

Course code : **CSE2007**
Course title : **Database Management System**
Module : **2**
Topic : **1**

ER Model

Objectives

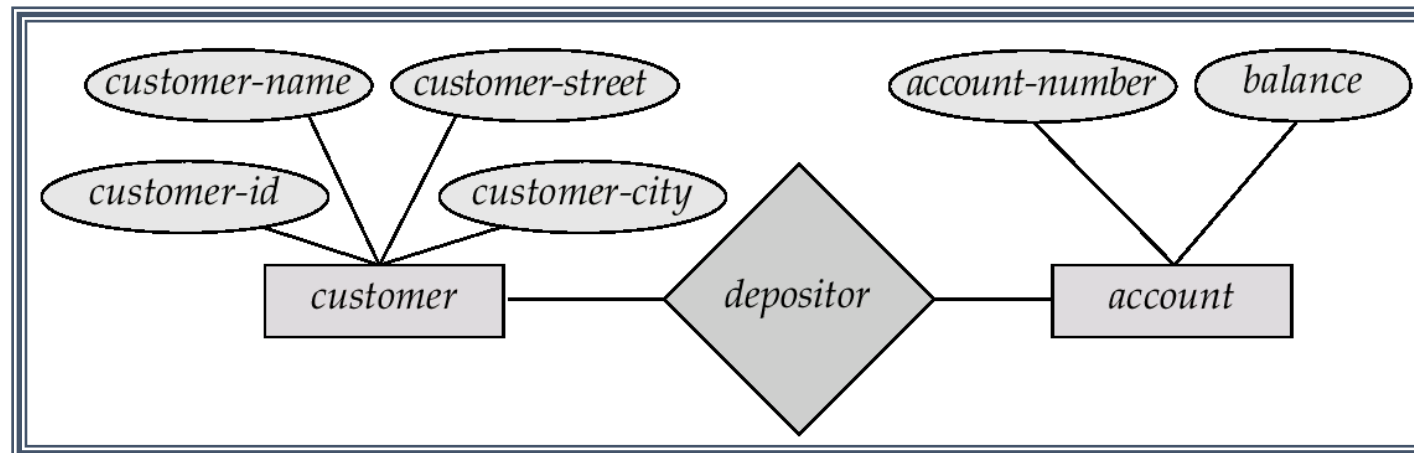
This session will give the knowledge about

- ER Diagram

Entity Relationship model

The entity relationship model consists of a collection of basic objects, called entities and its relationship with other entities.

- **Entity**: an entity is a 'thing' or 'object' in the real world
- **Relationship**: a relationship is an association among several entities.



Entity & Entity set

The ER Model employs on three basic notations:

- Entity sets,
- Relationship sets and
- Attributes

Entity: an entity is a ‘thing’ or ‘object’ in the real world

Entity Set: a set of entity of the same type that share the same property or attributes.

Customer_id	Customer_name	City
C101	Hari	Bombay
C102	Ram	Pune
C104	John	Nashik
C303	Jim	Solapur

Customer

Account_no	Balance
A121	1000
A305	2000
A417	500

Attributes

An entity is represented by collection of attributes. Attributes are descriptive properties possessed by each member of an entity set.

Types of Attributes

- Simple
- Composite
- Single-valued
- Multi-valued

Attributes Types

Simple Attribute: a simple attribute is an attribute composed of a single component with an independent existence.

Example: Salary, Roll_no

Composite Attribute: an attribute composed of a multiple components each with an independent existence.

Example: Name – first name, last name, middle name
 Address – door_no, street, city

Attributes Types

Single valued Attribute (Atomic attribute): a single valued attribute is one that holds a single value for a single entity.

Example: Room_no, Customer_id

Multi valued Attribute: a multi valued attribute is one that holds a multiple value for a single entity.

Example: Hobby – reading, playing, painting

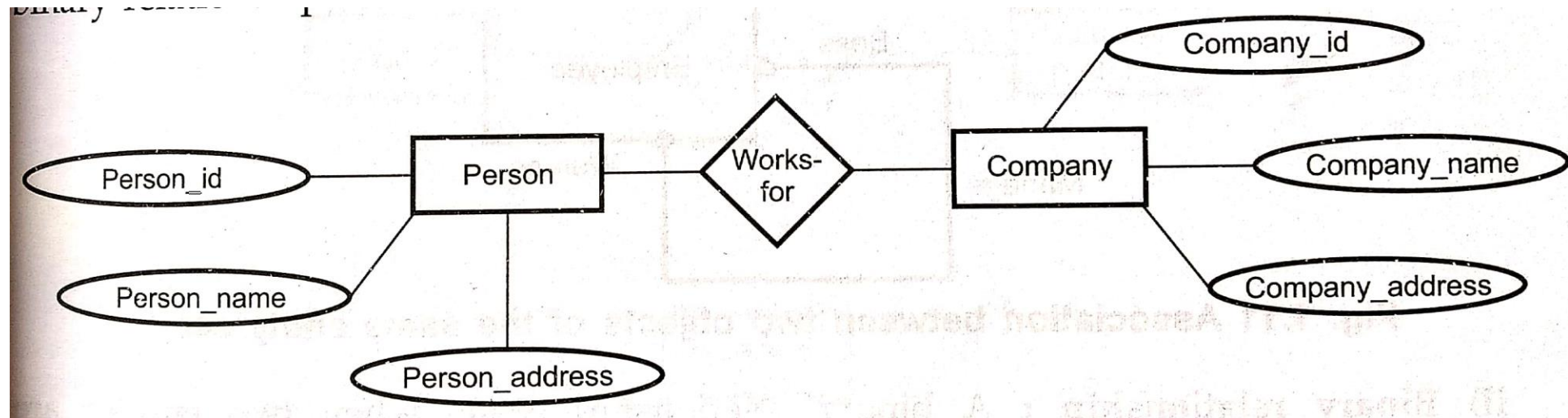
Derived Attribute: a derived attribute is one that represent a value that derivable from the value of related attribute or set of attributes.

Example: age – can be derived from DOB.

Relationship and Relationship sets

A relationship expresses an association among several entities.

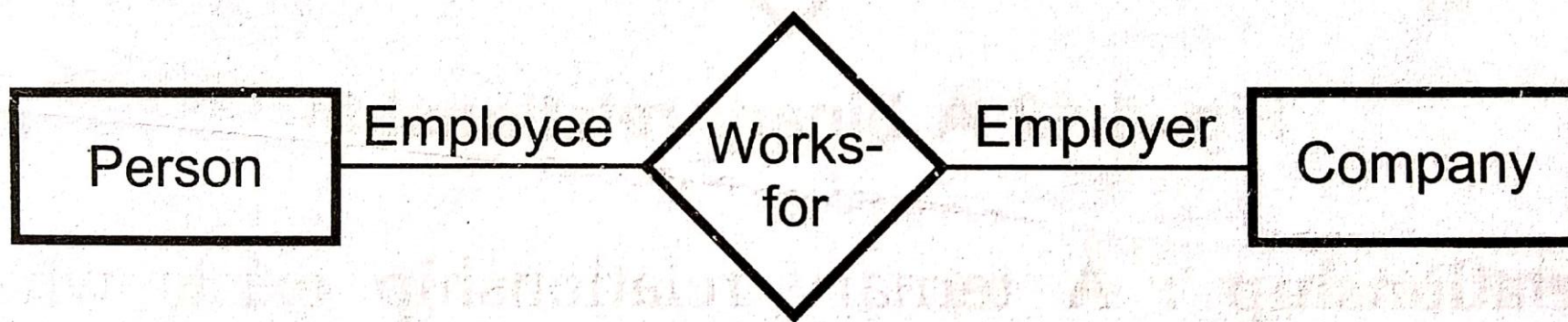
A relationship set is a set of relationship of the same type.



Relationship and Relationship sets

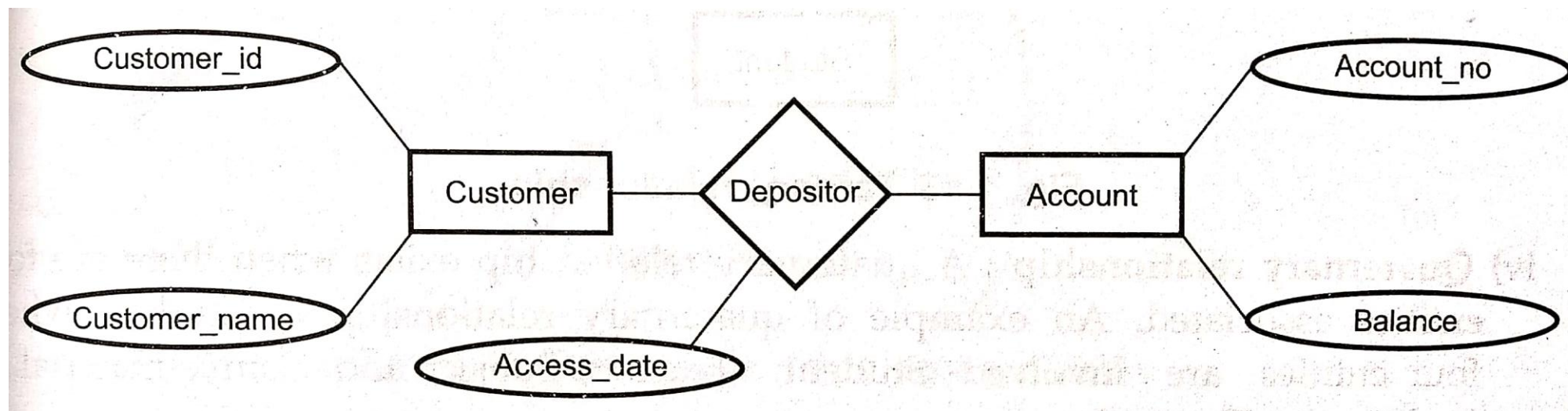
Entity Role:

The function that an entity plays in a relationship is called that entity's role.



Relationship sets

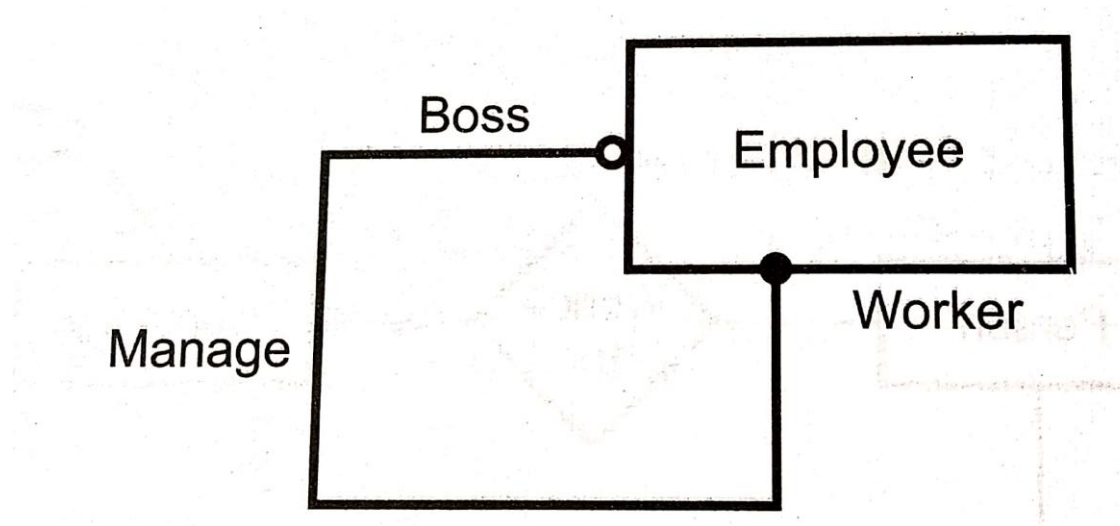
A relationship may also have attributes called descriptive attributes.



Types of Relationships

Unary relationship:

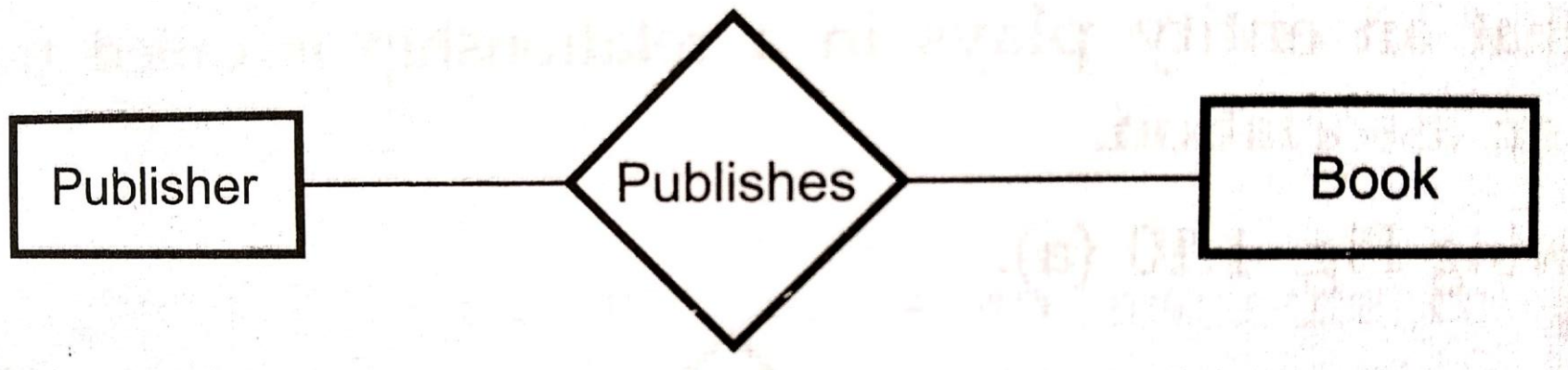
A Unary relationship exists when an **association is maintained within a single entity**.



Types of Relationships

Binary relationship:

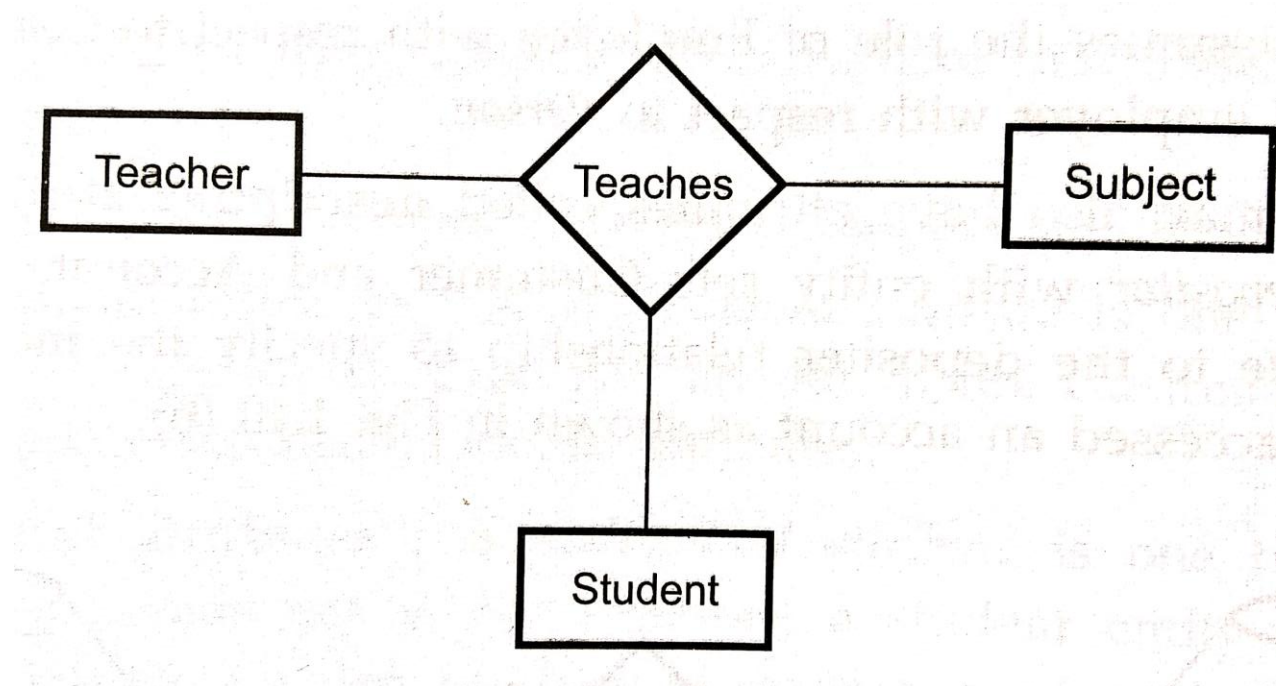
A Binary relationship exists when **two entities are associated**.



Types of Relationships

Ternary relationship:

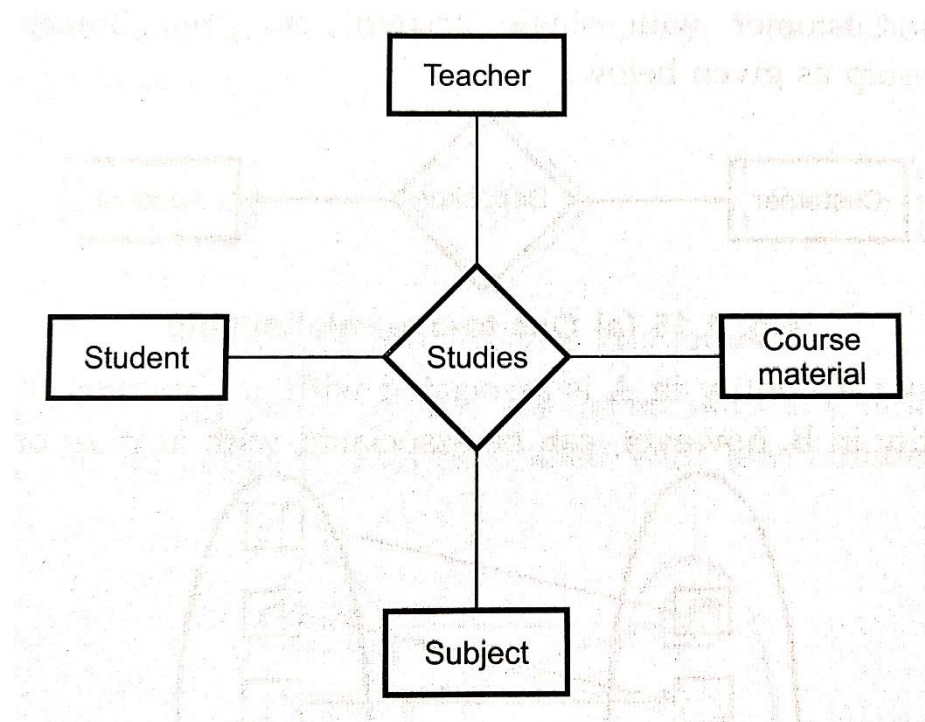
A Ternary relationship exists when **there are three entities are associated.**



Types of Relationships

Quaternary relationship:

A Quaternary relationship exists when there are **four entities are associated**.



Constraints

An E-R enterprise scheme may define certain constraints to **which the content of database system must confirm and accept.**

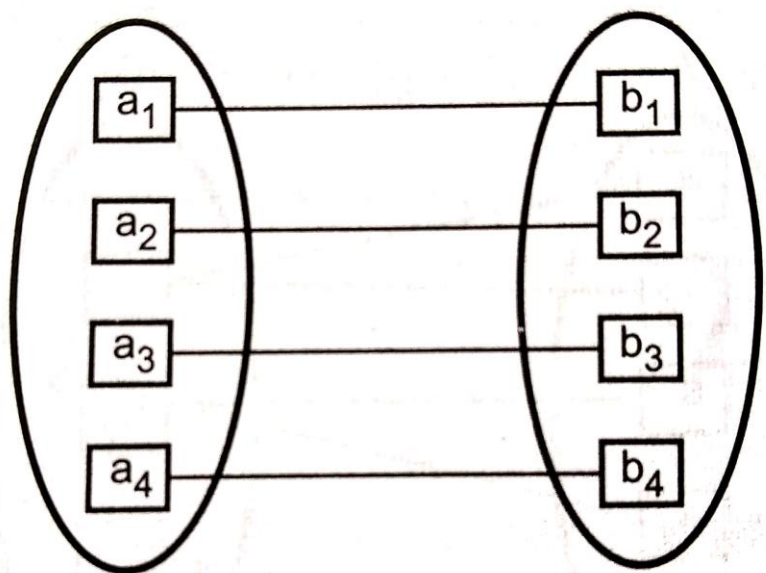
Two important types of constraints are:

- Mapping cardinalities
- Participation constraints

Mapping cardinalities: It describes the number of entities to which another entity can be associated via a relationship set.

Mapping cardinalities Types

One to One: An entity in A is associated with at most one entity in B, and an entity in B is associated with at most one entity in A.

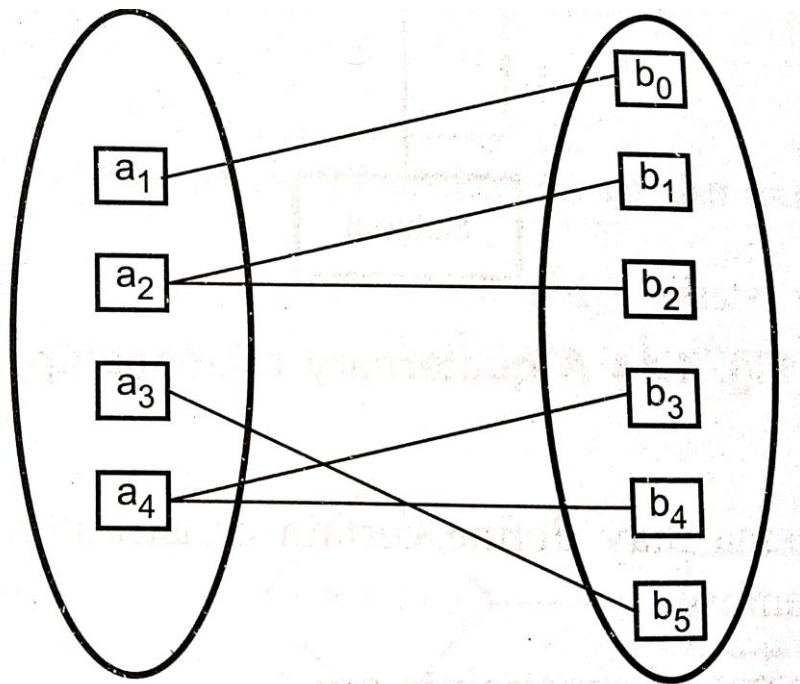


Example:

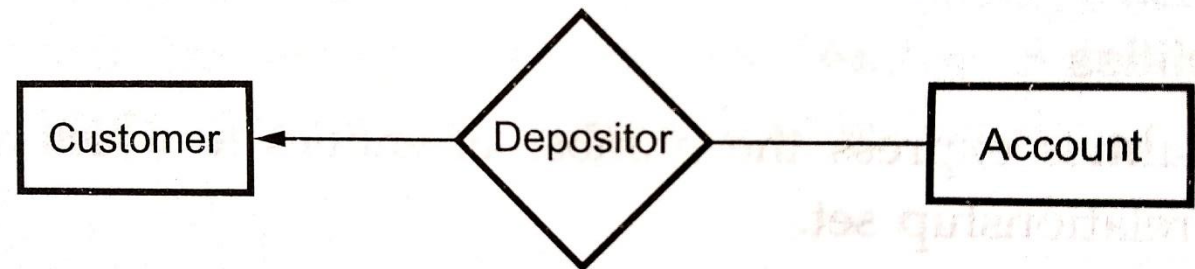


Mapping cardinalities Types

One to Many: An entity in A is associated with any number of entities in B, and an entity in B, however, can be associated with at most one entity in A.

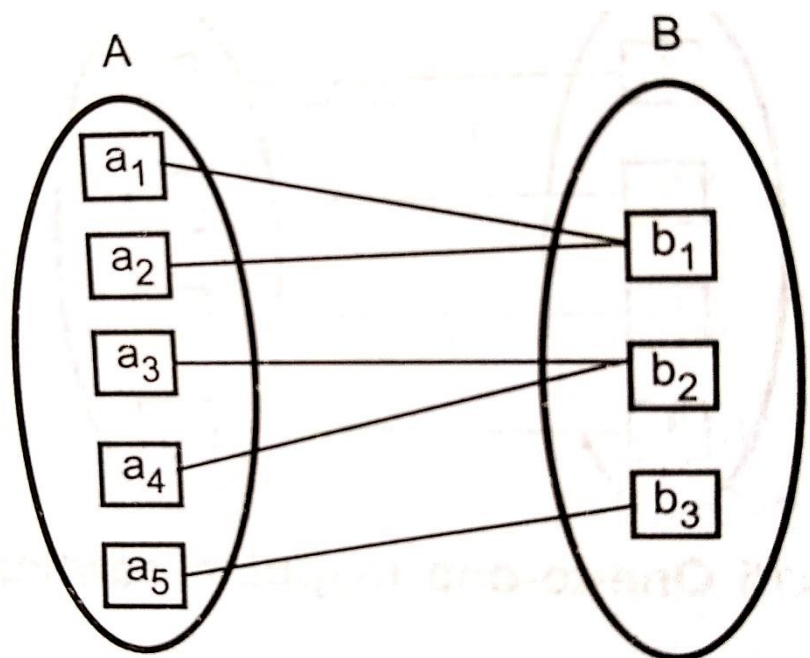


Example:

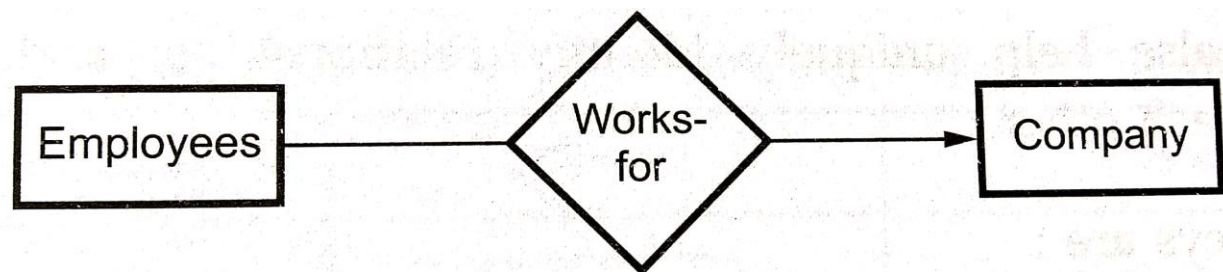


Mapping cardinalities Types

Many to One: An entity in A is associated with at most one entity in B, and an entity in B, however, can be associated with any number of entities in A.

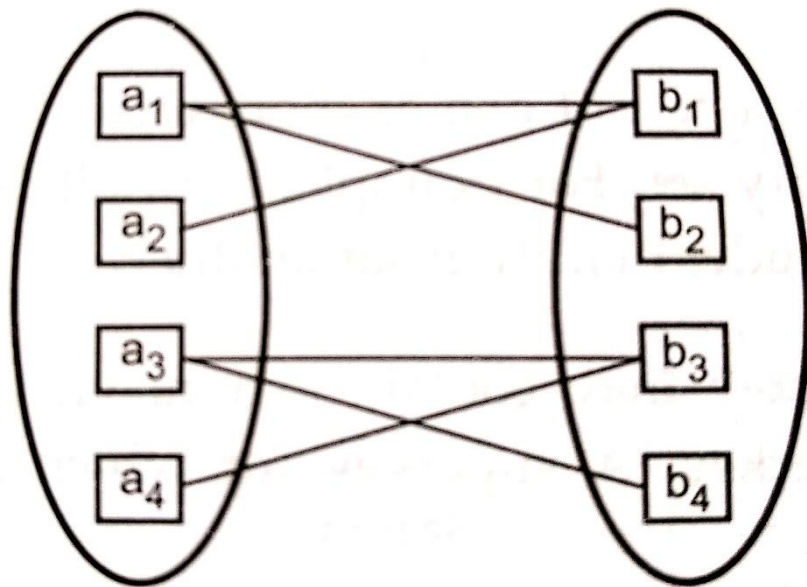


Example:

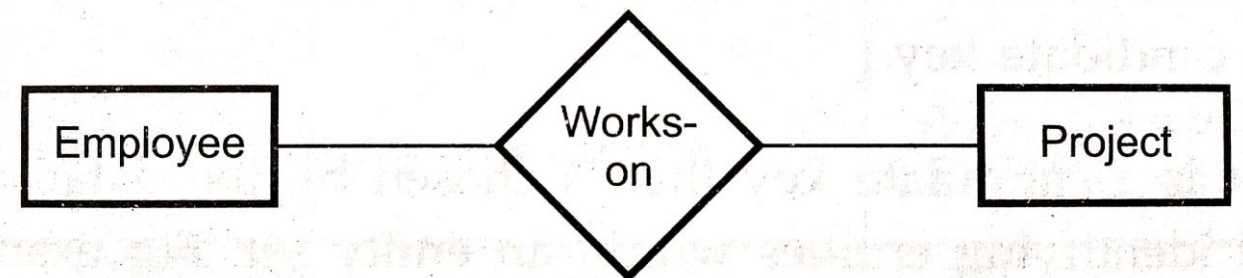


Mapping cardinalities Types

Many to Many: An entity in A is associated with any number of entities in B, and an entity in B can be associated with any number of entities in A.



Example:



Participation Constraints

There are two types of participation constraints:

- Total participation
- Partial participation

Total participation: The participation of an entity set E in a relationship set R is said to be total if every entity in E participates in at least one relationship in R

Partial participation: If only some entities in E participate in relationships in R , the participation of entity set E in relationship R is said to be partial.

Keys

A key is an attribute or set of attributes, which uniquely identifies a tuple within the relation.

Example: Employee_ID

Types of KEYS:

1. Primary Key
2. Foreign Key
3. Super Key
4. Candidate Key

Keys

EMP_ID	EMP_SSN	EMP_NAME	EMP_DEPT	EMP_DESIGNATION
EMP7001	74634	Codd	HR	Manager
EMP7002	54354	Charles	Finance	Manager
EMP7003	34254	Azar	HR	Executive
EMP7004	64342	Samson	Development	Developer
EMP7005	53246	Thilak	Finance	Executive
EMP7006	74612	Shruthi	HR	Executive

Keys

Candidate Key: are individual columns in a table that qualifies for uniqueness of all the rows. Here in Employee table EMP_ID & EMP_SSN are Candidate keys.

Primary Key: is the columns you choose to maintain uniqueness in a table. Here in Employee table you can choose either EMP_ID or EMP_SSN columns, EMP_ID is preferable choice, as EMP_SSN is a secure value.

Alternate Key: Candidate column other the Primary column, like if EMP_ID is PK then EMP_SSN would be the Alternate key.



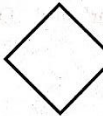



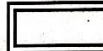
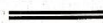
Keys

Super Key: If you add any other column/attribute to a Primary Key then it become a super key, like EMP_ID + EMP_NAME is a Super Key.

Composite Key: If a table do have a single columns that qualifies for a Candidate key, then you have to select 2 or more columns to make a row unique. Like if there is no EMP_ID or EMP_SSN columns, then you can make EMP_NAME + EMP_DOB as Composite primary Key. But still there can be a narrow chance of duplicate row.

E-R Diagram

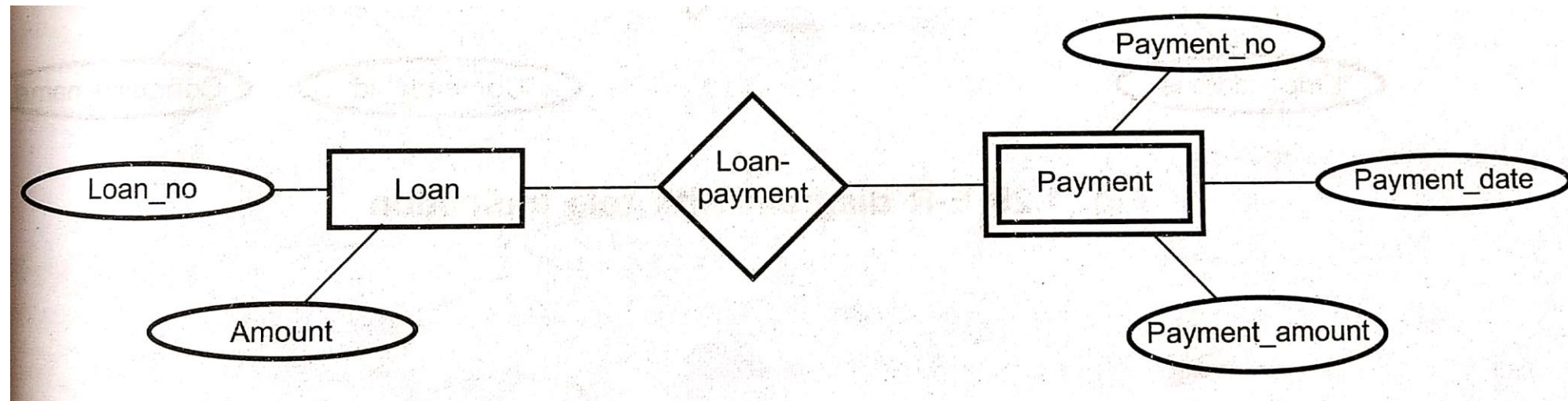
The overall logical structure of a database can be expressed graphically using E-R Diagrams. The symbols used in E-R Diagram are:

Component name	Symbol	Description
1) Rectangles		Represents entity sets
2) Ellipses		Represents attributes
3) Diamonds		Represents relationship sets
4) Lines		Links attributes to entity sets & entity sets to relationship sets
5) Double ellipses		Represents multivalued attributes
6) Dashed ellipses		Represents derived attributes
7) Double rectangles		Represents weak entity sets
8) Double lines		Represents total participation of an entity in a relationship set

Dependency

Existence dependencies:

If the existence of entity X depends on the existence of entity Y, then X is said to be existence dependent on Y.

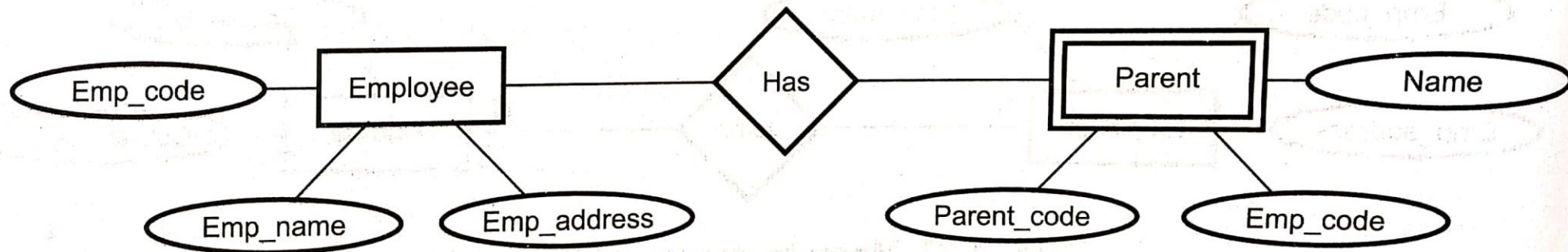


Dependency

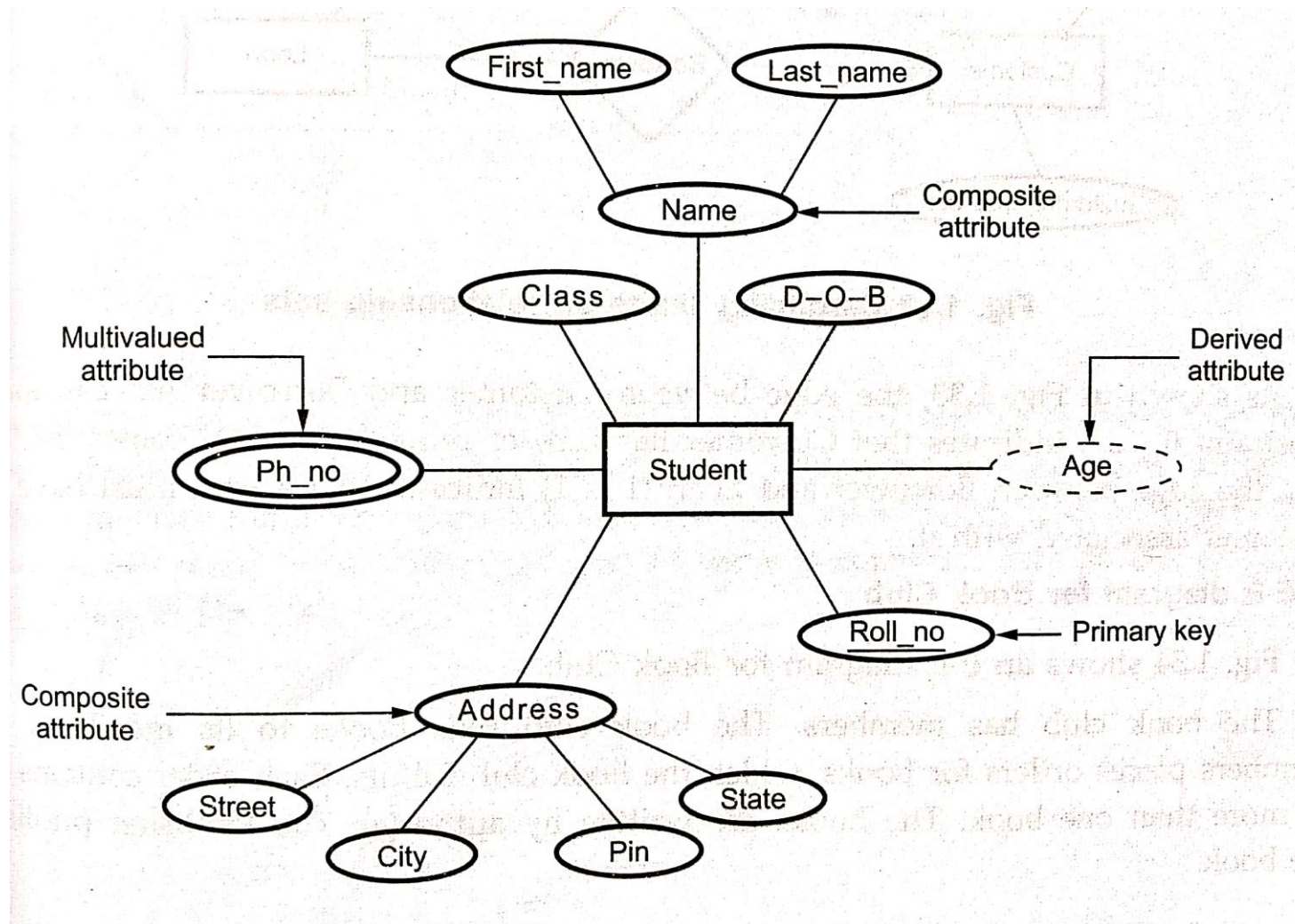
Strong and Weak Entity sets:

Entities are classified as Strong or Weak entity types.

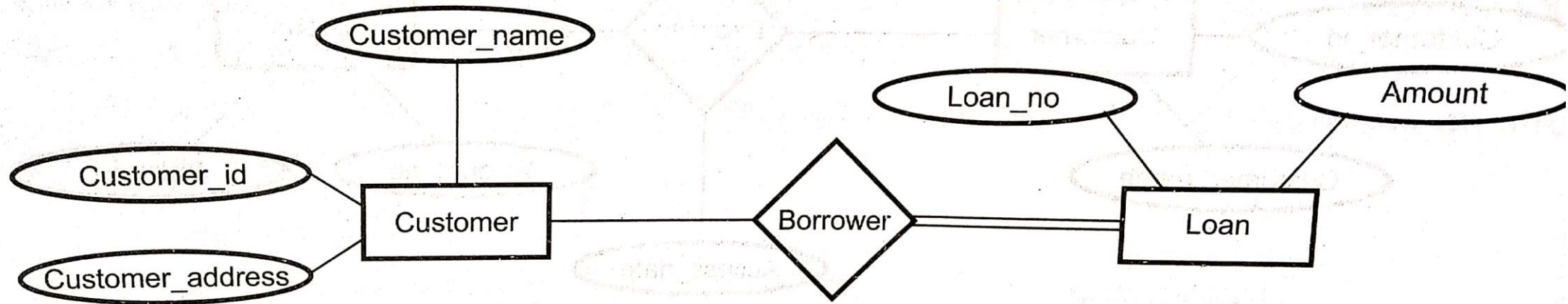
- An entity that is existence dependent on some other entity is called weak entity.
- An entity set on which the weak entity depends, is called strong entity.



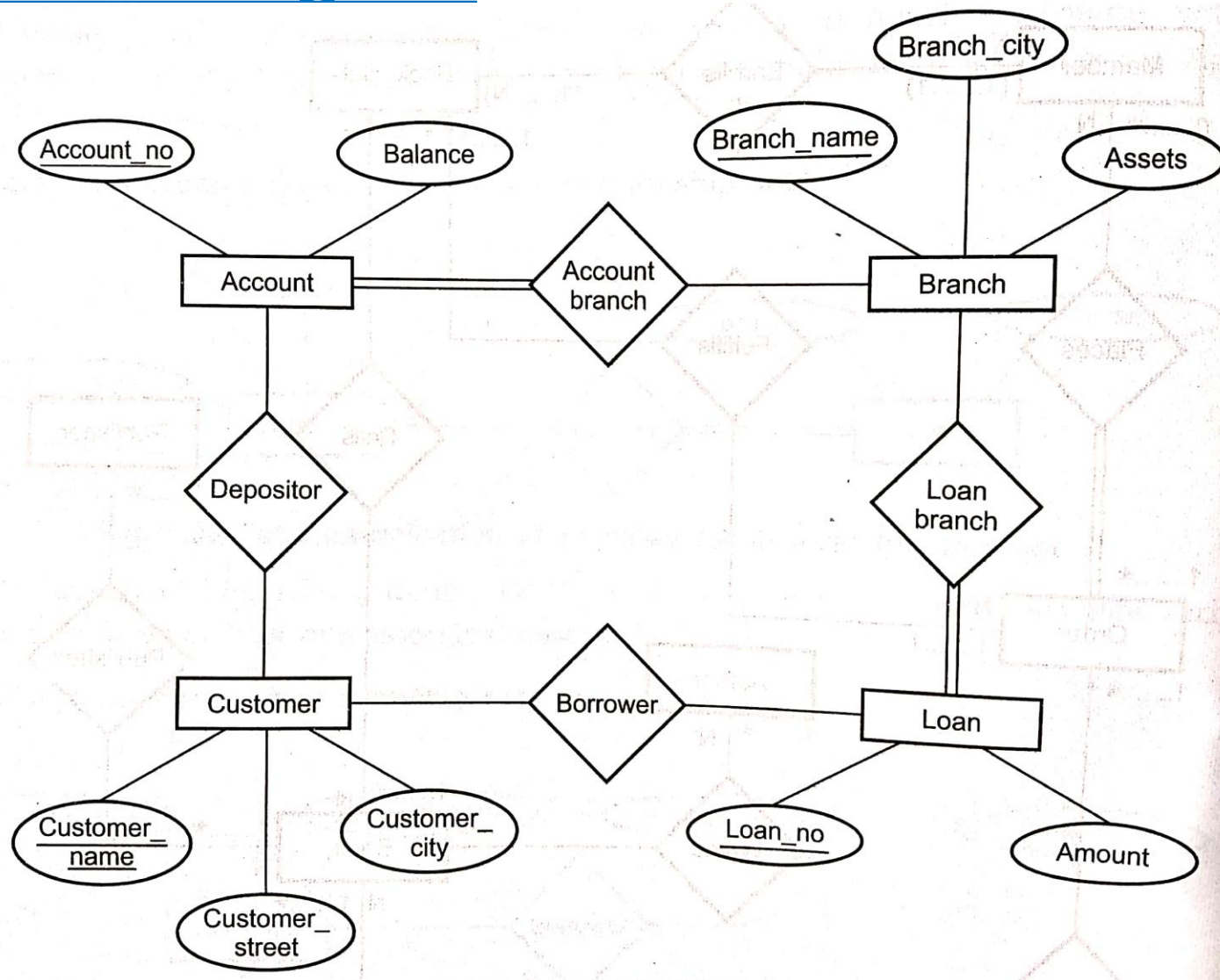
Example – ER Diagram



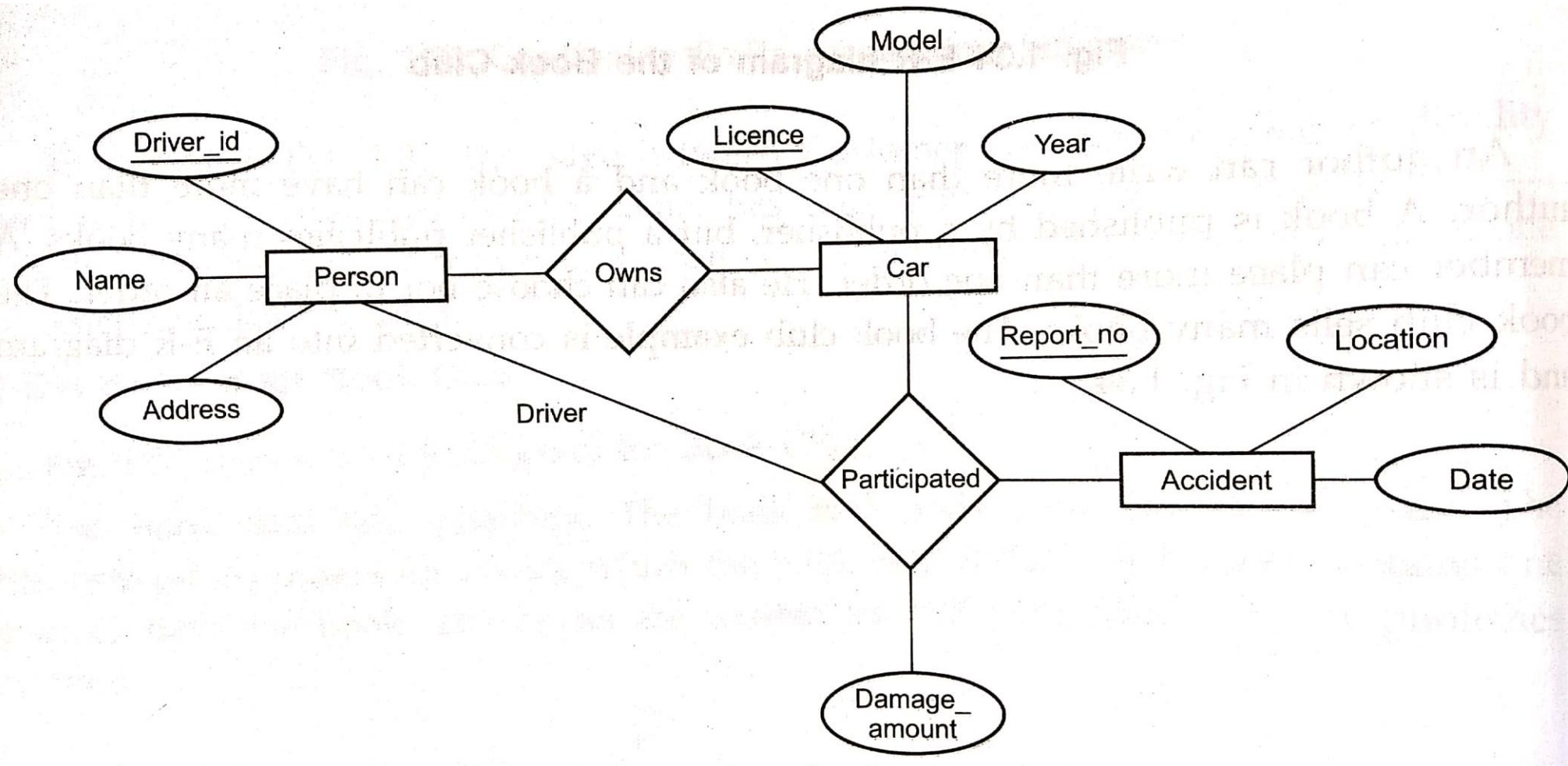
Example – Total Participation entity



Example – ER Diagram



Example – ER Diagram



Summary

This session will give the knowledge about

- ER Models