

MODULE 3

ER Diagram

- ER diagram stands for Entity relationship diagram.
- Conceptual model that gives the graphical representation of the logical structure of the database.
- ER diagrams are created based on three basic concepts:
 - Entities,
 - Attributes and
 - Relationships.

Entity Sets

- An entity is a real-world object or component of data.
- An entity is represented as rectangle in an ER diagram.
- An entity set is a set of same type of entities.
- Examples of entities:
 - **Person:** Employee, Student, Patient
 - **Place:** Store, Building
 - **Object:** Machine, product, and Car

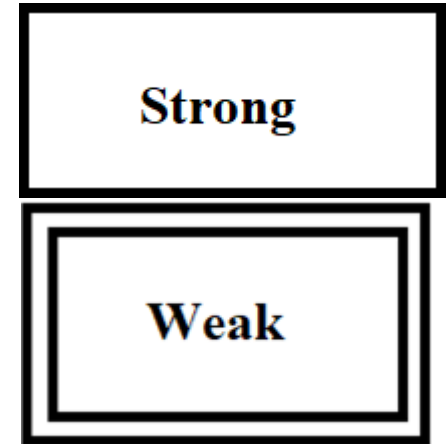
- Two types of Entity Sets

- **Strong Entity**

- A strong entity set possess its own primarykey.
 - It is represented using a single rectangle.

- **Weak Entity**

- A weak entity set do not possess its own primary key.
 - It is represented using a double rectangle.

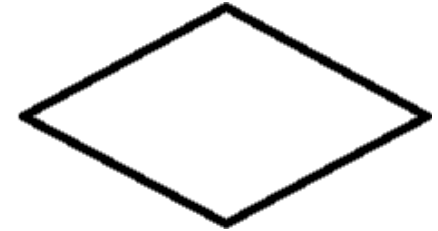


Relationship Sets

- Relationship is nothing but an association among two or more entities.
- A relationship set is a set of same type of relationships.
- A relationship set may be of the following two types
 - Strong Relationship set
 - Weak or Identifying Relationship

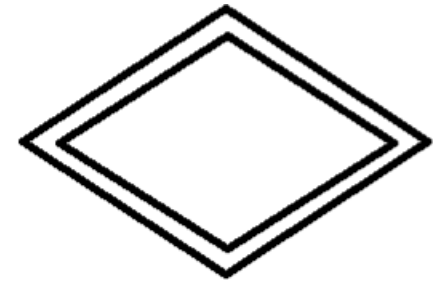
- Strong Relationship set

- A strong relationship exists between two strong entity sets.
- It is represented using a diamond symbol.



- Weak or Identifying Relationship

- A weak or identifying relationship exists between the strong and weak entity set.
- It is represented using a double diamond symbol.



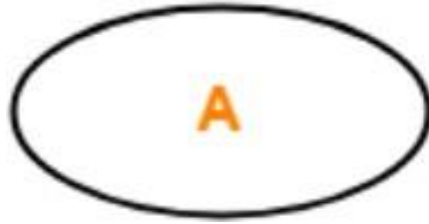
- Attributes are the properties which describes the entities of an entity set.
- There exist a specific domain or set of values for each attribute fromwhere the attribute can take its values.
- It is represented using ellipses.

Attributes

- Attributes associated with an entity set may be of the following types
 - Simple attributes

- Composite attributes
- Single valued attributes
- Multi valued attributes
- Derived attributes
- Key attributes

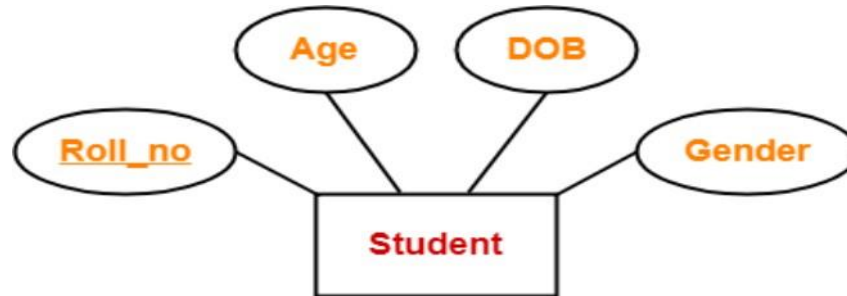
- Simple attributes are those attributes which can not be divided further



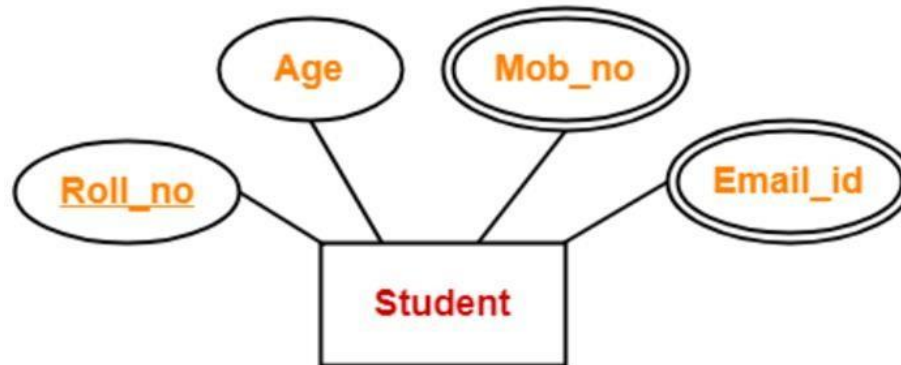
- Composite attributes are those attributes which are composed of many other simple attributes.



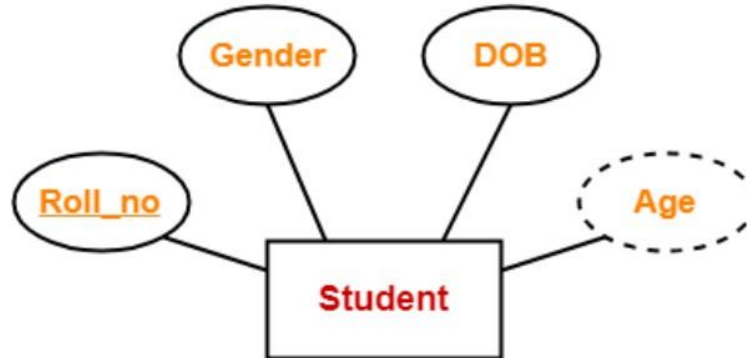
- Single valued attributes are those attributes which can take only one value for a given entity from an entity set.



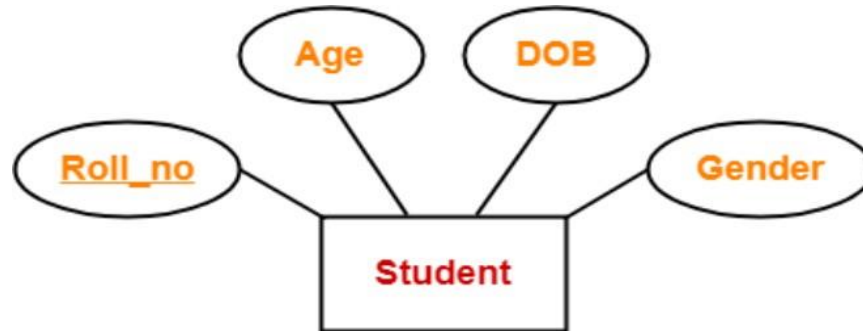
- Multi valued attributes are those attributes which can take morethan one value for a given entity from an entity set. It isrepresented by double ellipses.



- Derived attributes are those attributes which can be derived from other attribute. It is represented by dashed ellipses.



- Key attributes are those attributes which can identify an entity uniquely in an entity set. It is represented by underlined attribute name.

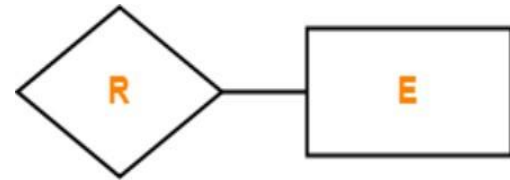


Participation:

- Participation constraint defines the least number of relationship instances in which an entity has to necessarily participate.
- Two types of participation
 - Partial participation
 - Total participation

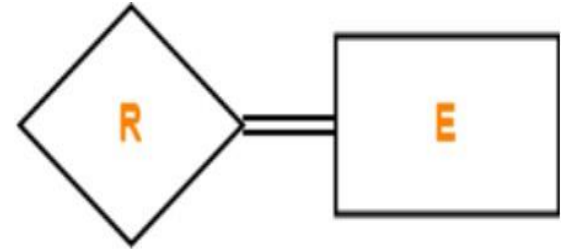
Partial Participation

- Partial participation is represented using a single line between the entity set and relationship set.
- It specifies that each entity in the entity set may or may not participate in the relationship instance in that relationship set.
- That is why, it is also called as **optional**



Total Participation

- Total participation is represented using a double line between the entity set and relationship set.
- It specifies that each entity in the entity set must compulsorily participate in at least one relationship instance in that relationship set.
- it is also called as **mandatory participation**

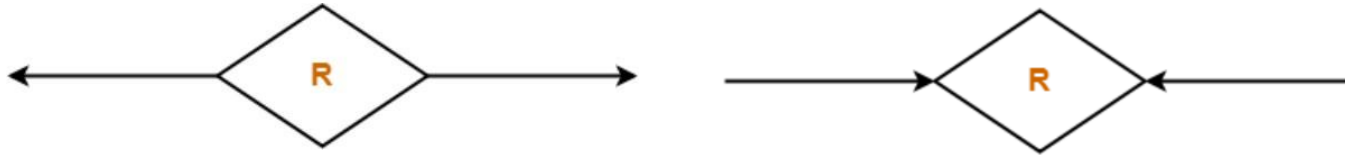


Cardinality Constraints:

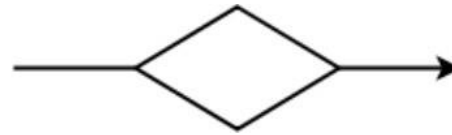
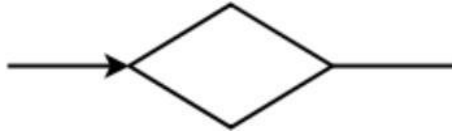
- Cardinality constraint defines the maximum number of relationship instances in which an entity can participate.
- Minimum cardinality tells whether the participation is partial or total.
 - If minimum cardinality = 0, then it signifies partial participation.
 - If minimum cardinality = 1, then it signifies total participation.
- Maximum cardinality tells the maximum number of entities that participates in a relationship set

- There are 4 types of cardinality ratios
 - Many-to-many cardinality (m:n)
 - Many-to-one cardinality (m:1)
 - One-to-many cardinality (1:n)
 - One-to-one cardinality (1:1)

- One-to-one cardinality (1:1)
 - An entity in set A can be associated with at most one entity in set B.
 - An entity in set B can be associated with at most one entity in set A.



- Many-to-one cardinality (m:1)
 - An entity in set A can be associated with at most one entity in set B.
 - An entity in set B can be associated with any number (zero or more) of entities in set A.



- One-to-many cardinality (1:n)
 - An entity in set A can be associated with any number (zero or more) of entities in set B.
 - An entity in set B can be associated with at most one entity in set A.



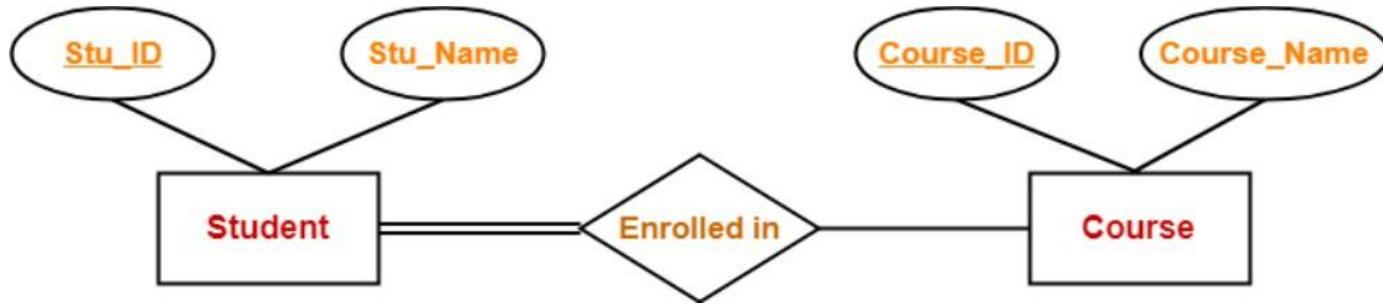
- Many-to-many cardinality (m:n)
 - An entity in set A can be associated with any number (zero or more) of entities in set B.
 - An entity in set B can be associated with any number (zero or more) of entities in set A



Strong Entity Set

- A strong entity set is an entity set that contains sufficient attributes to uniquely identify all its entities.
- A primary key exists for a strong entity set. It is represented by underlining the attribute name.
- A single rectangle is used for representing a strong entity set.
- A diamond symbol is used for representing the relationship that exists between two strong entity sets.

Strong Entity Set

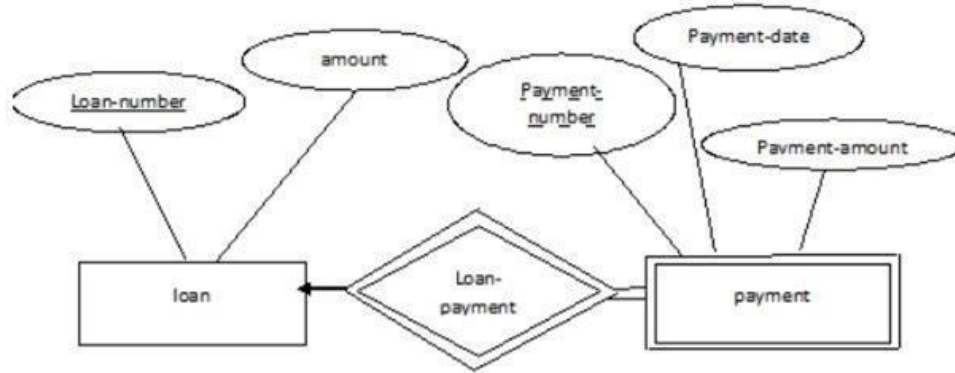


Weak Entity Set

- A weak entity set is an entity set that does not contain sufficient attributes to uniquely identify its entities.
- In other words, a primary key does not exist for a weak entity set.

Weak Entity Set

- Thus, this combination serves as a primary key for the weak entityset.



Strong Entity Vs Wrong Entity

Strong Entity Set	Weak Entity Set
Strong entity set always has a primary key.	It does not have enough attributes to build a primary key.
It is represented by a rectangle symbol.	It is represented by a double rectangle symbol.
It contains a Primary key represented by the underline symbol.	It contains a Partial Key which is represented by a dashed underline symbol.

Strong Entity Vs Weak Entity

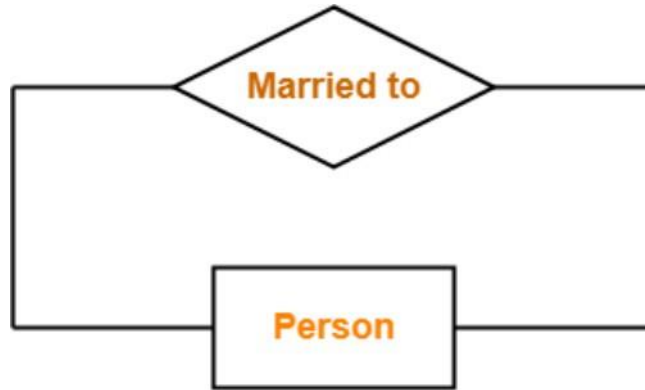
Strong Entity Set	Weak Entity Set
In the ER diagram the relationship between two strong entity set shown by using a diamond symbol.	The relationship between one strong and a weak entity set shown by using the double diamond symbol.
The connecting line of the strong entity set with the relationship is single.	The line connecting the weak entity set for identifying relationship is double.

Relationship

- A relationship is defined as an association among several entities.
- The number of entity sets that participate in a relationship set is termed as the degree of that relationship set.

- On the basis of degree of a relationship set, a relationship set can be classified into the following types-
 - Unary relationship set
 - Binary relationship set
 - Ternary relationship set
 - N-ary relationship set

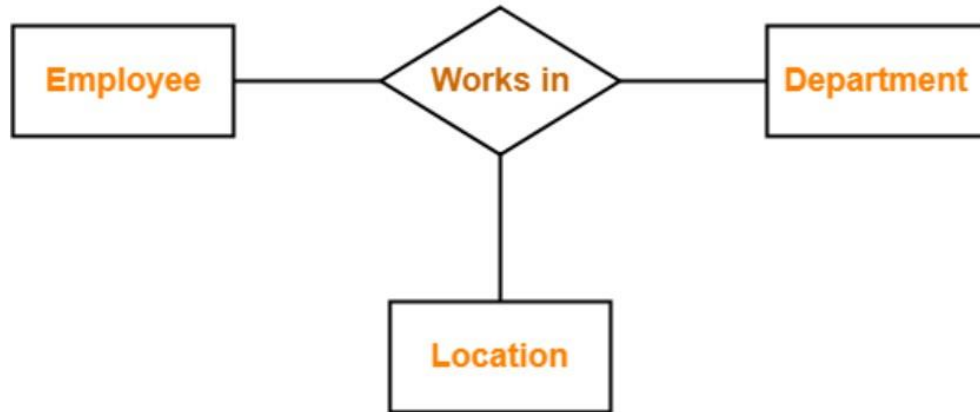
- Unary relationship set is a relationship set where only one entity set participates in a relationship set.



- Binary relationship set is a relationship set where two entity sets participate in a relationship set.

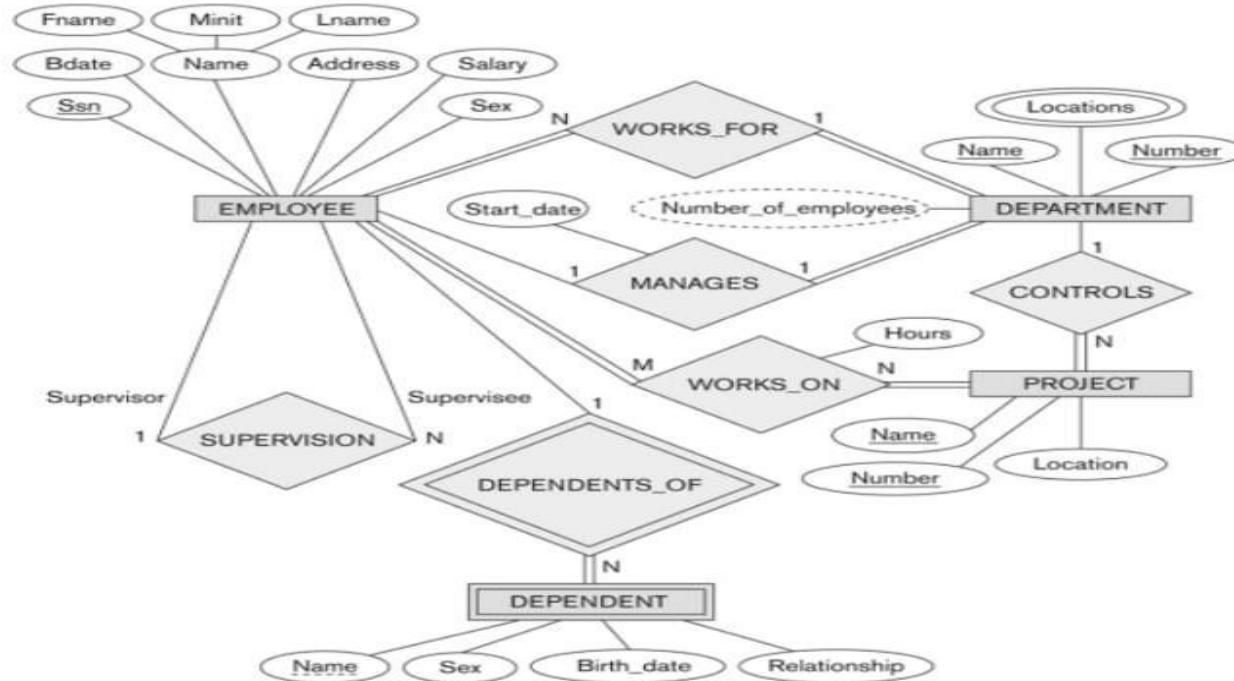


- Ternary relationship set is a relationship set where three entity sets participate in a relationship set.



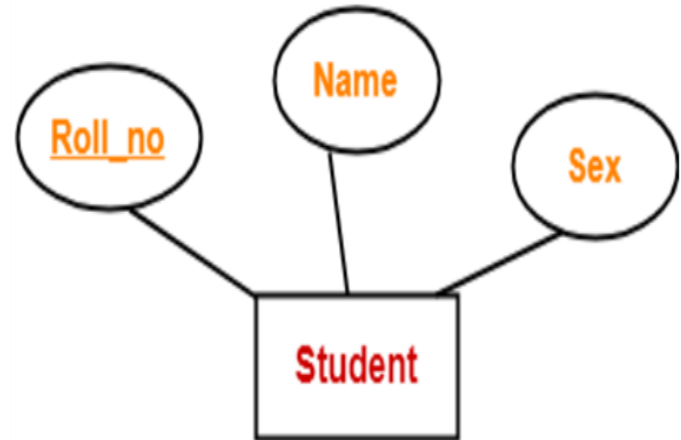
- N-ary relationship set is a relationship set where 'n' entity sets participate in a relationship set.

ER diagram Example

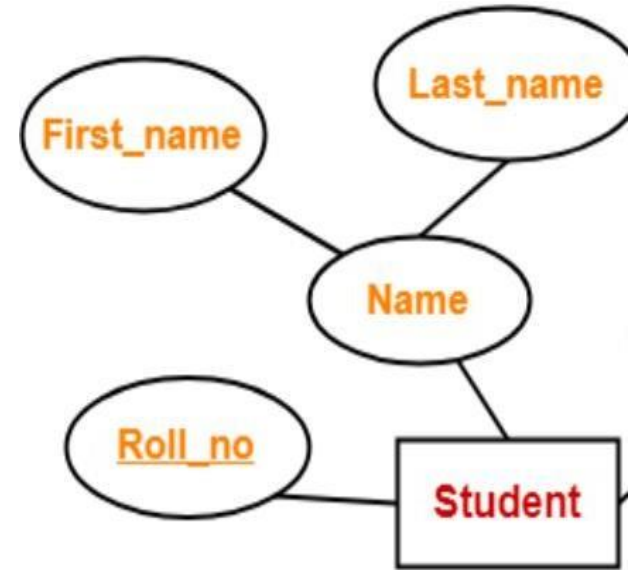


Conversion of ER to Tables

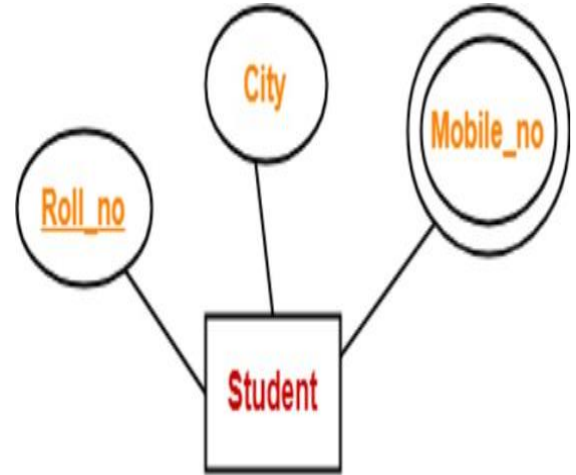
- **Rule - 01:** A strong entity set with only simple attributes will require only onetable in relational model.
- **Student**(Roll_no,Name,Sex)



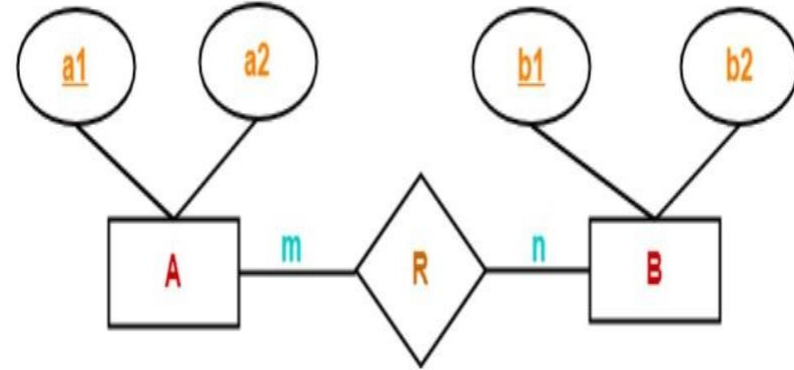
- **Rule - 02:** A strong entity set with any number of composite attributes will require only one table in relational model. While conversion, simple attributes of the composite attributes are taken into account and not the composite attribute itself.
- **Student**(Roll_no, Name, First_name, Last_name)



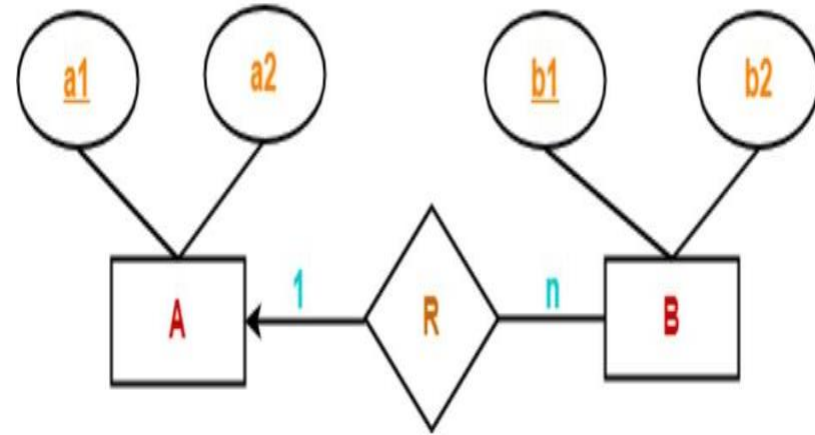
- **Rule - 03:** A strong entity set with any number of multi valued attributes will require two tables in relational model.
- **Student**(Roll_no, City)
- **Student_Contact**(Roll_no, mobile_no)



- **Rule - 04:** For Binary Relationship With Cardinality Ratio m:n
- $A(\underline{a1}, a2)$
- $B(\underline{b1}, b2)$
- $R(a1, b1)$

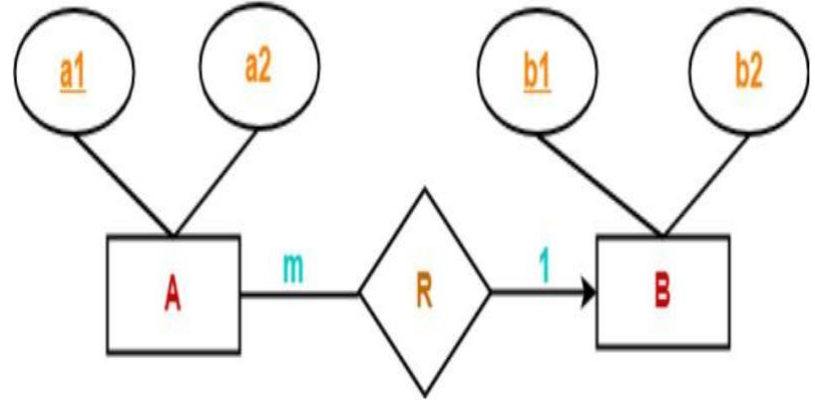


- **Rule - 05:** For Binary Relationship With Cardinality Ratio 1:m
- $A(\underline{a1}, a2)$
- $B(\underline{b1}, b2, a1)$

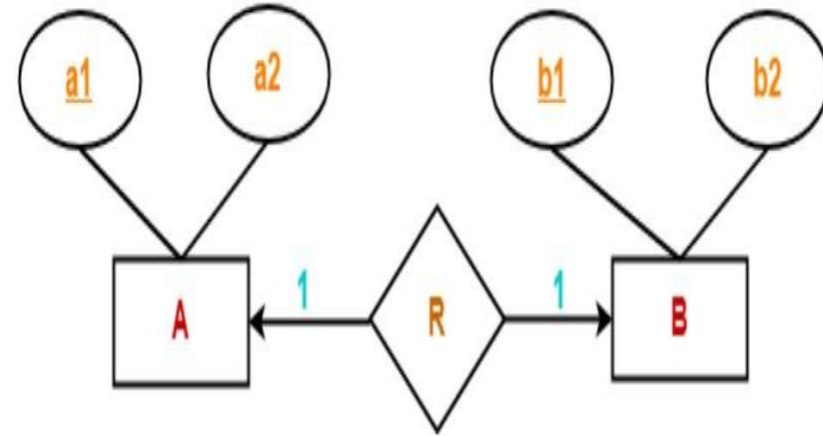


Conversion of ER to Tables

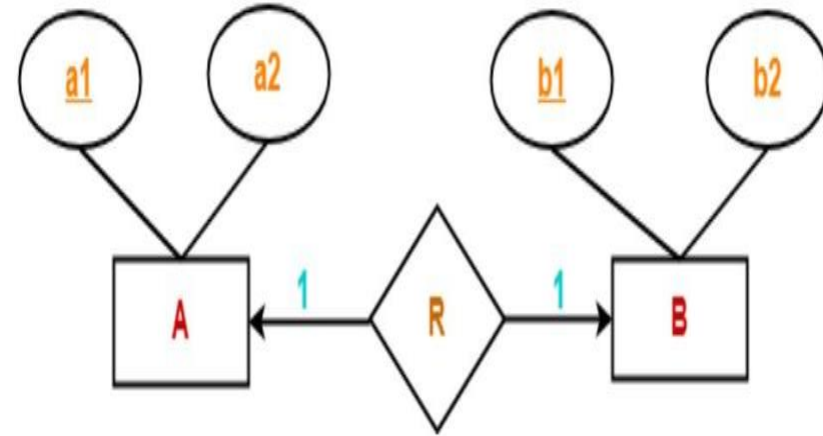
- **Rule - 06:** For Binary Relationship With Cardinality Ratio m:1
- $A(\underline{a1}, a2, b1)$
- $B(\underline{b1}, b2)$



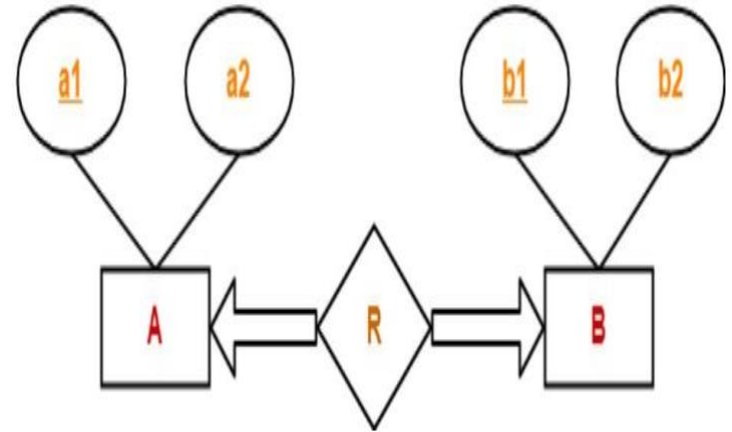
- **Rule - 07:** For Binary Relationship With Cardinality Ratio 1:1
- Way 1
 - $A(\underline{a1}, a2, b1)$
 - $B(\underline{b1}, b2)$



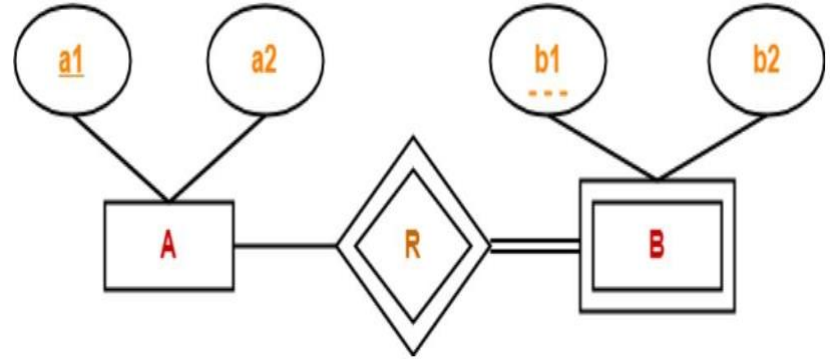
- **Rule - 07:** For Binary Relationship With Cardinality Ratio 1:1
- Way 2
 - $A(\underline{a1}, a2)$
 - $B(\underline{b1}, b2, a1)$

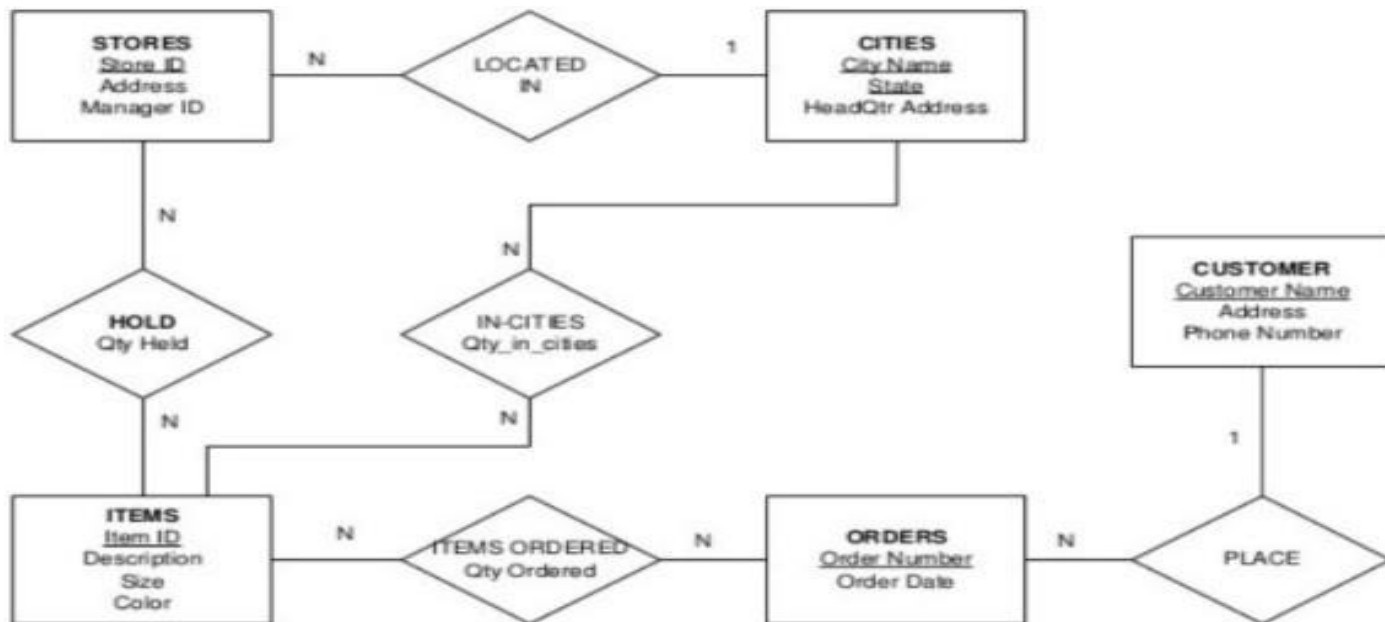


- **Rule - 08:** For Binary Relationship With Cardinality Constraint and Total Participation Constraint From Both Sides
- **ARB**(a1,a2,b1,b2)



- **Rule - 09:** For Binary Relationship With Weak Entity Set
- $A(\underline{a1}, a2)$
- $B(\underline{a1}, \underline{b1}, b2)$





1. Cities(cityname,state,headQtrAddr)
2. Stores(Store_id,address,manager_id,
cityname,state)
3. Items(item_id,Description,Size,Color)
4. Hold(Qtyheld,Store Id,Item Id)
6. Customer(customer_name,address,phon
enumber)
7. Orders(ordernumber,orderdate,customername)
8. Itemsordered(qtyordered,ordernumber,itemid)

