CHAPTER 2

Module II

Entity Relationship Data Model

Syllabus

Conceptual Modeling of a database, The Entity-Relationship (ER) Model, Entity Type, Entity Sets Attributes and Keys, Relationship Types, Relationship Sets, Weak entity Types, Generalization Specialization and Aggregation, Extended Entity-Relationship (EER) Model. Self-learning Topics: Design an ER model for any real time case study.

2.1 Conceptual Modeling of a Database

The database design and implementation process need a systematic approach to design the logical and physical structure of one or more databases to satisfy all information needs of the users in an organization for any given applications.

1. Gathering Requirements from users

Before designing any database application one must know about goals of system, expectations of end users and uses of database application in detailed manner.

2. Conceptual Modeling / Logical Modeling

A conceptual schema is a high-level description of user requirements. It generally includes the main concepts and relationship between them. A conceptual data model is a representation of the concepts and their relationships.

The second phase of database design involves two parallel activities,

a. Conceptual Data Model - Check all data requirements produced by previous phase.

b. Transaction Design - Design the characteristics of known database transactions.

3. Physical Database Design / Physical Modeling

Physical database design is the process of selecting data structure and access paths for database files to achieve good performance. Each DBMS offers many multiple options for file organization and access paths.

4. Database Implementation and Tuning

After the logical and physical designs are completed the final database schema is ready for final implementation.

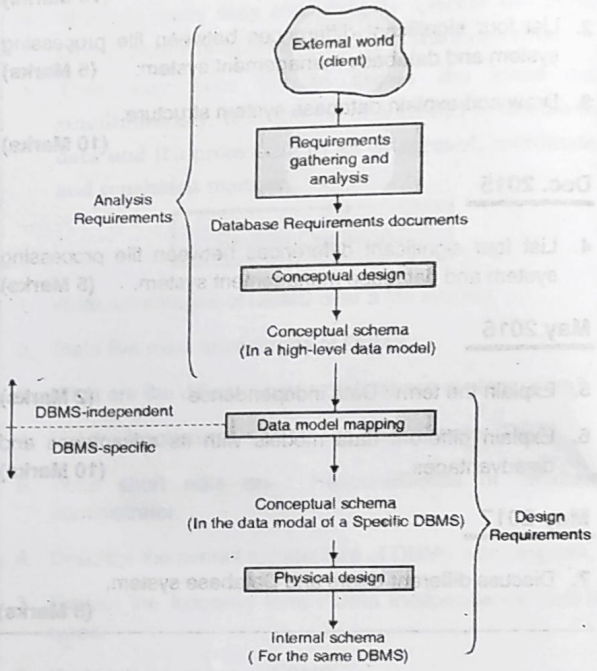


Fig. 2.1.1 : Database Design phases

2.2 Entity-Relationship (ER) Model

Q. Compare ER and EER models.

MU - Dec. 15, 5 Marks

- In 1976, Scientist Chas hen developed the **Entity-Relationship (ER) model** which is a high-level conceptual data model.
- ER diagram is the first step of database design to specify the desired components of the database system and the relationships among those components.
- ER model define data elements and relationships among various data elements for a specified system.

- The ER data model is based on perception of real world data that consists of set of entities (data items) and relationship among these entities.
- ER Diagrams having components,
  - Entity
  - Attributes
  - Relationships

2.3 Entity

Q. We can convert any entity set to a strong entity set by simply adding appropriates attributes. Why then, do we have weak entity sets ?
MU - May 15, 5 Marks

Q. Write short note on : Types of Entities
MU - May 18, May 19, 5 Marks

1. Introduction

- Entity is anything in real world which may have physical or logical existence.
- An **entity** is anything in real world with its physical existence. Example, Student, faculty, subject having independent physical existence.
- An entity may be an object with a physical existence or it may have logical existence. Example, Department, Section, subject may have logical existence.
- Each entity has its own properties which describes that entity such properties are known as **attributes.**

2. Entity Set

- Entity set is collection of entities of same type.
- Example, Student entity set contains all students in college database.

3. Entity Type

- Entity set is collection of entities with same attributes.
- As in Student table, each row is an entity and have same attributes. In other words we can say a student table is an entity type
- The types of entities are,
  a. Strong entity type
  b. Weak entity type

a. Strong entity type

Q. What is strong entity ? Explain with example.
MU - May 12, 5 Marks

Q. Define Strong entity set.
MU - May 14, 2 Marks

- Entity type which has its own key attributes by which we can identify specific entity uniquely is called as strong entity type.

Example

- In case of Employee entity any specific employee can be identified by his Employee_id which is primary key of employee entity.
- In case of student in class each student identified by unique roll number which is his primary key.
- Strong entity type is represented by single rectangle.

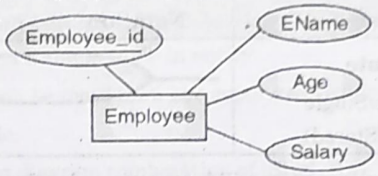


Fig. 2.3.1 : Employee entity

b. Weak entity type

Q. What is weak entity ? Explain with example.
MU - May 12, Dec.18, 5 Marks

Q. Define the term weak entity set.
MU - May 19, 5 Marks

- Entity type which cannot form distinct key from their attributes and takes help from corresponding strong entity is called as weak entity type.
- These types of entities are dependent on strong entity for primary key.
- For some weak entities we assign virtual primary key. Such virtual primary key of weak entity is called as '**discriminator**'.
- Weak entity type is represented by double rectangle.
- **Example :** In case of "Dependent" entity depend on employee entity for primary key.

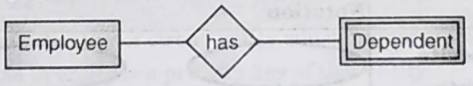


Fig. 2.3.2 : Weak entity "dependent"

2.4 Attributes

Q. Explain different types of attributes in ER Model
MU - May 17, May 18, 5 Marks

Q. What are different Keys in ER diagram?
MU - Dec.17, 5 Marks

Q. List and explain the Attributes, Keys, Relationship types. **MU - Dec.18, 5 Marks**

Q. Write short note on types of attributes. **MU - Dec. 19, 5 Marks**

Introduction

Each entity has its own properties which describes that entity such properties are known as attributes.

- The attribute value that describes each entity becomes a major part of data stored in database.
- Employee entity may be described by attributes name, age, phone etc.

Type	Notation
Attribute (Simple/Single valued/Stored)	

- A particular entity will have some value for each of its attributes.

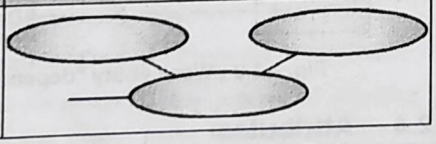
Example

- For an employee of with Employee_id 30, the name attribute value is 'Jayendra'
- The various types of attribute are used in ER diagrams,
  - Composite Attributes
  - Multivalued Attributes
  - Derived Attributes
  - Null Attributes
  - Key Attributes

a. Composite Attributes

Q. Write a note on composite attributes.

- The attributes which can be divided in multiple subparts.

Type	Notation
Composite attribute	

- The divisible attributes are composite attributes.
- **Example:** The Name attribute of Student table can be divided into First_Name and Last_Name.

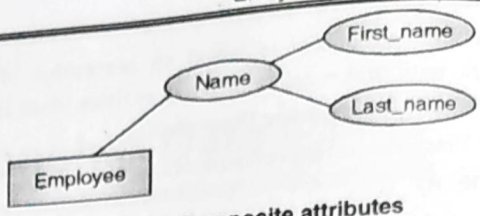


Fig. 2.4.1 Composite attributes

b. Multivalued attributes

Q. Write a note on multivalued attributes.

- The attribute having more then one value for a same entity is called as multi-valued attribute.

Type	Notation
Multivalued Attribute	

- Example, A Single student can have multiple mobile numbers.

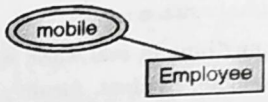
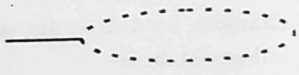


Fig. 2.4.2 Multi valued attributes

c. Derived Attributes

Q. Define Derived attribute. **MU - Dec. 14. 2 Marks**

- The value of some attribute can be derived from the value of related stored attribute such attributes are known as derived attributes.

Type	Notation
Derived attribute	

- Example, Employee tenure can be calculated from stored attribute 'Date_of_joining' of employee by subtracting it from today's date.

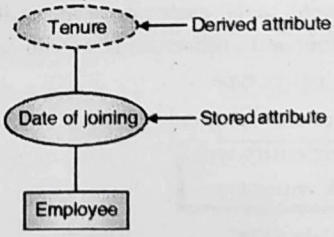


Fig. 2.4.3 : Derived attributes

d. Null attribute

Q. Write a note on Null attributes

- This attribute can take NULL value when entity does not have value for it.
- This is a special attribute the value of which is unknown, unassigned, not applicable or missing.
- Example, The 'Net_Banking_Active_Bin' attribute gives weather particular customer having net bankig facility activated or not activated.
- For bank which does not offer facility of net banking in customer table 'Net_Banking_Active_Bin' attribute is always null till Net banking facility is not activated as this attribute indicates Bank offers net banking facility or does not offers.
- These attribute can be used in future use or for unknown, unsigned, missing values of attribute.

e. Key attributes

Q. Write a note on Key attributes. Explain various type of keys in ER Diagram

- This is an attribute of an entity which must have a unique value by which any row can be identified is called as key attribute of entity.
- **Example :** Emp_Id for employee.

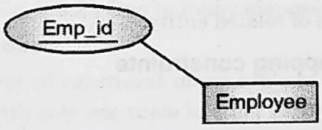


Fig. 2.4.4 : Key attributes

Type	Notation
Key attribute	

- The column value that uniquely identifies a single record in a table called as key of table.
- An attribute or set of attributes whose values uniquely identify each entity in an entity set is called a key for that entity set.
- ID is a key of student table. It is possible to have only one student with a one ID (Say only one student **'Mahesh'** with ID = 1)

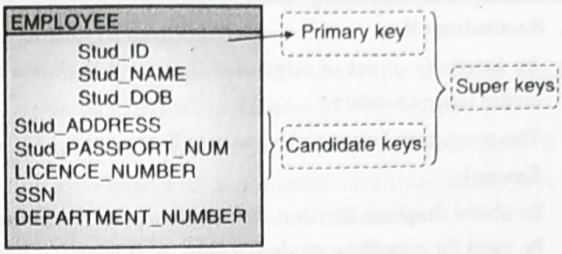


Fig. 2.4.5

- **Types of Keys** – The various types of keys in ER Diagrams are as follows,

1. Super Key

- An attribute or set of attributes that uniquely identifies a single tuple in entity.
- There can be more than one super keys in single table
- Example,
- In above diagram combination of (Stud_ID, Stud_name, Stud_Passport_Num, Licence_Number,ssn) acts like a super key.

2. Composite Key

- Any key with more than one attributes that uniquely identifies a single tuple in entity.
- Example,
- In above diagram a super key has more than one attribute so, it is a composite key.

3. Candidate Key

- A super key with minimum number of attributes is a candidate's key.
- No subset of candidate key van be key.
- Example,
- In above diagram combination of (Stud_Passport_Num, Licence_Number,ssn) acts like a Candidates key.

4. Primary Key

- A selected key of strong entity which uniquely identify tuple in entity is a primary key of that entity.
- Example,
- In above diagram combination of (Stud_ID) acts like a Primary key.

5. Alternate Key

- A Candidate key which is not selected as primary key.
- Example,
- In above diagram candidate key (Stud_Passport_Num, Licence_Number, ssn) acts like alternate key

6. Secondary Key

- An attribute or set of attributes that used to access a single tuple in entity.
- The secondary key not necessary to be unique
- Example,
- In above diagram attribute (Stud_Passport_Num) can be used for accessing student's data, so it is acting like secondary key

Key Type	Definition
Super Key	An attribute or set of attributes that uniquely identifies a single tuple in entity.
Composite Key	Any key with more than one attributes that uniquely identifies a single tuple in entity.
Candidate Key	A super key with minimum number of attributes is a candidate's key. No subset of candidate key van be key.
Primary key	A selected key of strong entity which uniquely identify tuple in entity is a primary key of that entity.
Alternate Key	A Candidate key which is not selected as primary key
Secondary Key	An attribute or set of attributes that used to access a single tuple in entity.

2.5 Relationship Set

Q. With reference to figure-1 list and explain the Attributes, Keys, Relationship types.
MU - Dec.18, 5 Marks

Q. What is relationship set ? Give various constraints of relationship.

1. Introduction

- A relationship is an association among one or more than one entities.
- We use diamond shape to show relationship.

Type	Notation
Relationship	

- It is recommended to arrange relationship to be read it from left to right or up to down.
- **Example :** Employee works for Department.

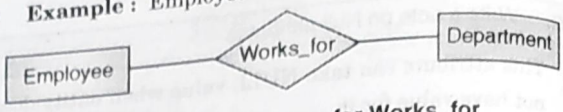


Fig. 2.5.1 : ER Diagram for Works_for

2. Relationship Set

Collection of all relationship of same type is relationship set. The many employees are working for different departments so it is relationship set of Works_For relationship.

3. Degree of Relationship

The degree of relationship type is number of participating entity types in a particular relation.

Types of Relationship based on degree are,

- Unary Relationship
- Binary Relationship
- Ternary Relationship

2.6 Relationship Types based on Constraints

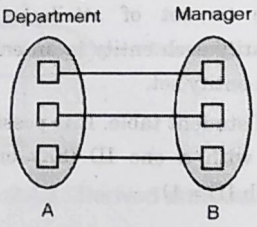
A. Mapping Constraints / Cardinalities

- Number of entities from each side participating in a relationship set.
- Cardinality expresses specific number of entity occurrence of related entity.

Types of mapping constraints

1. One is to one

- In this type of constraint one tuple in entity is related with only one tuple in other entity.
- That is one row in table is related with only one row in other table.
- A associated with at most one entity in B, B associated with at most one entity in A.
- **Example :** one department can have only one manager.
- Every row in Department table can be having relationship with only one row in Managers table.



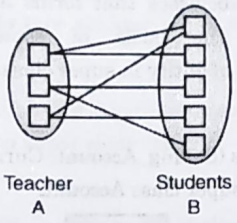
a. One to one mapping

(b) Representation in ER diagram

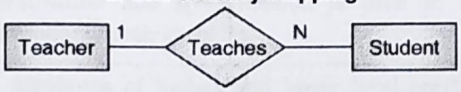
Fig. 2.6.1 : One to one mapping

2. One to many

- In this type of constraint one tuple in entity can be related with many tuples in other entity.
- A associated with any number of entities in B.
- B associated with at most one entity in A.
- **Example :** One teacher may teach to many students.
- Every row in Teacher table can have relationship with many rows in Student table.



a. One to many mapping

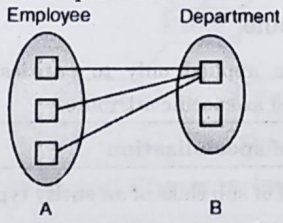


(b) Representation in ER diagram

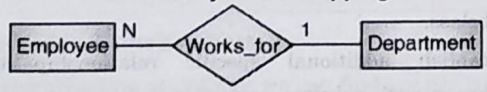
Fig. 2.6.2 : One to many mapping

3. Many to one

- In this type of constraint many tuple in entity can be related with only one tuple in other entity.
- A associated with at most one entity in B.
- B associated with any number of entities entity in A.
- **Example :** Number of employee works for department.
- Multiple rows in Employees table can be related with only one row in Department table.



a. Many to one mapping

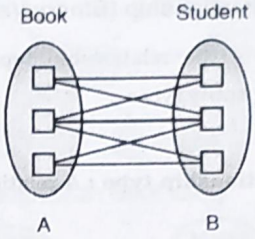


(b) Representation in ER diagram

Fig. 2.6.3

4. Many to many

- In this type of constraint many tuple in entity can be related with multiple tuples in other entity.
- A associated with any number of entities in entity B.
- B associated with any number of entities entity in A.



a. Many to many mapping

(b) Representation in ER diagram

Fig. 2.6.4

- **Example :** Books in library issued by students.
- Multiple rows in Book table can be related with many rows in Student table.

B. Participation constraints

Q. Explain the terms total participation and Partial participation with example. **MU - May 15, 5 Marks**

Q. Explain the term : Total participation. **MU - May 16, 2 Marks**

Q. Explain Total participation and Partial participation. **MU - Dec. 16, May 19, 5 Marks**

1. Total participation

- In case of total participation every object in an entity must participate in a relationship.
- The total participation is indicated by a dark line or double line between entity and relationship.
- **Example :** Every department must have a manager.

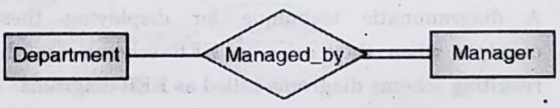


Fig. 2.6.5 : Total participation

2. Partial participation

- In case of partial participation more than one object in an entity may participate in a relationship.
- The total participation is indicated by a single line between entity and relationship.

- **Example:** Employees works for department.

Fig. 2.6.6 : Partial participation

C. Degree of Relationship (Binary Vs ternary)

a. The degree of the relationship type is number of participating entity types.

b. Types

- **Binary relationship type :** A relationship of degree two.

  Example, Employees works for department.

Fig. 2.6.7 : Binary Relationship

- **Ternary relationship type :** A relationship of degree three.

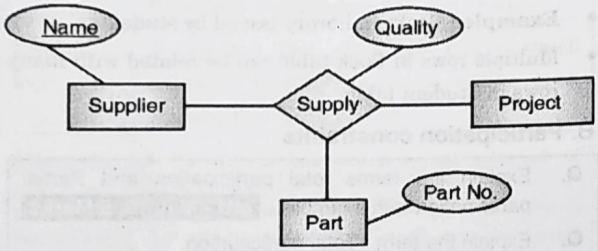


Fig. 2.6.8 : Ternary relationship

2.7 Extended Entity-Relationship (ER) Model

Q. Compare ER and EER models. **MU - Dec. 15, 5 Marks**

- EER model includes all the modeling concept of ER model. In addition it also includes the concept of aggregation, specialization and generalization.
- A diagrammatic technique for displaying these concepts when they arise in EER schema are the resulting schema diagrams called as EER diagrams.
- **EER Features**
  - Specialization
  - Generalization
  - Attribute Inheritance (Subclass and Superclass)
  - Aggregation

2.7.1 Specialization

Q. Explain Specialization. **MU - Dec. 13, Dec. 14, May 16, Dec. 16, 5 Marks**

Q. Explain Specialization with the help of an example. **MU - May 14, 5 Marks**

Q. Write a short note on : Specialization **MU - Dec. 17, Dec.19, 5 Marks**

- Top down approach of superclass / subclass relationship.
- Specialization is a process of defining a set of subclass of entity type, this entity type is called super **class of specialization.**
- The set of subclasses that forms a specialization is defined on the basis of some distinguishing characteristic of entity in super class.

Example

Set of subclass (Saving_Account, Current_Account) are Specialization of super class Account.

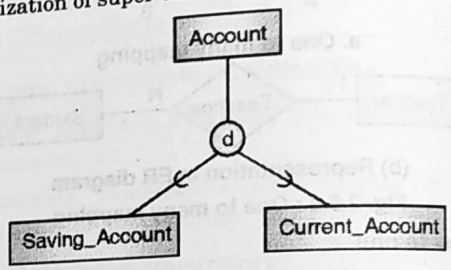


Fig. 2.7.1 : Specialization

Notation

- The subclass defined in a specialization is attached by lines to a circle which is connected to super class.
- The subset symbol on each line connecting a subclass to circle indicates the direction of super class / subclass relationship.

Specific attribute

An attribute applied only to entities of particular subclass is called as specific attribute.

Summary of specialization

1. Defines a set of sub class of an entity type.
2. Establish additional specific attributes with each subclass.
3. Establish additional specific relationship types between each subclass and other entity type or other subclass.

Generalization

Q. Write short note on : Generalization.
MU - May 12, Dec.17, Dec.19, 5 Marks

Q. Explain Generalization with the help of an example.
MU - May 14, 5 Marks

Q. Explain Generalization.
MU - Dec. 13, Dec. 14, May 16, Dec. 16, 2 Marks

This is reverse process of specialization or this is bottom up approach of Superclass /subclass relationship.

Definition

Generalization is a process in which we differentiate among several entity types identifying there common features and generalizing them to a single super class of which original entity type are special subclass.

Example

Car and Bike all having several common attribute they can generalize to the super class vehicle.

Notation

- A diagrammatic notation to distinguish between generalization and specialization is used in some programming methodologies.
- Arrow pointing to generalized superclass represents generalization.
- Arrow pointing to generalized subclass represents specialization.

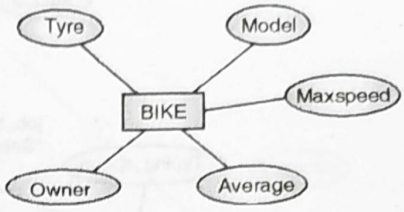


Fig. 2.7.2 : BIKE entity

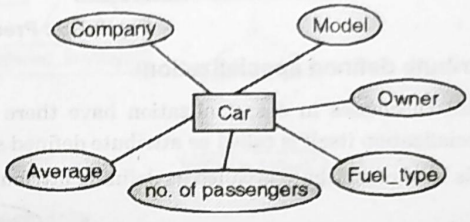


Fig. 2.7.3 : Car entity

Attribute inheritance

- The attributes of higher and lower level entities created by specialization and generalizations are attributes inheritance.
- Abstraction through which relationship (aggregation) is treated as higher level entities.

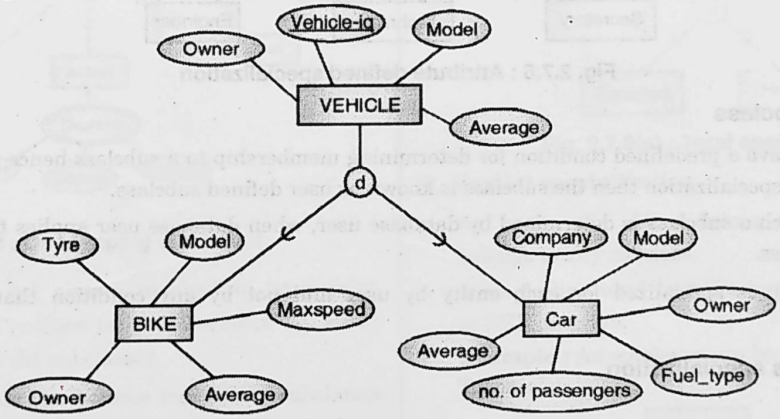


Fig. 2.7.4 : Generalized VEHICLE entity

2.7.2 Constraints and Characteristics of Specialization and Generalization

Q. Define Specialization and Generalization
MU - May 19, Dec.19, 5 Marks

1. Predicate defined subclass

- In specialization sometimes we can find exactly which entities will become member of specific subclass by placing a condition (or a predicate) on the value of some attributes of superclass, such subclasses are called as predicate subclasses.

- **Example :** employee has attribute job_type. We can put condition job_type = 'typist'

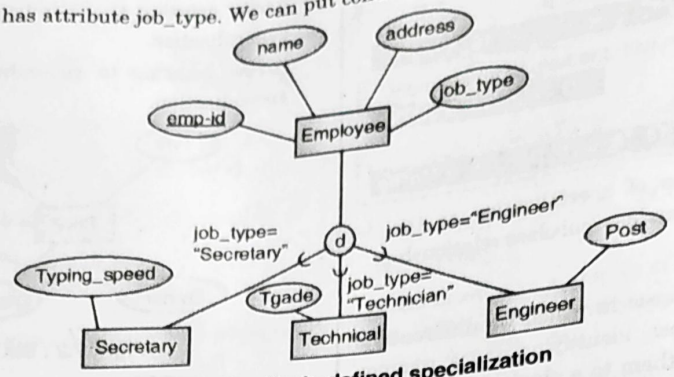


Fig. 2.7.5 : Predicate defined specialization

2. Attribute defined specialization

- If all subclasses in a specialization have there membership condition on some attribute of superclass then the specialization itself is called as attribute defined specialization.
- This kind of attribute is called as defining attribute of specialization.

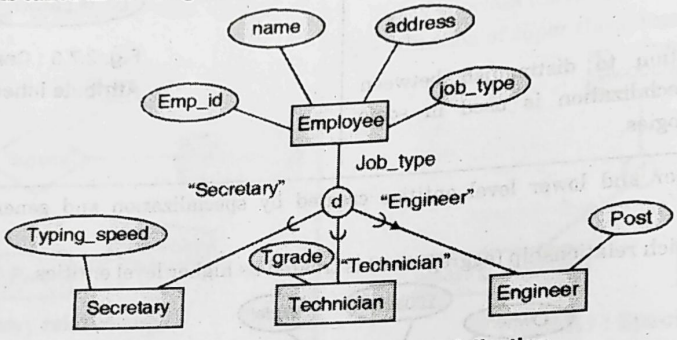


Fig. 2.7.6 : Attribute defined specialization

3. User defined subclass

- When we do not have a predefined condition for determining membership to a subclass hence user needs to specify condition for such specialization then the subclass is known as user defined subclass.
- Membership in such a subclass is determined by database user, when database user applies the operations to add an entity to subclass.
- Hence membership is specialized for each entity by user and not by any condition that may be evaluated automatically.

4. Other constraints specialization

a. Disjointness

1. Disjointness constraints

- Disjointness constraints specify that the subclasses of specialization must be disjoint that means entity can be a member of the most one subclass of specialization.
- **For Example :** New employee can become member of only one subclass like Assistant, Technician or Engineer only.
- Attribute defined Specialization determines the disjointness constraints.
- If attribute is used to define the membership then predicate should be single valued.
- **Example :** In employee entity Job_Type predicate that must be single valued.

- Disjoint subclass indicated by encircled **d** as shown in Fig. 2.7.7

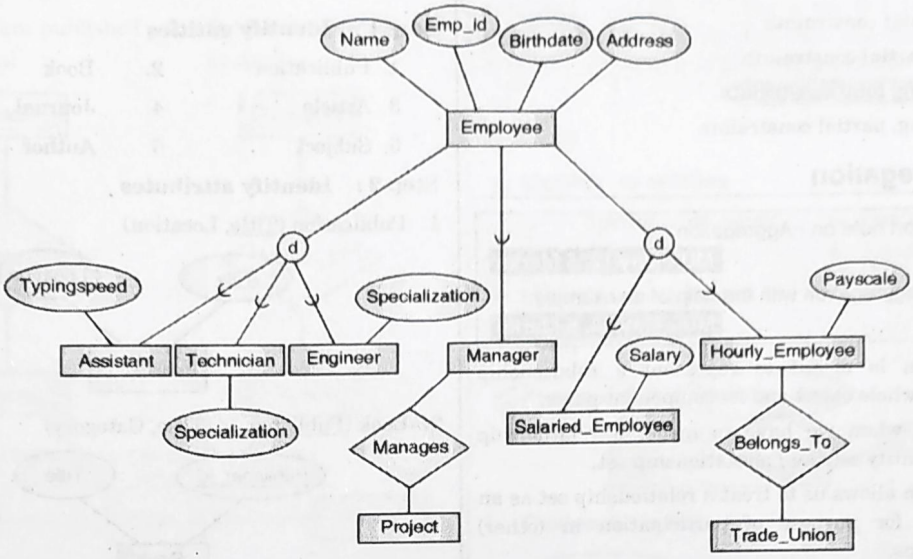


Fig. 2.7.7 : Disjoint constraints

2. Overlapping constraints

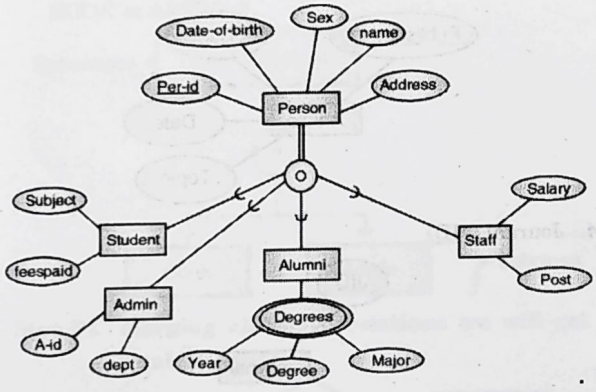


Fig. 2.7.8 : Overlapping constraint

- The subclass is not always required to be disjoint, then such set of entities can be overlaped i.e. entity may part of more the subclasses.
- **Example :** Person can become member of subclasses like student, Admin or Staff. It is possible to have person belongs to more than one subclasses.
- Disjoint subclass is indicated by encircled 'O'.

b. Completeness constraints

1. Total specialization

- A total specialization constraints specifies that entity in super class may be member of at least one of the subclass in the specialization.
- A double line is used to represent total specialization in EER diagram.
- **Example :** An employee must belong to salaried employees or hourly employee.

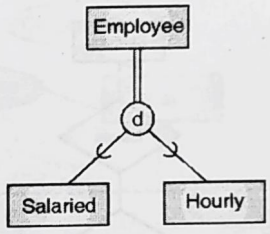


Fig. 2.7.9(a) : Total specialization

2. Partial specialization

- An entity can either belong to a subclass or not belongs to any subclass.
- A single line used to represent partial specialization in EER diagram.
- **Example :** An employee can be Engineer, Secretary or Technician.

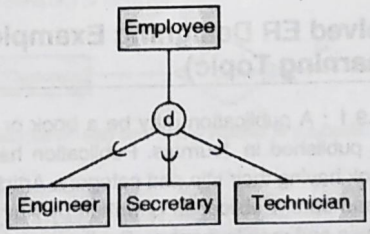


Fig. 2.7.9(b) : Partial specialization

3. **Possible constraints**

- Disjoint, total constraints
- Disjoint, partial constraints
- Overlapping, total constraints
- Overlapping, partial constraints

2.8 Aggregation

Q. Write short note on : Aggregation.
MU - May 12, 5 Marks

Q. Explain aggregation with the help of an example.
MU - May 14, 5 Marks

- Aggregation is meant to represent a relationship between a whole object and its component parts.
- It is used when we have to model a relationship involving entity sets and a relationship set.
- Aggregation allows us to treat a relationship set as an entity set for purpose of participation in (other) relationships.
- **Example :** A Project is sponsored by a department. This is a simple relationship.
- An Employee monitors this sponsorship (and not project or department). This is aggregation. Monitors are mapped to the table like any other relationship set.

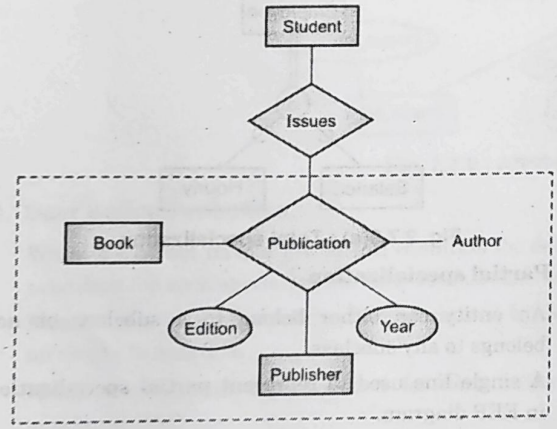


Fig. 2.8.1 : Aggregation

2.9 Solved ER Designing Examples (Self Learning Topic)

Example 2.9.1 : A publication may be a book or an article. Articles are published in Journals. Publication has title and location. Book having their title and category. Article includes title, Topic and date. Publication is written by Authors stores Name, address and mobile number. Publication also belongs to particular subject which has their names.

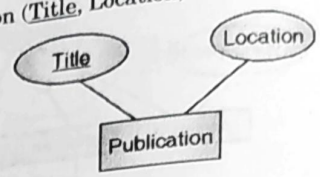
Solution :

Step 1 : Identify entities

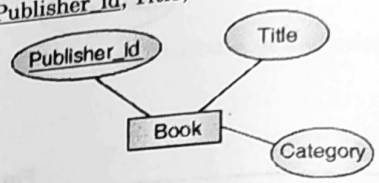
1. Publication
2. Book
3. Article
4. Journal
5. Subject
6. Author

Step 2 : Identify attributes

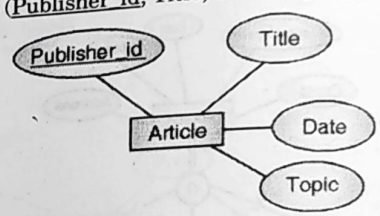
1. Publication (Title, Location)



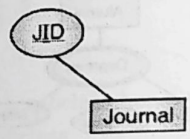
2. Book (Publisher_id, Title, Category)



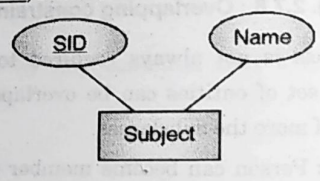
3. Article (Publisher_id, Title, Date, Topic)



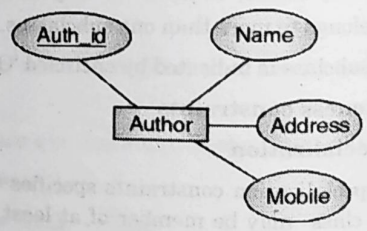
4. Journal (JID)



5. Subject (SID, Name)

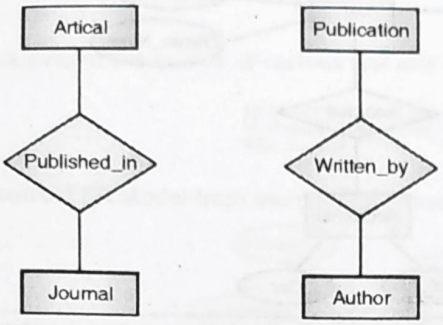


6. Author (Auth_id, Name, Address, Mobile)



Step 3 : Identify relationships

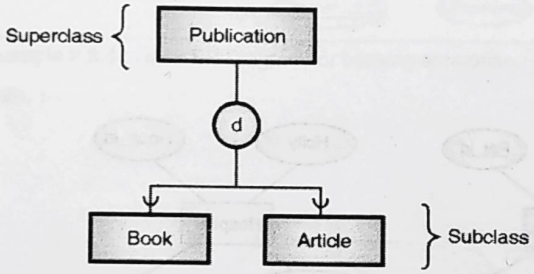
1. Articles are published in Journal.
2. Publication is written by Author.



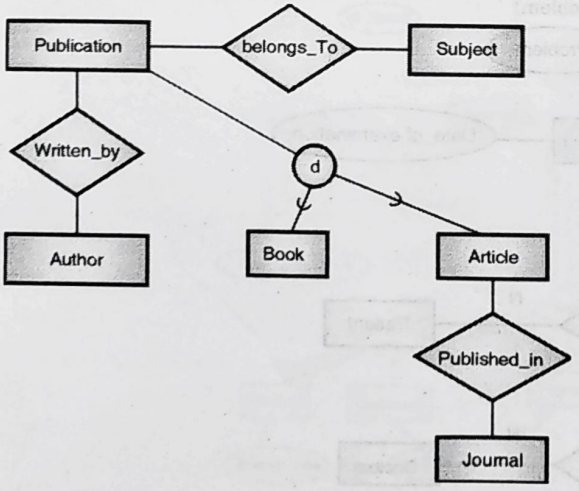
3. Publication belongs to a particular subject.

Step 4 : Identify inheritance relations

Publication can be BOOK or ARTICLE.



Step 5 : Merging all above relations we will get final ER model



Example 2.9.2 : Construct on E-R diagram for a car-insurance company that has a set of customers each of whom owns one or more cars. Each car has associated with it zero to any number of recorded accidents.

MU - May 14, May 15, 10 Marks

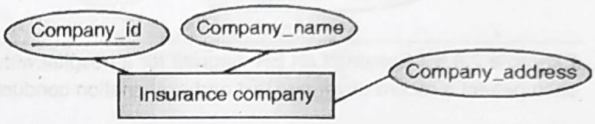
Solution :

1. Identify all entities

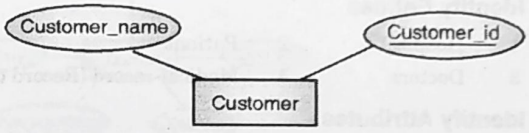
a. Insurance company b. Customer
c. Car d. Accidents

2. Identify all attributes

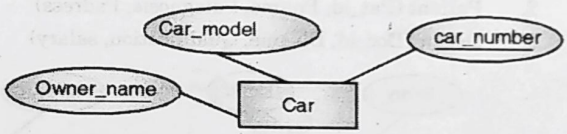
a. Company entity



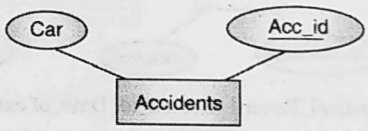
b. Customer entity



c. Car entity

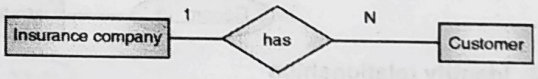


d. Accidents



3. Identify all relationship

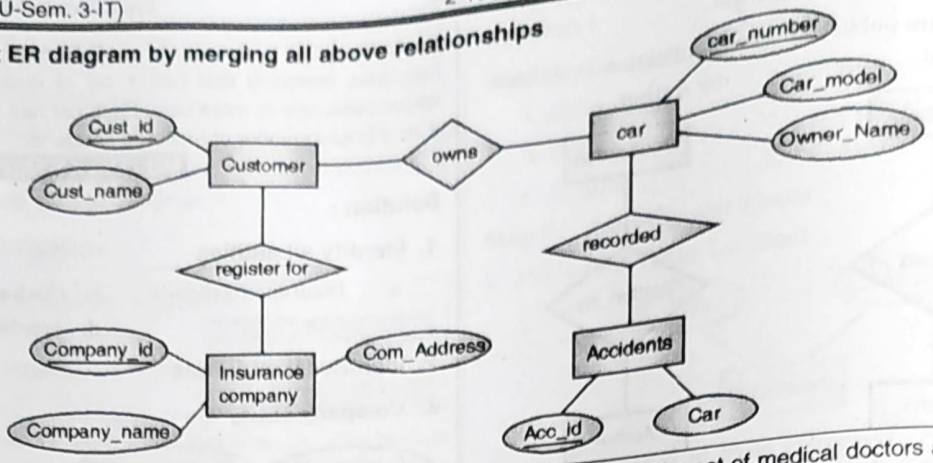
a) Car insurance company has a set of customers



b) Customer owns one or more car

c) Each car associated with zero or any number of accidents

4. Construct ER diagram by merging all above relationships



Example 2.9.3 : Construct an ER diagram for a hospital with a set of patients and the set of medical doctors associated with each patient a record of various text and examination conducted.

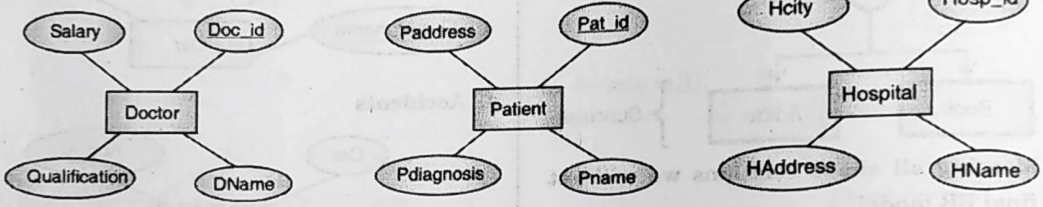
Solution :

1. Identify Entities

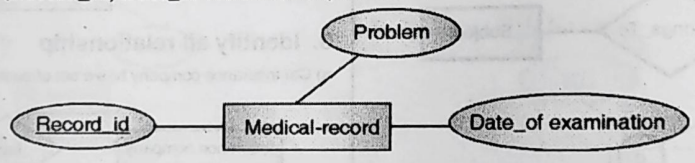
1. Hospital
2. Patient
3. Doctors
4. Medical-record (Record of various test and examination conducted)

2. Identify Attributes

1. Hospital (Hosp_id, HName, HAddress, Hcity)
2. Patient (Pat_id, Pname, Pdiagnosis, Padress)
3. Doctor (Doc_id, DName, Qualification, salary)

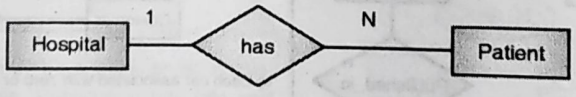


4. Medical_Record (Record_id, Date_of examination, Problem)

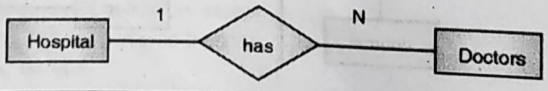


3. Identify relationships

a. Hospital has a set of patients

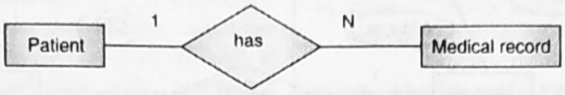


b. Hospital has a set of doctors

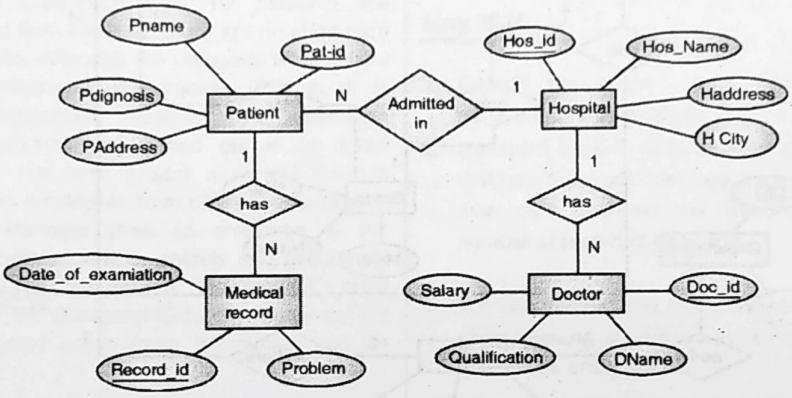


c. Doctors are associated with each patient

d. Each patient has record of various test and examination conducted

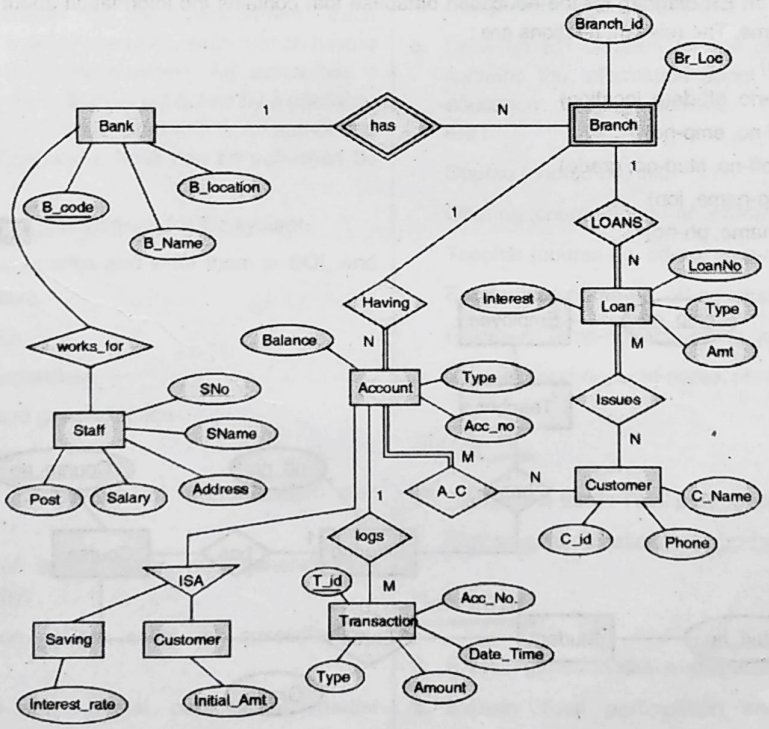


4. Construct ER Model from merging all above relationship



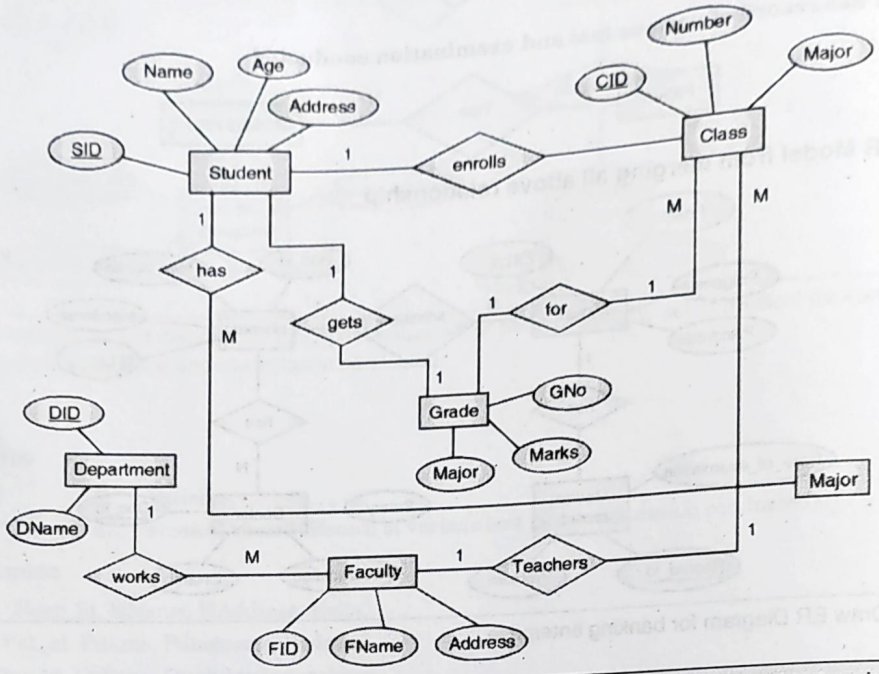
Example 2.9.4 : Draw ER Diagram for banking enterprise.

Soln. :



Example 2.9.5: Draw ER Diagram for University database consisting four Entities Student, Department, Class and Faculty. Student has a unique id, the student can enroll for multiple classes and has a most one major. Faculty must belong to department and faculty can teach multiple classes. Each class is taught by only faculty. Every student will get grade for the class he/she has enrolled. **MU – Dec. 13, Dec. 14, Dec. 16, 10 Marks**

Solution :



Example 2.9.6 : Draw an ER diagram for the education database that contains the information about an in house company education training scheme. The relevant relations are :

Course (course-no, title)

Offering (course-no, off-no, off-date, location)

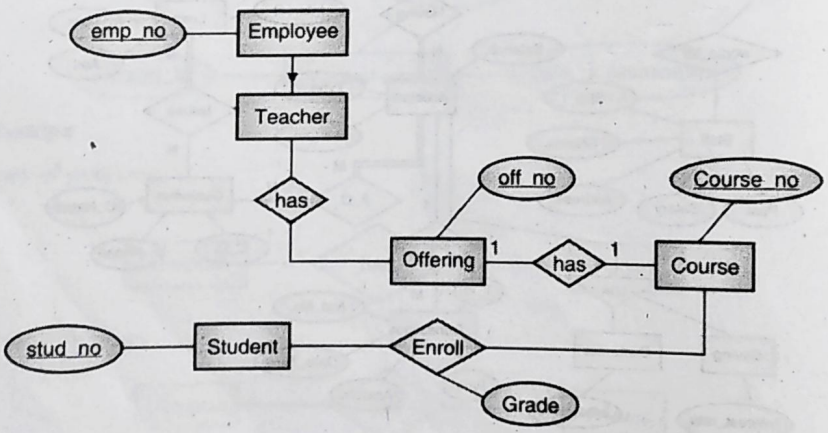
Teacher (course-no, off-no, emp-no)

Enrolment (course-no, off-no, stud-no, grade)

Employee (emp-no, emp-name, job)

Student (stud-no, stud-name, ph-no) **MU – Dec. 15,10 Marks**

Solution. :



Review Questions

1. Explain ER Diagrams and its components.
2. Explain the term aggregation.
3. A database is to be designed for a medium sized company dealing with industrial application of computers. The company delivers various products to its customers ranging from a single application program through to complete installation of hardware with customized software. The company employs various expert, consultants and supporting staff. All personal are employed on long term basic i.e. there are no short-term or temporary staffs. Although the company is somehow structured for administrative purposes (that is, it is divided into department headed by Department Managers) all projects are carried out in an inter-disciplinary way. For each project a project team is selected, grouping employees from different department, and a Project Manager (also an employee of the Company) is appointed who is entirely and exclusively responsible for the control of the project, quite independently of the Company hierarchy. Draw an ER Diagram. If required some more information can be assumed.
4. You have to design and implement a database that manages information about publishers, authors, and books. Some information includes : A publisher has a name and an address for the headquarters. Each publisher also has a set of branches, each branch having an address and two phone numbers. An author has a name and an address. A book is published by a publisher and has a list of authors associated with it. An author can publish several books and a book can be published by only one publisher.
   a. Draw an extended E-R diagram for the system.
   b. Take two typical queries and write them in SQL and relational algebra.
5. Write a short note on :
   1. Subclass and superclass
   2. Specialization and generalization
   3. Type Inheritance
6. Describe various constraints of specialization and generalization.
7. Explain concept of specialization and generalization lattices and hierarchy.
8. Write short note on : Weak entity set, specialization, generalization.
9. Write short note on : Total participation, partial participation.
10. Define degree.
11. Draw an E-R diagram which models an online bookstore. List entity sets and primary keys.
12. Write short note on : Extended e-r features.
13. Write short note on : Generalization and aggregation.
14. What is strong entity and weak entity ? Explain with example.

2.10 University Questions and Answers

May 2015

1. Explain the terms total participation and Partial participation with example **(5 Marks)**
2. Construct on E-R diagram for a car-insurance company that has a set of customers each of whom owns one or more cars. Each car has associated with it zero to any number of recorded accidents. **(10 Marks)**
3. We can convert any entity set to a strong entity set by simply adding appropriates attributes. Why then, do we have weak entity sets ? **(12 Marks)**

Dec. 2015

4. Compare ER and EER models. **(5 Marks)**
5. Draw an ER diagram for the education database that contains the information about an in house company education training scheme. The relevant relations are :

   Course (course-no, title)

   Offering (course-no, off-no, off-date, location)

   Teacher (course-no, off-no, emp-no)

   Enrolment (course-no, off-no, stud-no, grade)

   Employee (emp-no, emp-name, job)

   Student (stud-no, stud-name, ph-no) **(10 Marks)**

May 2016

6. Explain the term : Total participation. **(2 Marks)**
7. Explain generalization and specialization.

Dec. 2016

8. Explain generalization and specialization.
9. Explain Total participation and Partial participation. **(5 Marks)**

10. Draw E-R diagram for university database consisting of four entities: student, department, class, faculty, Student has a unique id, the student can enroll for multiple classes and has at most one major. Faculty must belong to department and faculty can teach multiple classes. Each class is taught by only one faculty. Every student will get grade for the class he/she has enrolled. **(10 Marks)**

May 2017

11. Explain different types of attributes in ER Model **(5 Marks)**

Dec. 2017

12. What are different Keys in ER diagram? **(5 Marks)**
13. Write a short note on : Specialization and Generalization. **(5 Marks)**

May 2018

14. Explain different types of attributes with examples? **(5 Marks)**
15. Write short note on : Types of Entities **(5 Marks)**

Dec. 2018

16. Explain Weak Entity with example. **(5 Marks)**
17. With reference to figure-1 list and explain the Attributes, Keys, Relationship types. **(5 Marks)**

May 2019

18. Define Specialization and Generalization.
19. Define the term
    1. weak entity set,
    2. total participation,
    3. partial participation,
    4. entity type

    (10 Marks)

Dec. 2019

20. Define Specialization and Generalization. **(5 Marks)**
21. Write short note on types of attribute. **(5 Marks)**

❑❑❑