

## Lecture - 4

# Entity Relationship Diagram

- \* Introduction
- \* Entity and Entity set / type
- \* Attributes and types
- \* Relationship and Relationship set / type
- \* Strong and weak entity set
- \* Traps
- \* Conversion.

- It is introduced by Dr. Peter Chen in 1976
- A non-technical design method works on conceptual level based on the perception of real world.
- It consists of collection of basic entities and relationships among these entities and attributes which defines their properties.
- Basically, it is a diagrammatic representation, easy to understand even by non-technical user.

\* Entity → Any thing/object in the real world that is distinguishable from other objects based on the values of the attributes it possess.



## \* Types of Entities -

(1) Tangible - Entities which physically exists in real world.  
E.g., - cup, book, student.

(2) Intangible - Entities which exists logically.  
E.g. - Account.

\* Entity set - collection / set of same types of entities i.e. that share same attributes ~~and~~ is called Entity set.

E.g. - Student (age, name, RollNo.)

} → Schema  
 } → heading  
 } → name

Entity set →

- Entity can't be represented in an ER diagram as it is instance / data.

- Entity set is represented by rectangle in a diagram.

(age) → attribute.  
 (RollNo) → attribute.  
 (Name) → attribute.  
 Student → Entity set.

- Entity can be represented in a relational model by row / tuple / record.



- Entity set is represented by table in relational model.

E.g. Entity set student attributes.

Entities →

RollNo	age	name	add.
1	20	XYZ	aaaa
2	19	ABC	bbbb
3	21	PQR	cccc
⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮

## \* Types of attributes -

Attributes - are the units that describes the characteristics of entities.

- represented by ellipse or oval in E-R diagram but in relational model by a separate column.

### Types

(i) Simple vs. Composite

↳ It can't be divided further, represented by simple oval.

↳ Composite attributes can be divided further in simple attributes, represented by oval connected to an oval.



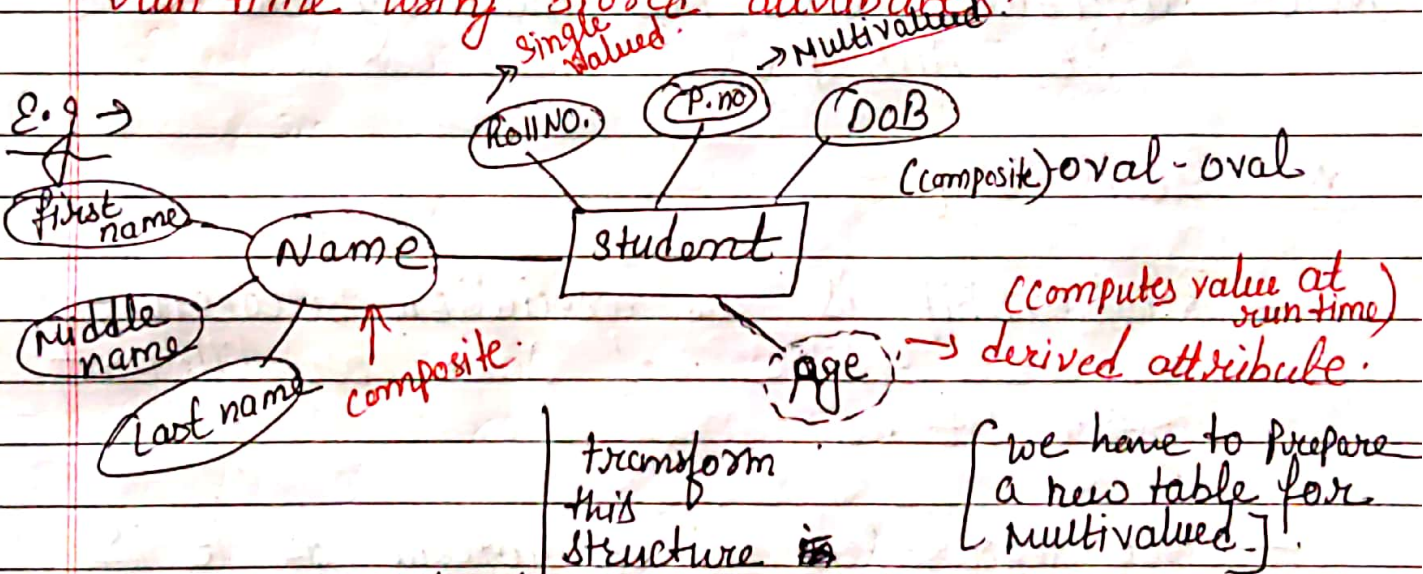
## Single vs. multivalued -

- Single <sup>attributes</sup> can have only one value at an instance of time.
- Multivalued attributes can have more than one value at an instance of time.

Stored vs derived.

→ value stored in database.

↳ value can be computed in run time using stored attributes:

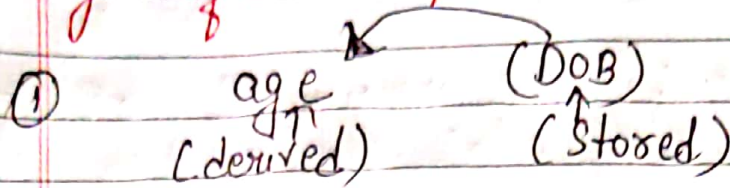


Student  $\downarrow$

[illegible]



Ex → of stored & derived attribute.



② Google map.

Composite attributes: composite + multivalued

Ex - Phone-No. or Address  
(Std / TID) (-----)

Note - Attributes are not mutually exclusive.  
i.e.  $A \cap B \neq \emptyset$

### \* Relationship -

- Relationship is an association between two or more Entities of same or different entity set.
- Not represented in ER diagram as it is an instance or data.
- In ER diagram, represented by diamond while in Relational model, represented by using row in a table.

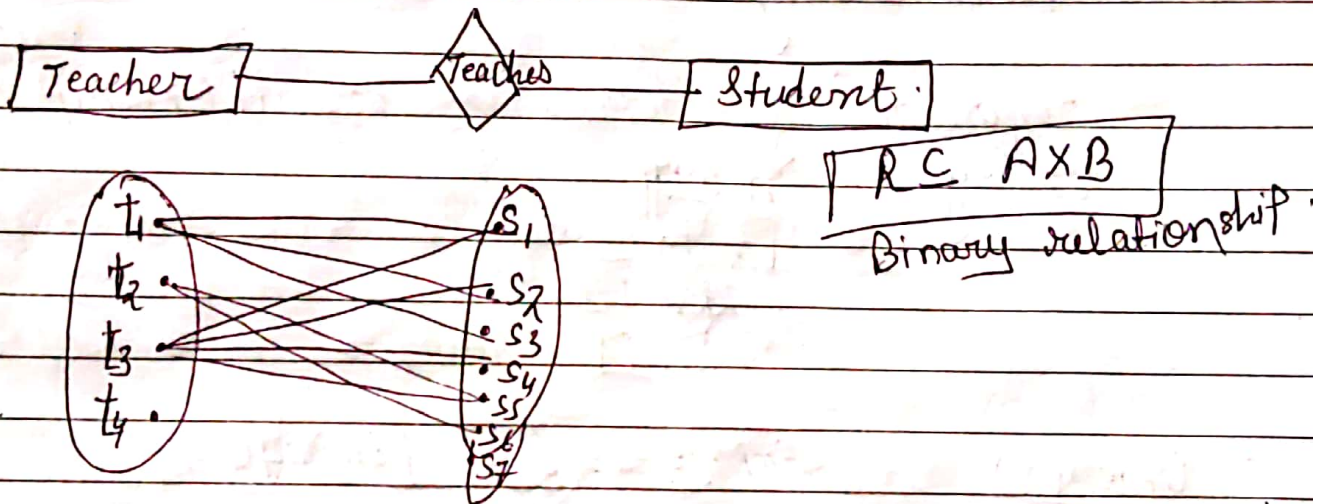
### Relationship Set / type -

- a set of similar type of relationship.

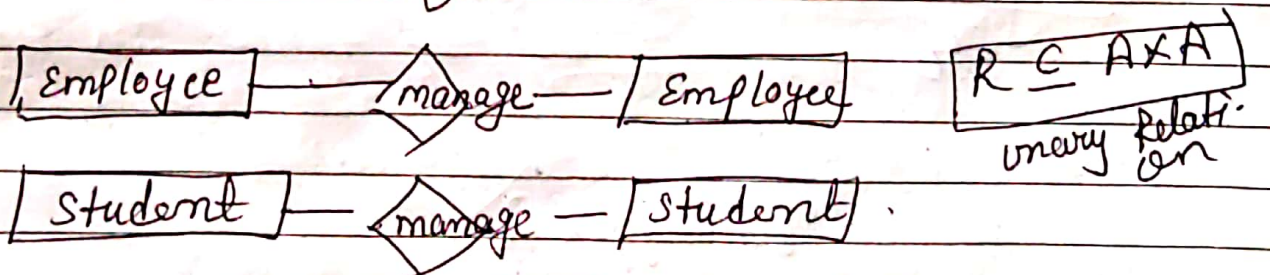


- In RM, either by a separate table or by separate column.
- Every relationship type has three components.
  - (1) Name -
  - (2) Degree.
  - (3) Cardinality ratio / Participation constraints.

E.g. -



E.g. -



E.g. -

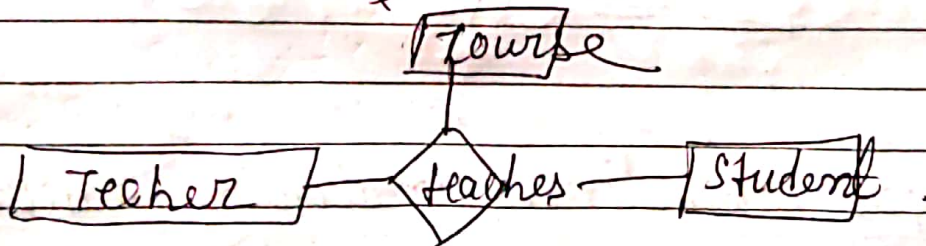
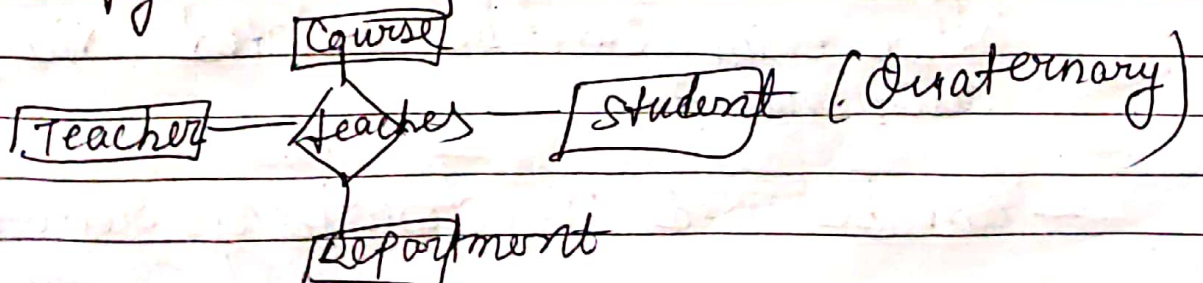


fig - Ternary relation

E.g. -

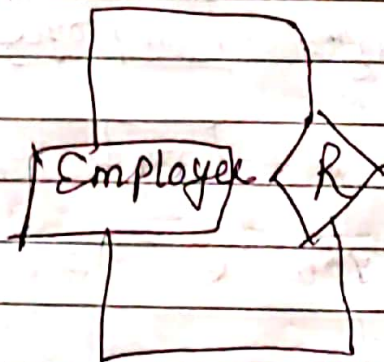
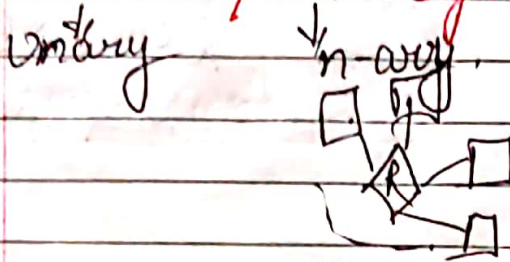




## Degree of a relation set -

- no. of Entity set participated in the relationship set.
- most of relationship sets in the ER-diagram are binary in nature, however relationship sets involve more than two Entity sets.

→ minimum / max. degree of relationship.

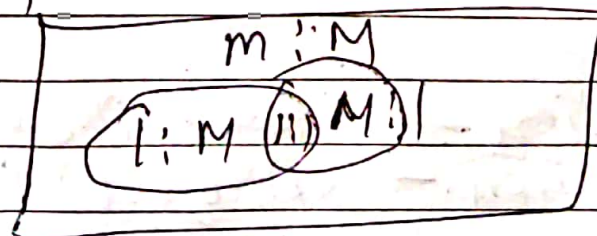
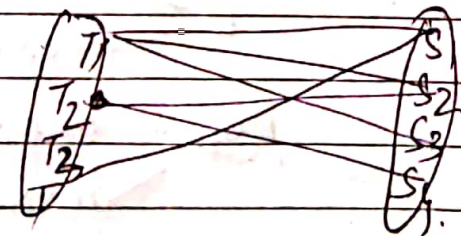
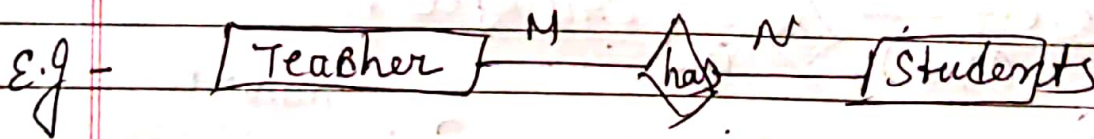
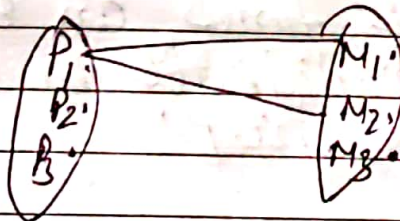
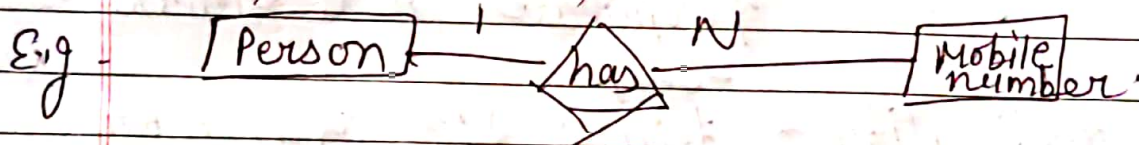
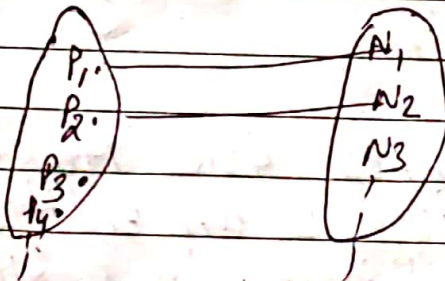


## mapping cardinalities / cardinality ratios:

- Express the no. of entities to which other entity can be related via a relationship.
- can be used in describing relationship

set of any degree but is most useful in binary relationship.

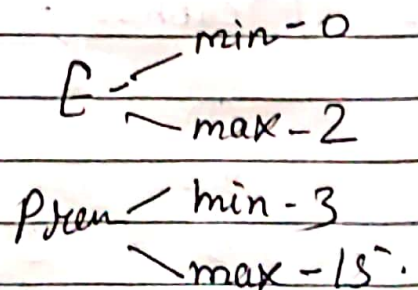
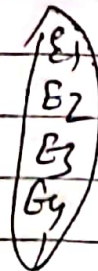
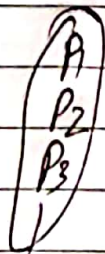
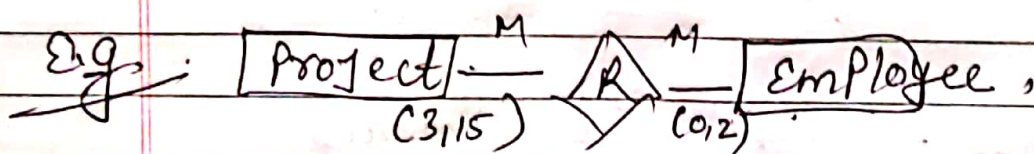
- 1:1  $\rightarrow$  (  $\leftarrow$  ,  $\frac{1}{1}$  )
- 1:M  $\rightarrow$  (  $\leftarrow$  ,  $\frac{M}{1}$  ,  $\frac{*}{1}$  )
- M:1
- M:M





## Participation constraints

- Specifies whether the existence of an entity depends on its being related to another Entity via relationship type.
- These constraints specify the minimum and max. number of relationship instances that each Entity can must participate in.
- Max. cardinality - defines the max. no. of times an Entity can participate in a Relationship.
- Min. cardinality - defines the minimum no. of times an Entity can participate in a Relationship.



- Partial Participation - (Employee) min-0
- Total participation - (Project) max-1