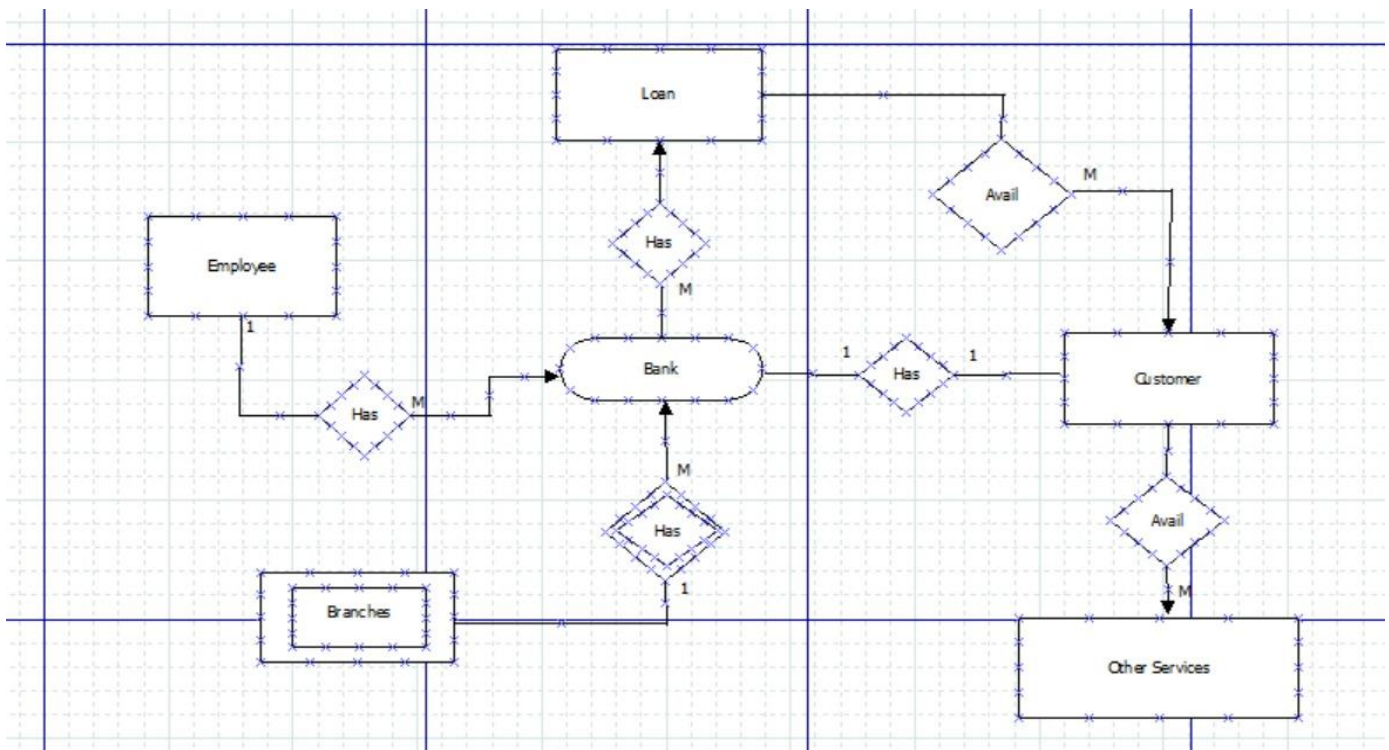
**Post Lab Descriptive Questions (Add questions from examination point view)**

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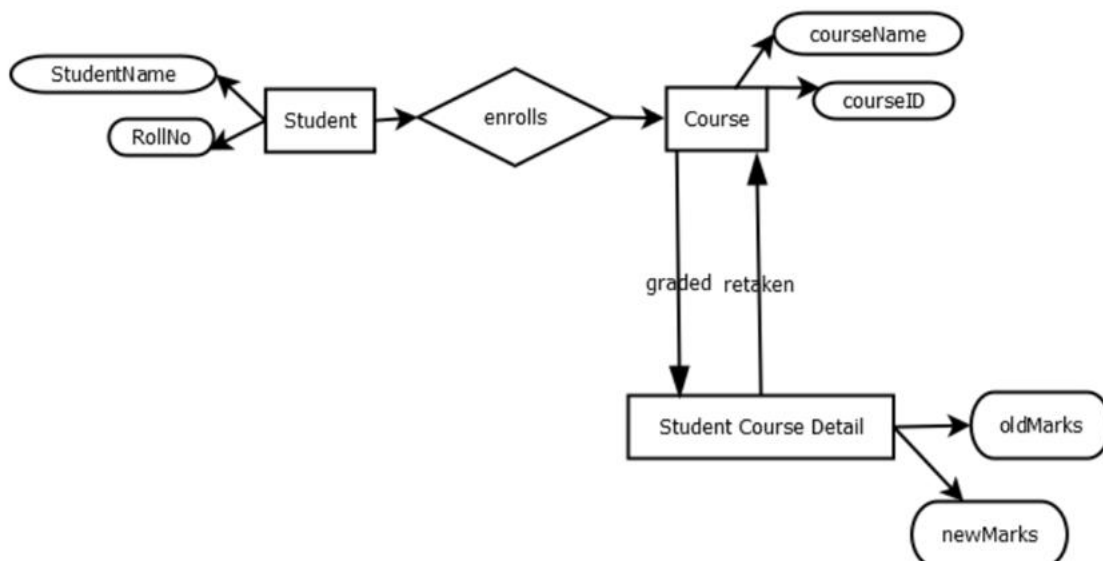
Discuss the concept of aggregation. Give an example. How to represent aggregation in ER model (if aggregation is not supported in EER diagram) .

Ans)
• A "whole-part" connection between things is represented by aggregation, in which a single entity (the whole) is made up of several other entities (the parts).
•In contrast to normal connections, this one allows for the autonomous existence of its constituent pieces.
•It's a conceptual construct that the notations in ER diagrams don't always clearly support.
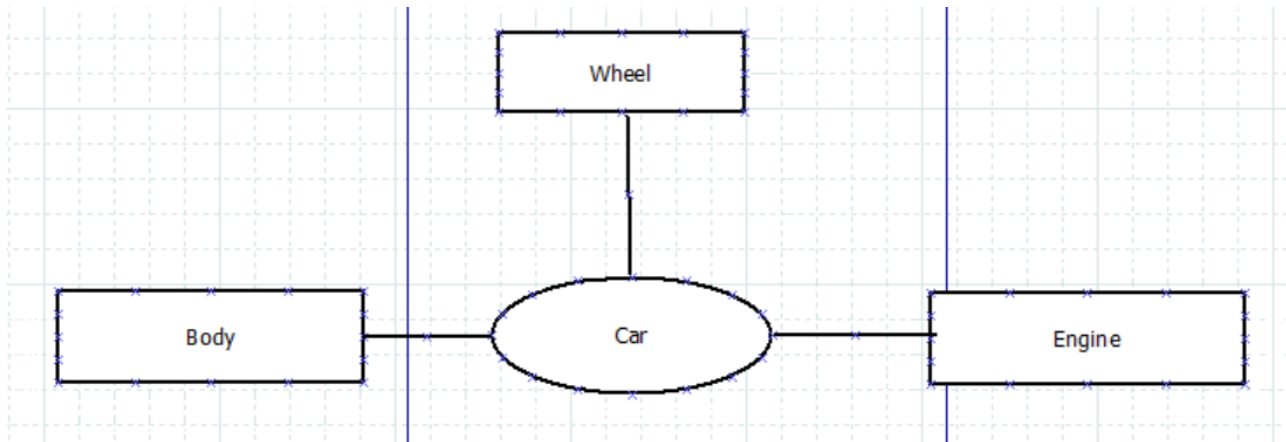
• Here Car is entity is aggregated from Engine, Wheel, and Body entities.
•The car cannot exist without these parts, but the engine, wheels, and body can exist
independently of any particular car.

2. 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
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)
Problem :-If both banks have branches with the same name, simply merging the datasets could
create duplicate entries in the "Branch" entity, leading into data confusion.

Solution:- Change the old bank name to the branch name before merging. This uniquely identifies
each branch and avoids duplication. Changes: Modify the "Branch" entity to include an additional
attribute "OldBankName". After merging, update all branch names with the format
"[OldBankName] - [Original Branch Name]". Effects: Increases the size of the "Branch" entity and
requires data manipulation before merging.

Problem :- Customers who were clients of both banks will appear twice in the merged database,
causing redundancy and potentially affecting account and loan relationships.

Solution:- Identify duplicate customers based on unique identifiers. Merge their entries, retaining

the most recent or complete information.

Changes: Add checks for duplicate IDs during data merging. Updates to existing relationships is needed.

Effects: Requires careful data analysis and potential data loss due to merging.

Problem :-Similar to branch names, having identical loan or account numbers across both banks can lead to confusion and data conflicts.

Solution:- Implement a new, unique numbering system for all accounts and loans after merging.

Changes: Develop new numbering logic and update all existing record references. Effects: Significant data manipulation and potential disruption to existing financial operations.