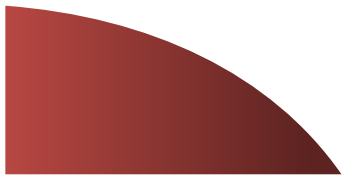


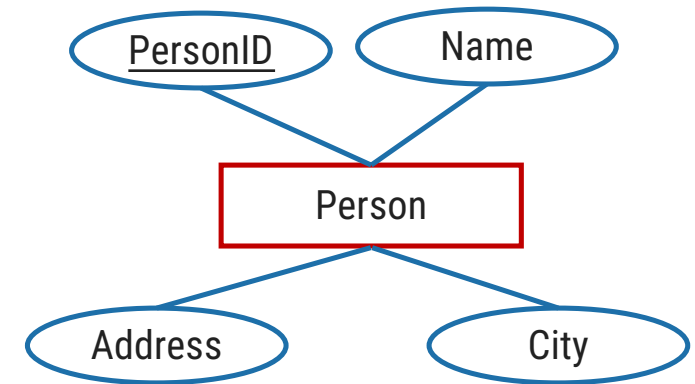
Reduce the E-R diagram to Database Schema or Conversion



Reduce the E-R diagram to database schema

Rule 1: For Strong **Entities** with Only **Simple Attributes**:

- ▶ Each **attribute** (except multi-valued and composite attribute) **turns into** a **column** (attribute) in the table.
- ▶ **Table name** can be same as **entity name**.
- ▶ The **primary key** of the table will be the **key attribute** of the entity set.
- ▶ It is highly recommended that every table should start with its primary key attribute, conventionally named as TableNameID.



Schema: Person (PersonID, Name, Address, City)

Person			
<u>Person ID</u>	Name	Address	City

Reduce the E-R diagram to database schema

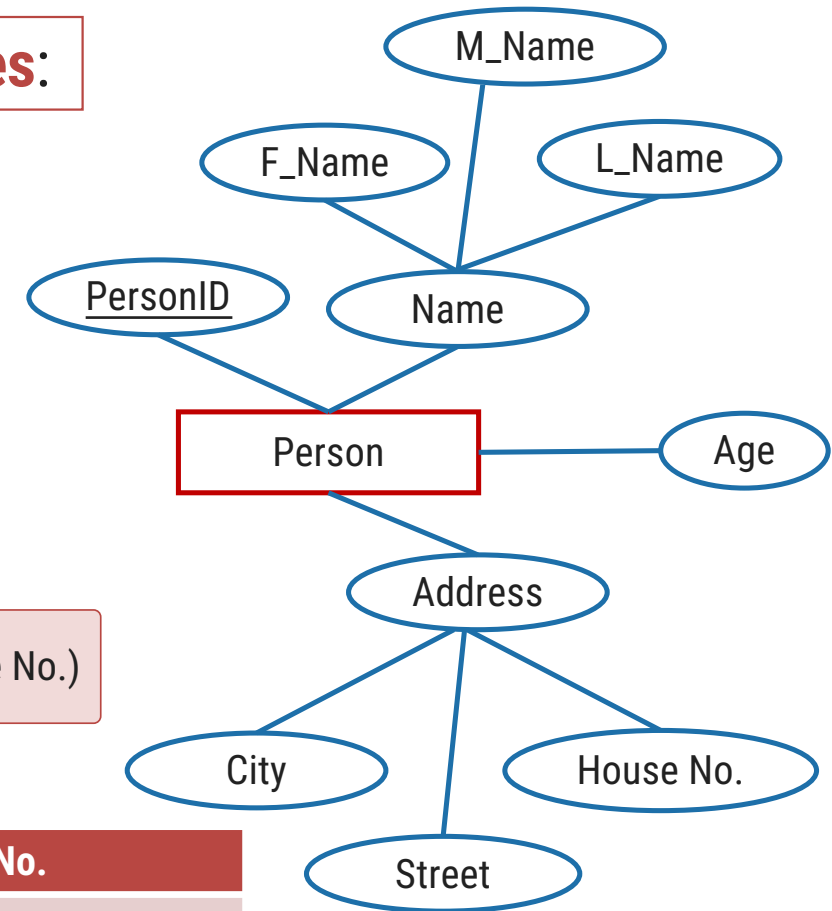
Rule 2: For Strong **Entities** with Composite **Attributes**:

- ▶ 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.

Schema: Person (PersonID, F_Name, M_Name, L_Name, Age, City, Street, House No.)

Person

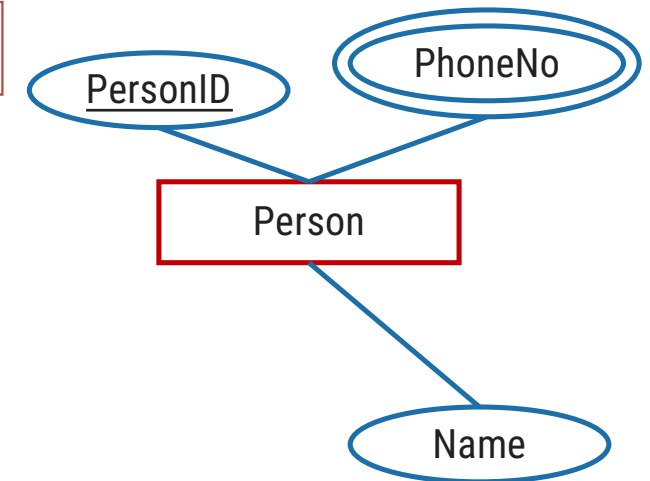
Person ID	F_name	M_Name	L_Name	Age	City	Street	House No.



Reduce the E-R diagram to database schema

Rule 3: For Strong **Entities** with **Multi-valued Attributes**:

- ▶ For each **multivalued attribute A**, create a **new table**.
- ▶ **Add** the **primary key** column into **multi-value attribute's table**.
- ▶ If the multivalued attribute is composite, we include its simple components.



Foreign Key

Schema: Person (PersonID, Name)
Person_No. (PersonID, PhoneNo)

Composite key

Person

<u>Person ID</u>	Name

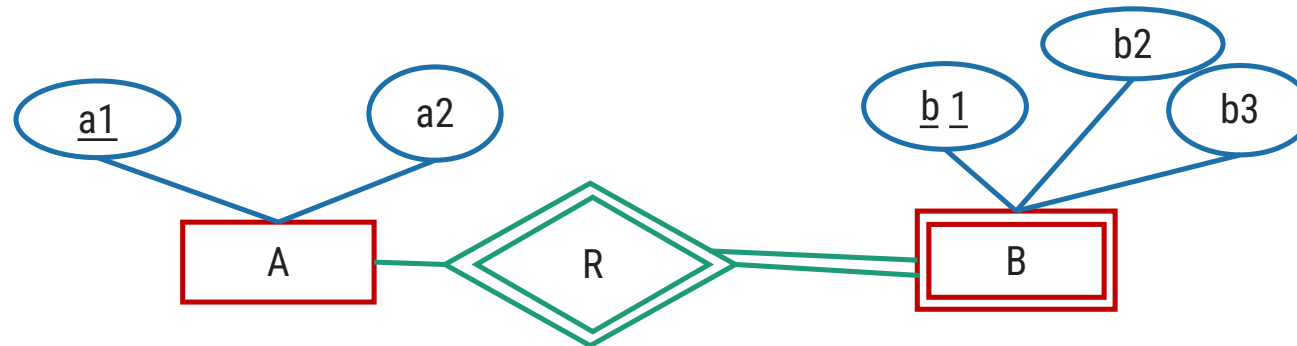
Person_No.

<u>Person ID</u>	<u>PhoneNo.</u>

Reduce the E-R diagram to database schema

Rule 4: For Binary Relationship With **Weak Entity Set**

- ▶ Weak entity set always appears in association with identifying relationship with total participation constraint.



Schema: A (a1, a2)
BR (a1, b1, b2, b3)

A	
<u>a1</u>	a2

BR			
<u>a1</u>	<u>b1</u>	b2	b3

Reduce the E-R diagram to database schema

Rule 5: For Binary Relationships With Cardinality Ratios-

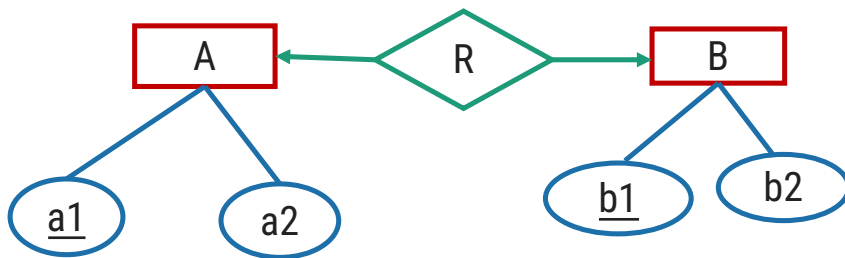
Rule 5.1- 1:1 Mapping Cardinality

Case-I Partial Participation Constraint from both side -

- Place the **primary key** of any **one table** in to the **another table** as a **foreign key**.
- Place the primary key (**RollNo**) of the **Student** table in the **Books** table as Foreign key.

OR

- Place the primary key (**BookID**) of the **Books** table in the **Student** table as Foreign key.



Foreign Key

Schema: A (a1, a2)

BR (b1, b2, a1)

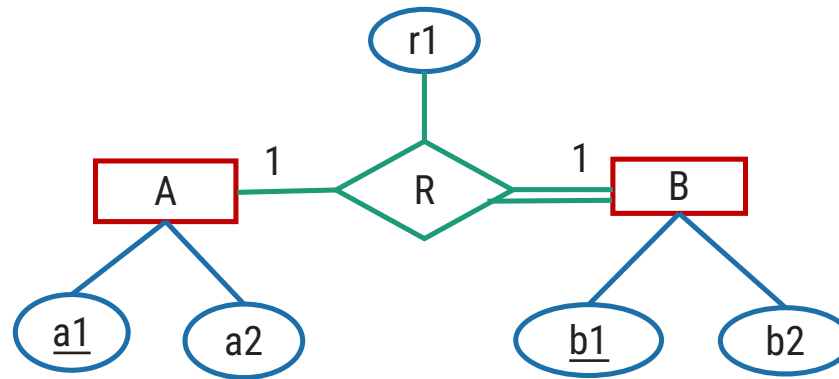
Schema: B (b1, b2)

AR (a1, a2, b1)

Foreign Key

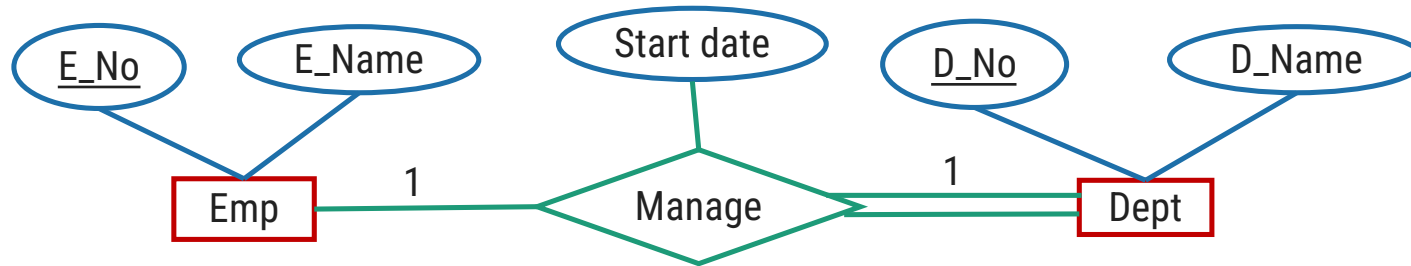
Reduce the E-R diagram to database schema

- Rule 5.1: For Binary Relationship With **1:1 Cardinality Constraint**
Case-II Total Participation Constraint at one side-



Two tables are required-

A (a1, a2)
BR (b1, b2, a1, r1)

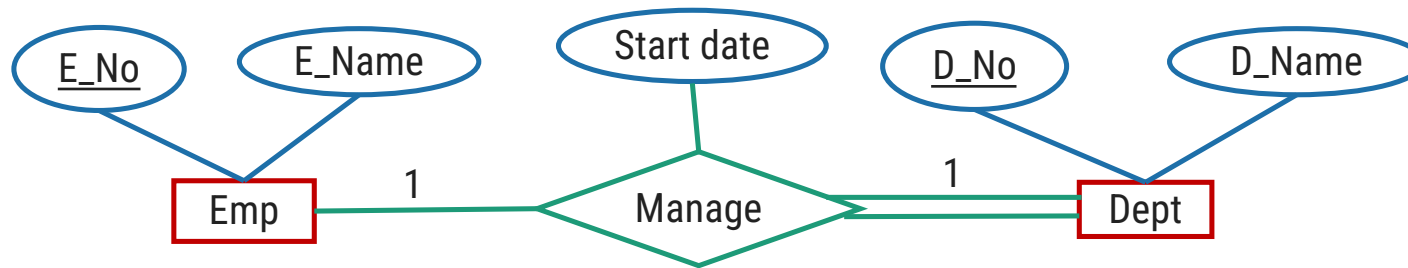


- The relationship Manage will have the start date of the employees who manage a particular Dept. Since Emp is partially participating here, which means not every employee is a manager.

<u>E_No</u>	E_Name
1	A
2	B
3	C
4	B

<u>D_No</u>	D_Name	Start date	E_No
11	CSE	14/05/2022	1
22	IT	24/02/2022	2
33	ECE	3/05/2022	3

FK



<u>E_No</u>	E_Name
1	A
2	B
3	C
4	B

- This relationship manage will have the start date of the employees who manage a particular Dept. Since Emp is partially participating here, which means not every employee is a manager.

<u>E_No</u>	E_Name	Start date
1	A	Null
2	B	Null
3	C	14/05/2022
4	B	24/02/2022

<u>D_No</u>	D_Name
11	CSE
22	IT
33	ECE

- To avoid null values we keep Start Date in Dept (total participation)

<u>D_No</u>	D_Name	Start date	E_No
11	CSE	14/05/2022	1
22	IT	24/02/2022	2
33	ECE	3/05/2022	3

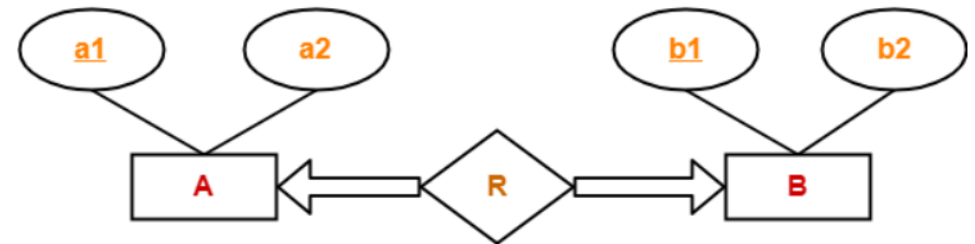
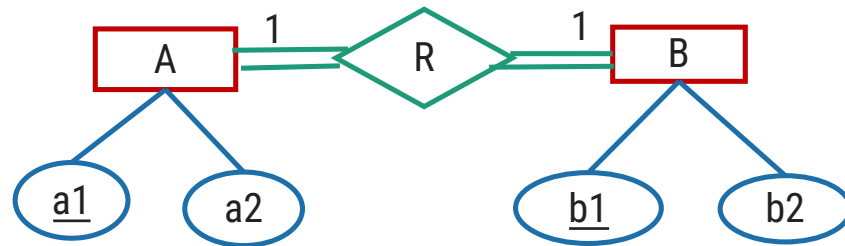
Why E_No is added here?
If we want to know the name of manager of CSE department, then D_Name → E_No → E_Name

FK

Reduce the E-R diagram to database schema

► Rule 5.1: For Binary Relationship With **1:1 Cardinality Constraint**

Case-III **Total Participation Constraint From Both Sides-**



Only one table is required-

ARB (a1 , a2 , b1 , b2)

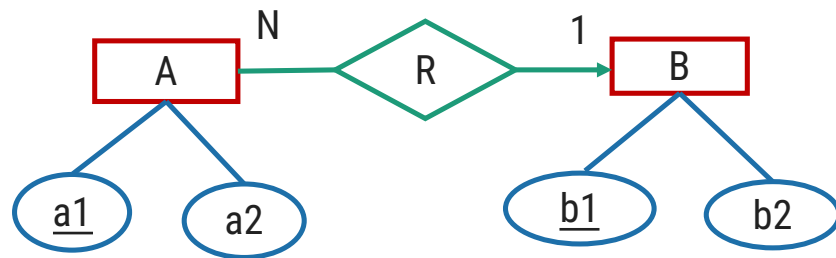
or

ARB (b1 , b2 , a1 , a2)

Reduce the E-R diagram to database schema

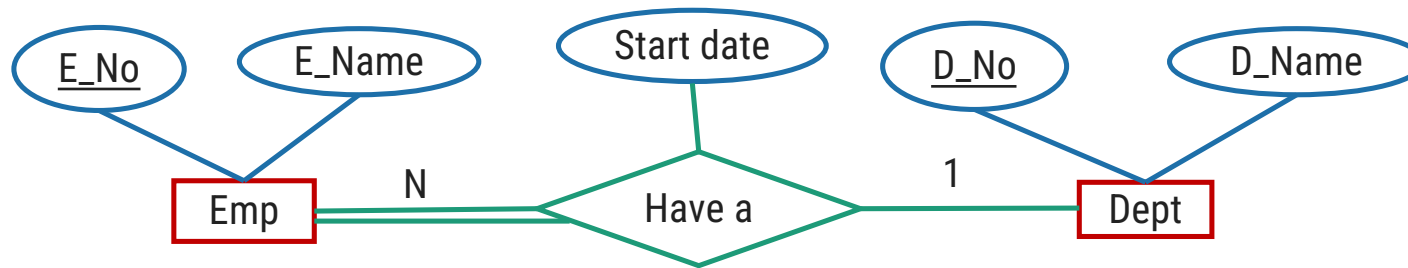
Rule 5.2- 1:N Mapping Cardinality:

- ▶ Place the **primary key** of **table having 1 mapping** into the another **table having many cardinality** as a **Foreign key**.
- ▶ Place the primary key of the Person table PersonID in the table House as Foreign key.



Schema: B (b1, b2)
AR (a1, a2, b1)

Foreign Key



- Every employee have a department, each department have multiple employees.

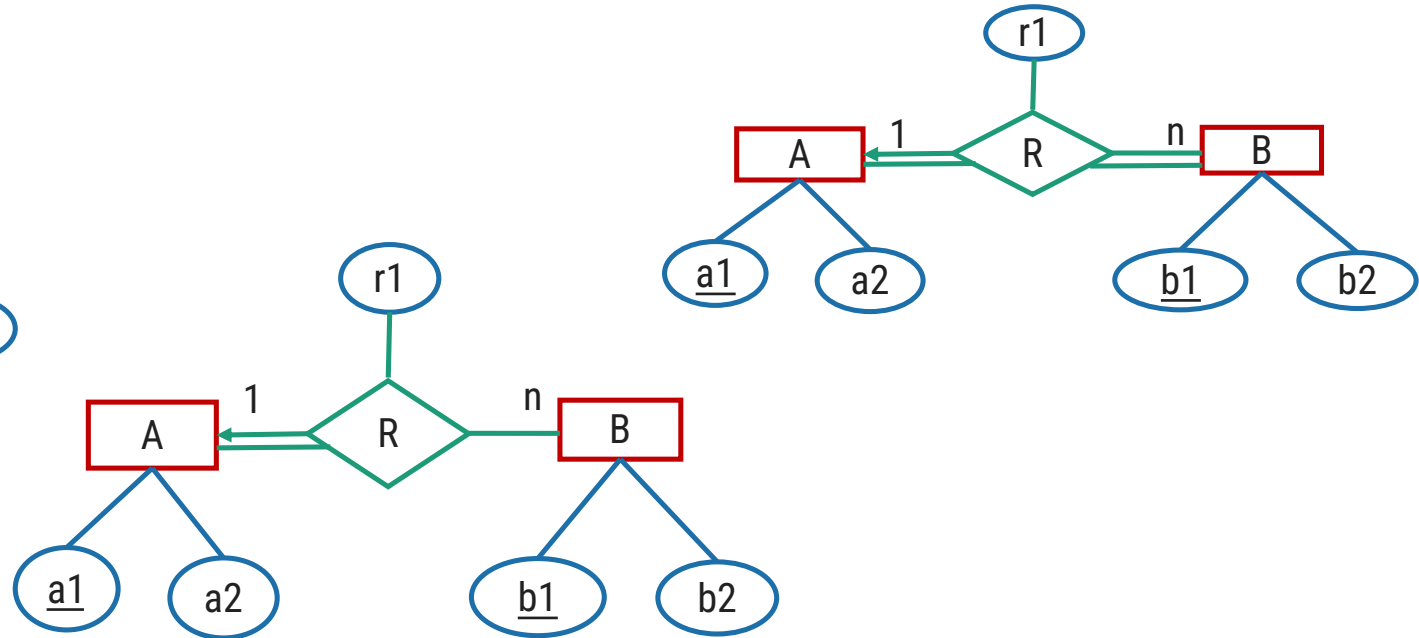
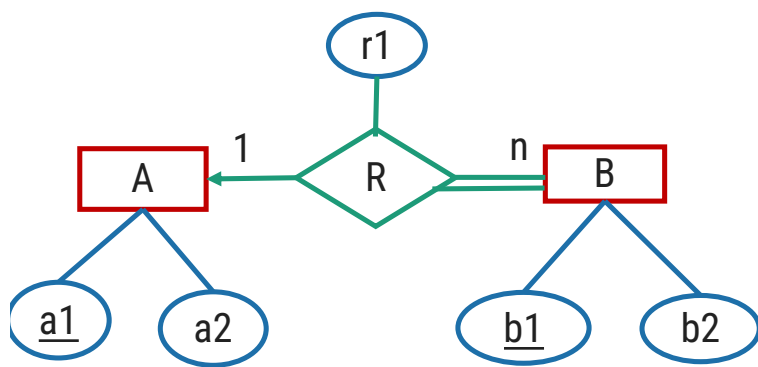
<u>E_No</u>	E_Name	Start date	D_No	<u>D_No</u>	D_Name
1	A	01/01/2022	11	11	CSE
2	B	3/05/2022	22	22	IT
3	C	14/05/2022	33	33	ECE
4	B	24/02/2022	44		

We can't keep start date in department table because in a department there will be multiple employees and each employee's start date will be different.

<u>E_No</u>	E_Name	D_No	<u>D_No</u>	D_Name	Start date
1	A	11	11	CSE	01/01/2022, 02/02/2022, 03/02/2022
2	B	22			
3	C	33	22	IT	
4	B	44	33	ECE	

Reduce the E-R diagram to database schema

**** For Binary Relationship With 1:n Cardinality Constraint and Participation Constraint on any side does not affect the number of tables!!**



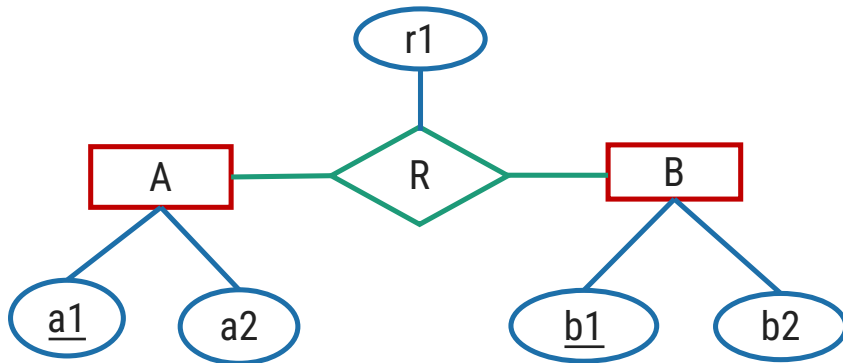
Two tables will be required - A (a1 , a2)
BR (b1 , b2, a1, r1)

Reduce the E-R diagram to database schema

Rule 5.3- N:N Mapping Cardinality:

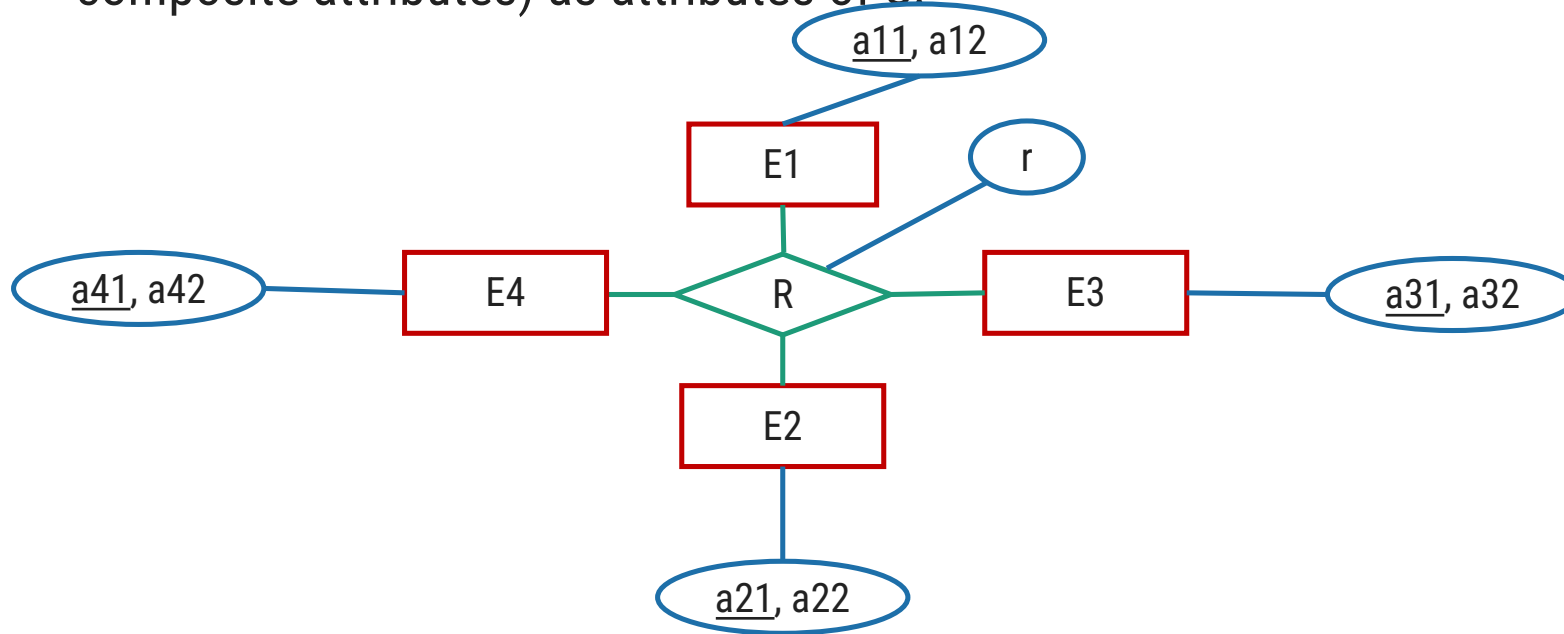
- ▶ Convert both **entities** in to **table** with proper attribute.
 - ▶ Create a **separate table for relationship**.
 - ▶ Attributes of the table are-
 - Primary key attributes of the participating entity sets (of **both entities table**) as **foreign key**
 - Its own descriptive attributes if any.
- three tables will be required in relational model.

Schema: A (a1, a2)
B (b1, b2)
R (a1, b1, r1)



R			A		B	
<u>a1</u>	<u>b1</u>	r1	<u>a1</u>	a2	<u>b1</u>	b2

- ▶ Conversion of n-ary relationship
- ▶ For each n-ary relationship type R, where $n > 2$, create a new relationship S to represent R.
- ▶ Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types.
- ▶ Also include any simple attributes of the n-ary relationship type (or simple components of composite attributes) as attributes of S.



E1 (),
E2 (),
E3 (),
E4 (),
R (a11, a21, a31, a41, r)

Summery of Symbols used in E-R diagram

Customer

Entity

Name

Attribute

Hold

Relationship

EmpID

Primary Key
Attribute

Age

Derived
Attribute

PhoneNo

Multi Valued
Attribute

Payment

Weak Entity

PymtID

Discriminating
Attribute

Issue

Weak Entity
Relationship



Total
Participation



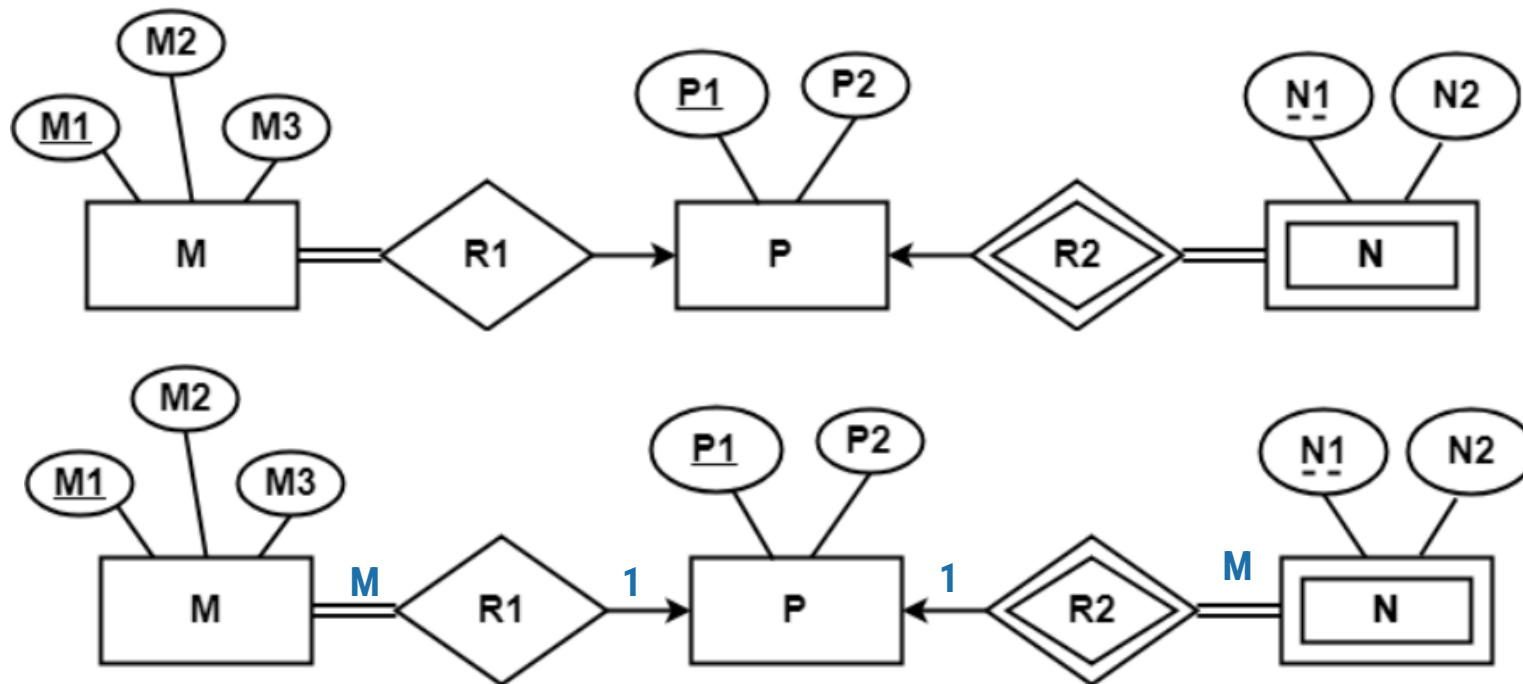
Role
Indicator



Specialization/
Generalization

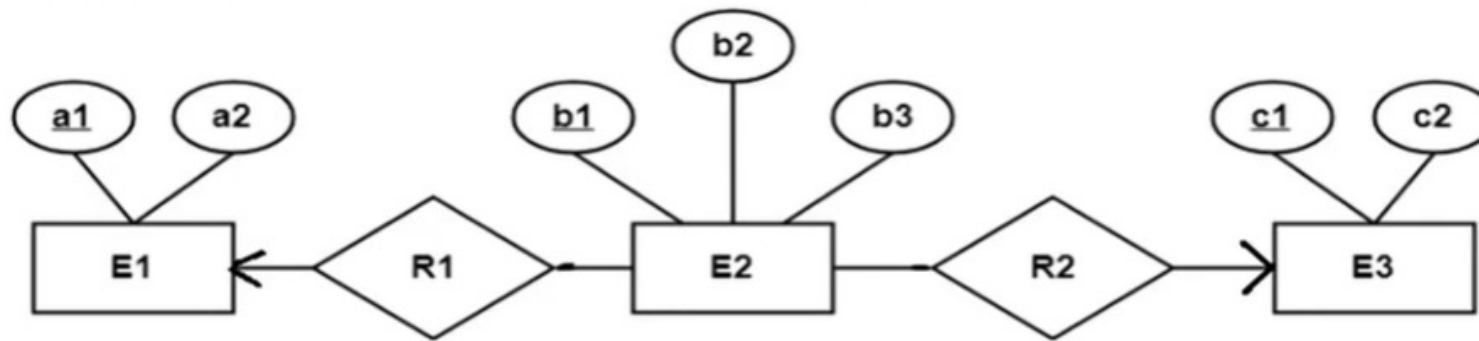
Problems on mapping of E-R diagram to Relational model

Q.1 Find the minimum number of tables required for the following ER diagram in relational model-



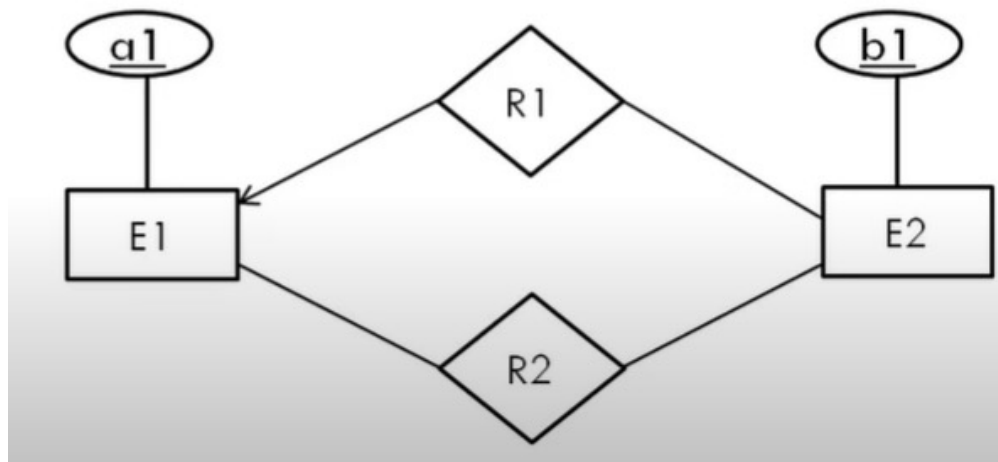
1. MR1 (m1, m2, m3, p1)
2. P (p1, p2)
3. NR2 (n1, p1, n2)

Q.2 Find the minimum number of tables required for the following ER diagram in relational model-



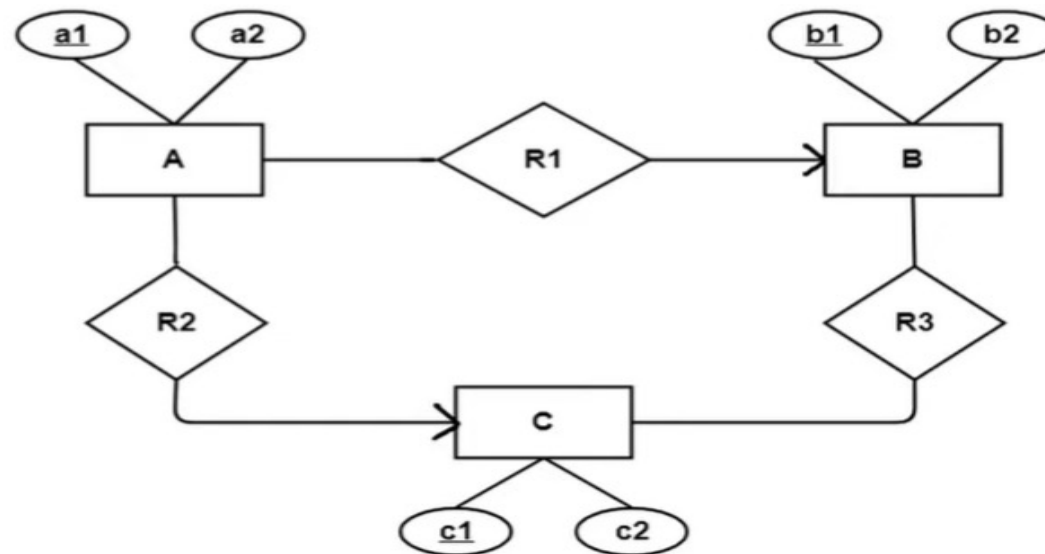
1. E1 (a1, a2)
2. E2 R1 R2 (b1, b2, b3, a1, c1)
3. E3 (c1, c2)

Q.3 Find the minimum number of tables required for the following ER diagram in relational model-



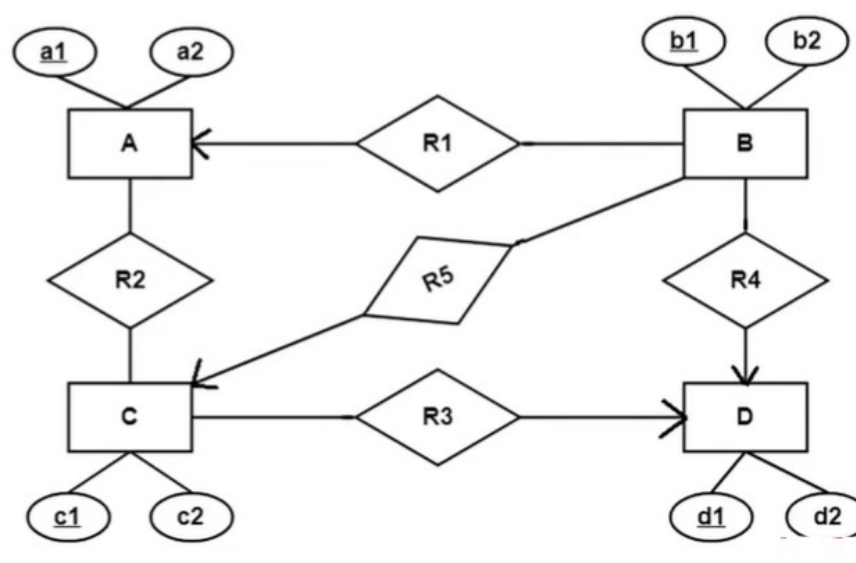
1. E2 R1 (b1, a1)
2. E1 (a1)
3. R2 (a1, b1)

Q.4 Find the minimum number of tables required for the following ER diagram in relational model-



1. A R1 R2 (a1, a2, b1, c1)
2. B (b1, b2)
3. C (c1, c2)
4. R3 (b1, c1)

Q.5 Find the minimum number of tables required for the following ER diagram in relational model-



1. A (a1, a2)
2. B R1 R4 R5 (b1, b2, a1, c1, d1)
3. C R3 (c1, c2, d1)
4. D (d1, d2)
5. R2 (a1, c1)