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Experiment / assignment / tutorial No.01
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

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

Expected Outcome of Experiment:

CO 1: Understand the features of Relational database management systems.

CO2: Develop relational database design using the designed Entity-Relationship model.

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.

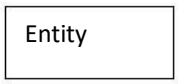
The ER tool has objects for entities, relationships, attributes (using the oval notation), edges, and so on. The properties boxes for each of these elements allow you to specify cardinality constraints, total participation, identifying relationship, etc.

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

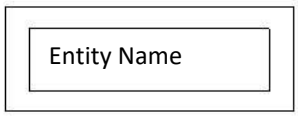
Pre Lab/ Prior Concepts:

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.

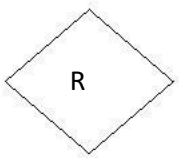
Symbols Used in ER Notation

1. 

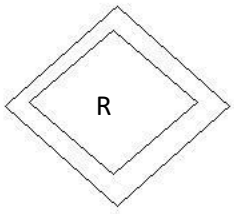
Entity set: An entity is a set of entities of the same type that share the properties or attributes.

2. 

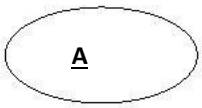
Weak entity set: An entity set may not have sufficient attributes to form a primary key. Such an entity set is termed as weak entity set.

3. 

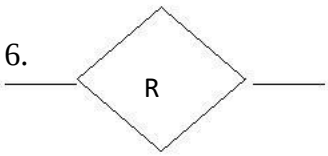
Realtionship Set: A relationship is an association among several entities. A relationship set is a set of relationship of the same type.

4. 

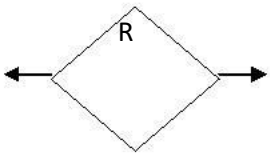
Identification relationship set for weak entity set: The relationship associating the weak entity set with the identifying entity set is called the identifying relationship.

5. 

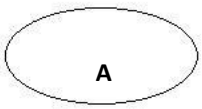
Primary key: The primary key is used to denote a candidate key that is chosen by the database designers as the principal means of identifying entities within an entity set.

6. 

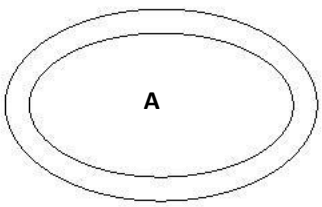
Many to Many relationship

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.

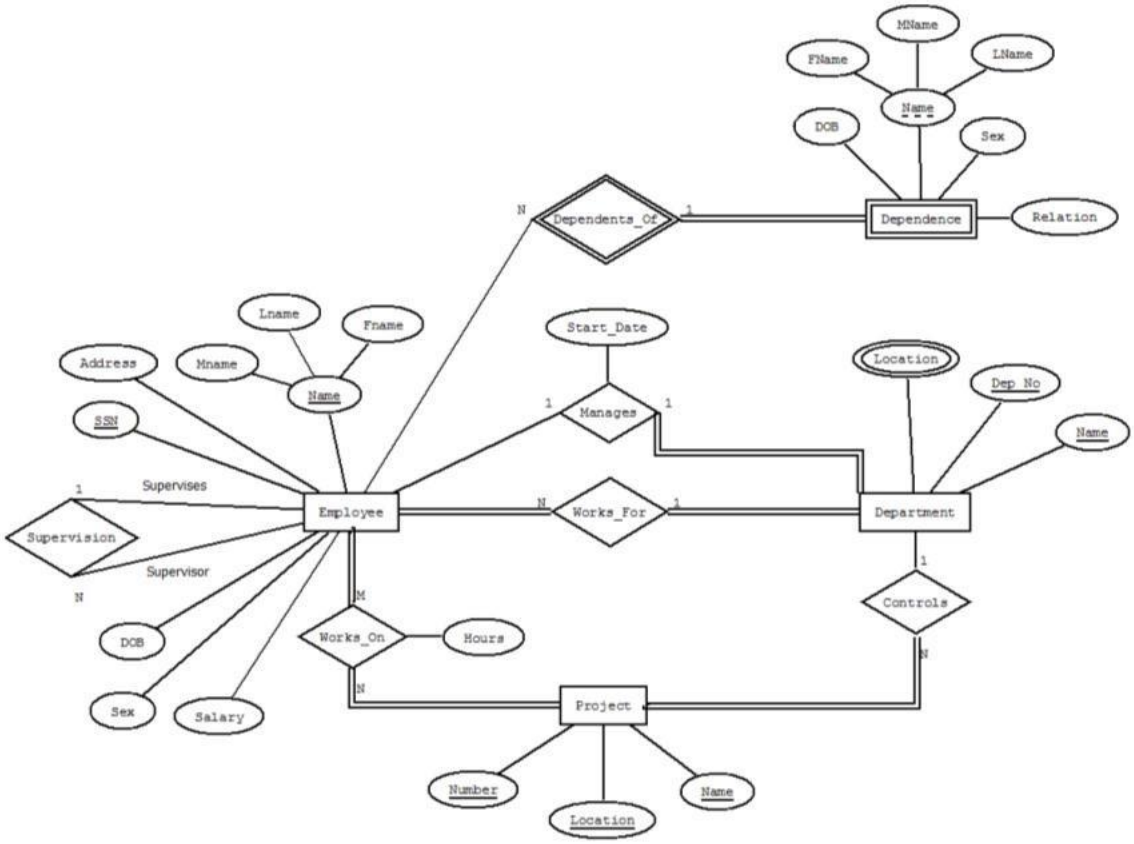
Example Case Study: List the data requirements for the database of the company which keeps track of the company employee, department and projects. The database designers provide the following description

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:



Enhanced entity-relationship (EER) diagrams are basically an expanded upon version of ER diagrams. EER models are helpful tools for designing databases with high-level models. With their enhanced features, you can plan databases more thoroughly by delving into the properties and constraints with more precision.

An EER diagram provides you with all the elements of an ER diagram while adding:

- Attribute or relationship inheritances
- Category or union types
- Specialization and generalization
- Subclasses and superclasses

Problem Definition:

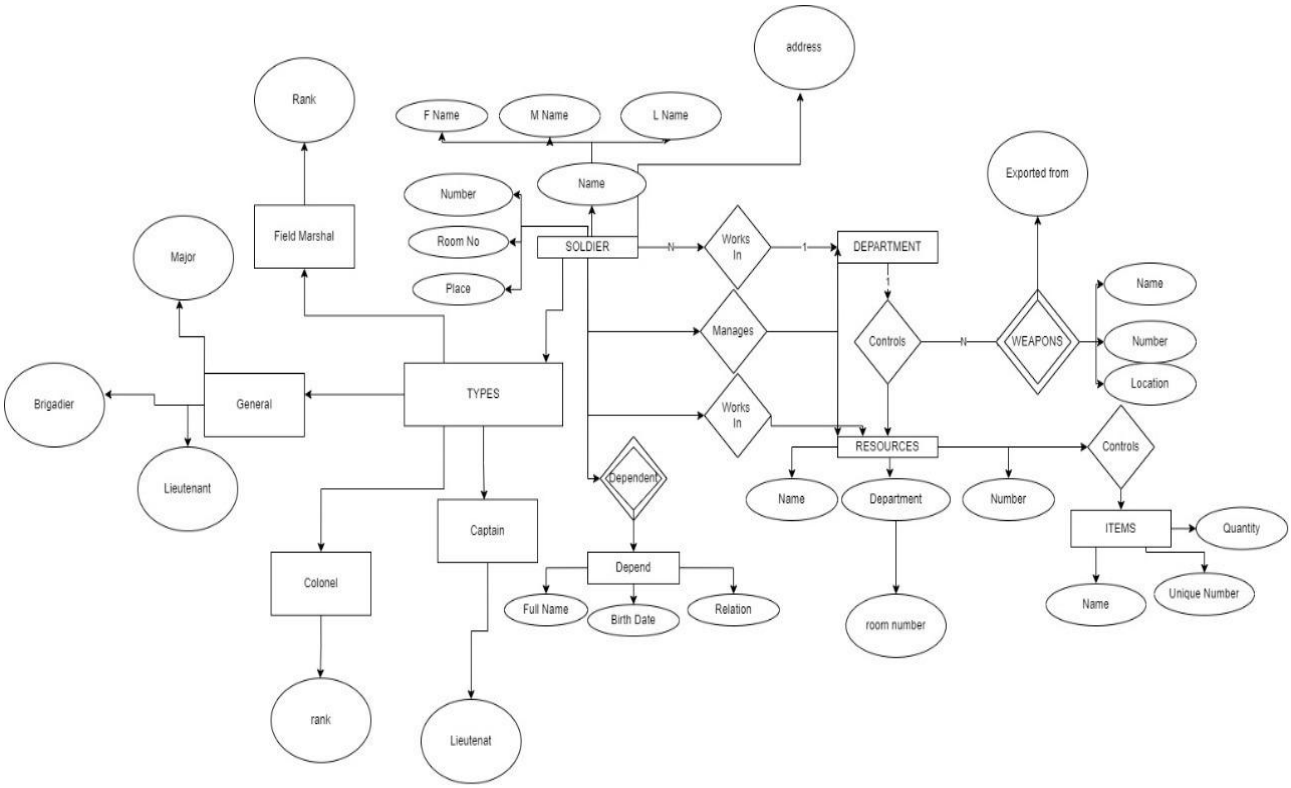
Considering a Defence Services database for the Army Services .
This database is modeled as the entity set for Service , Soldier , Resources and Department .
IN Army Service which attributes Name, Service-number, room-number, and Place
Resources has the name of the equipments and the products for the soldier .
Alternatively, one or more additional entity sets could be defined, along with relationship sets to replace some of the attributes of the Resources entity set, as

- Resources with attributes Name, department, and Items
- Items which attributes I-Number, Q-Number I-Name.

Each department has unique name and a particular Soldiers who manages the department.
Start date of the organization is recorded. Department have several locations.

- A department controls a number of Weapons . Weapons have a unique Name, Number and a location to Store In Them .
- Soldier name, ssno, address, salary, and birth date are recorded. An Soldier is assigned to department, but may work for Resources (not necessarily controlled by Single Entity).
- Soldier's DEPENDENT are tracked for health purposes (dependent name, birthdate, Relation).

Design of EER:

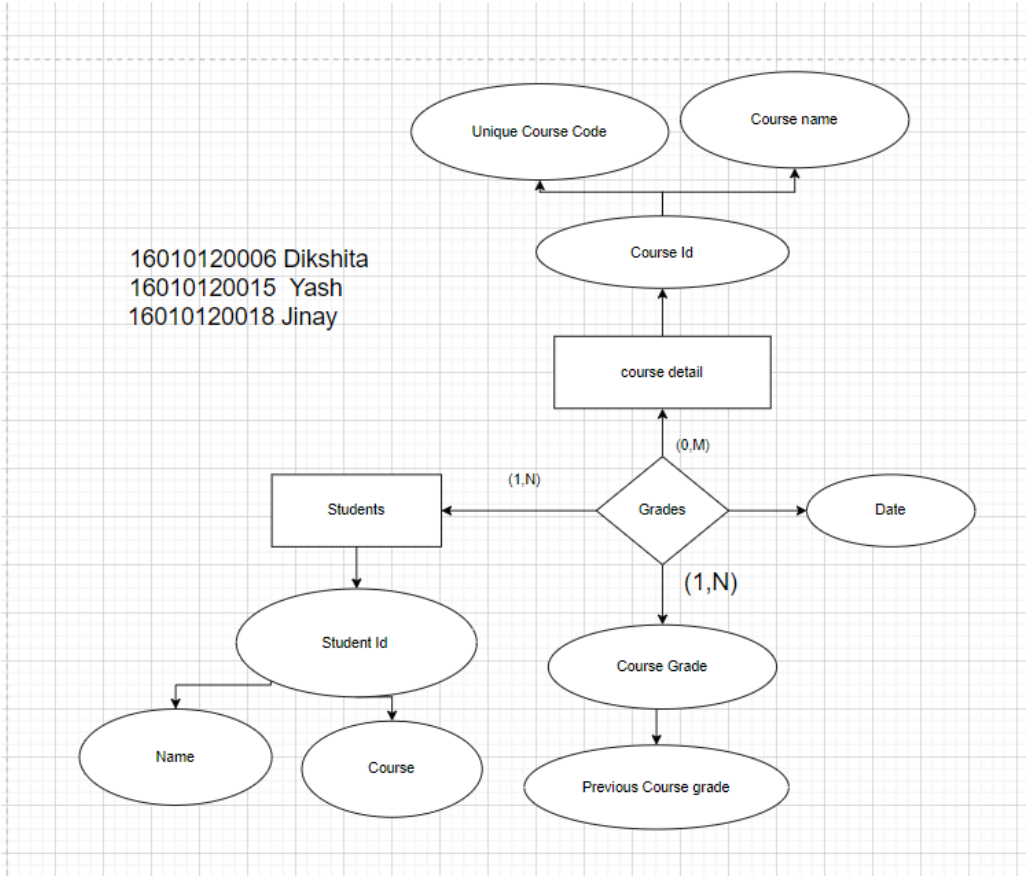


Post Lab Descriptive Questions

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:-

The database stores details about university students, courses, the student took a particular course , A student takes the courses that are part of his/her program. The administration will like to keep a record of the old/previous Grade as well as the new Grade in the course grade entity.

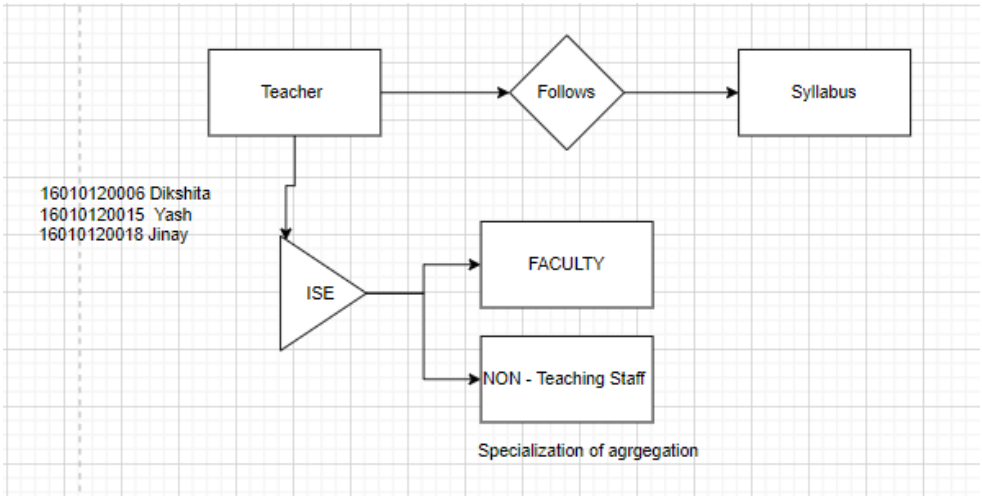


2. Discuss the concept of aggregation. Give an example. How to represent aggregation in ER model (if aggregation is not supported in EER diagram).

Ans :-

Aggregation is an abstraction concept for building composite objects from their

component objects i.e. relation between two entites are represented as a single one.
An example of aggregation is the 'Teacher' entity following the 'syllabus' entity act as a single entity in the relationship.



The case, which the EER model does not provide for explicitly, involves the possibility of combining objects that are related by a particular relationship instance into a higher-level aggregate object.