Recap of Previous Lecture

Topic → ER model & ER diagram

Topic → Relational model & Integrity constraints

Slide

Topics to be Covered

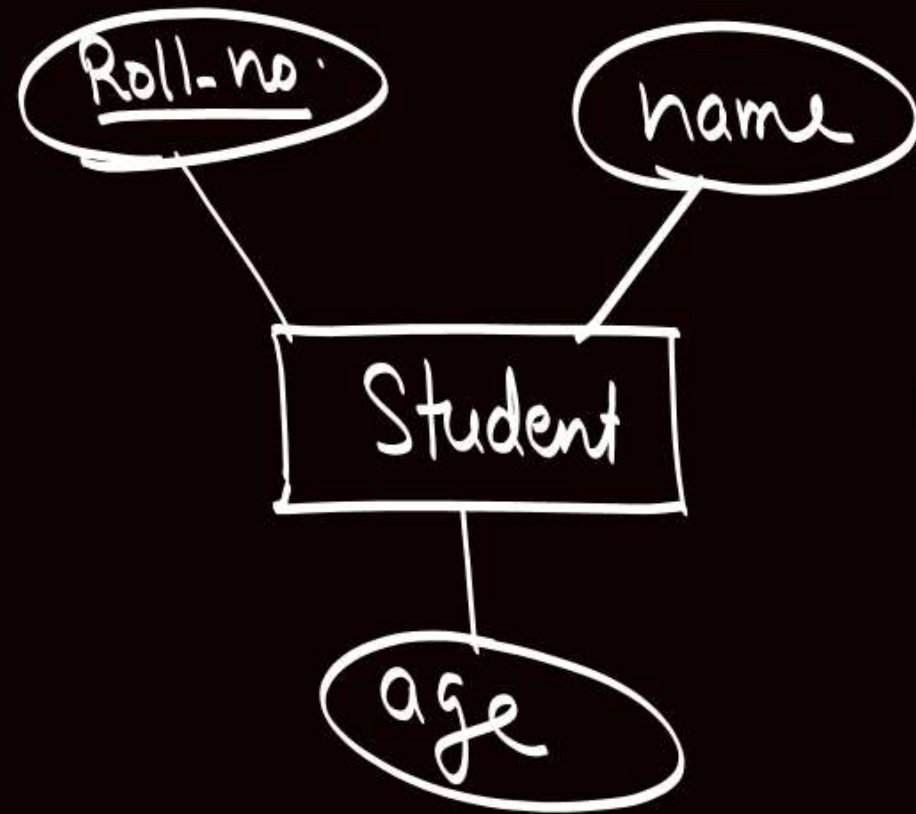**Topic** ER model to relational model

Given an ER diagram $\longrightarrow$ We need to $\longrightarrow$ Define relational tables

* Given an entity set, we will define relation w.r.t. that entity set.
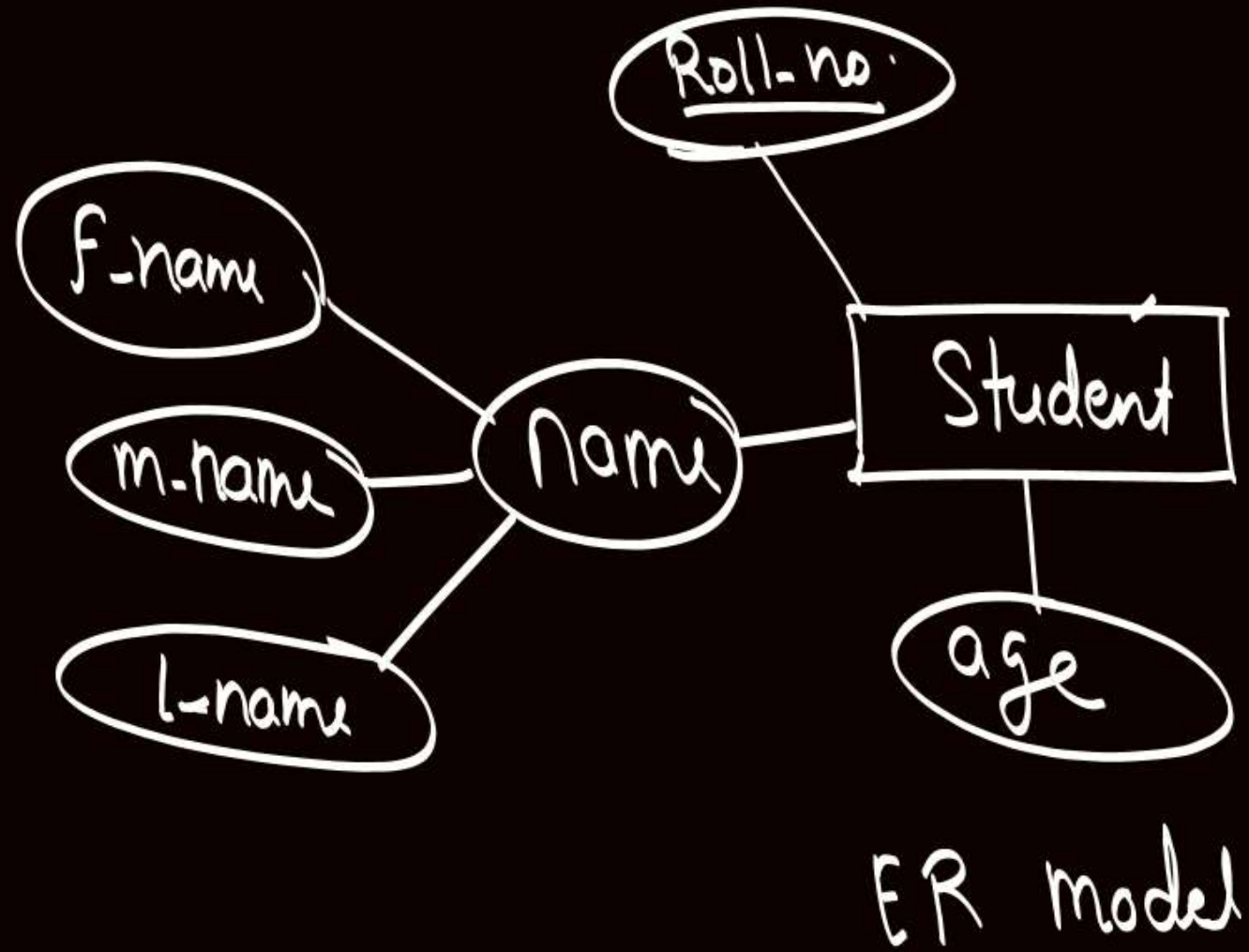
① All attributes are Simple Attributes: –

ER model

Relational table →

Student

Roll-no.	name	Age

Relational Model

* Given an entity set, we will define relation w.r.t. that entity set.

② When some attributes are Composite attributes:—

Roll-no.

f-name

name

m-name

L-name

Student

age

ER model

$\Longrightarrow$ Relational table

{ In relational table We will consider only simple Components of Composite attribute }

Student

Roll-no.	f-name	m-name	L-name	age

Relational Model

③ Some attributes are multivalued Attributes :

Student

Roll-no.	name	Age

Roll-no.

name

Student

Contanct-no

age

ER model
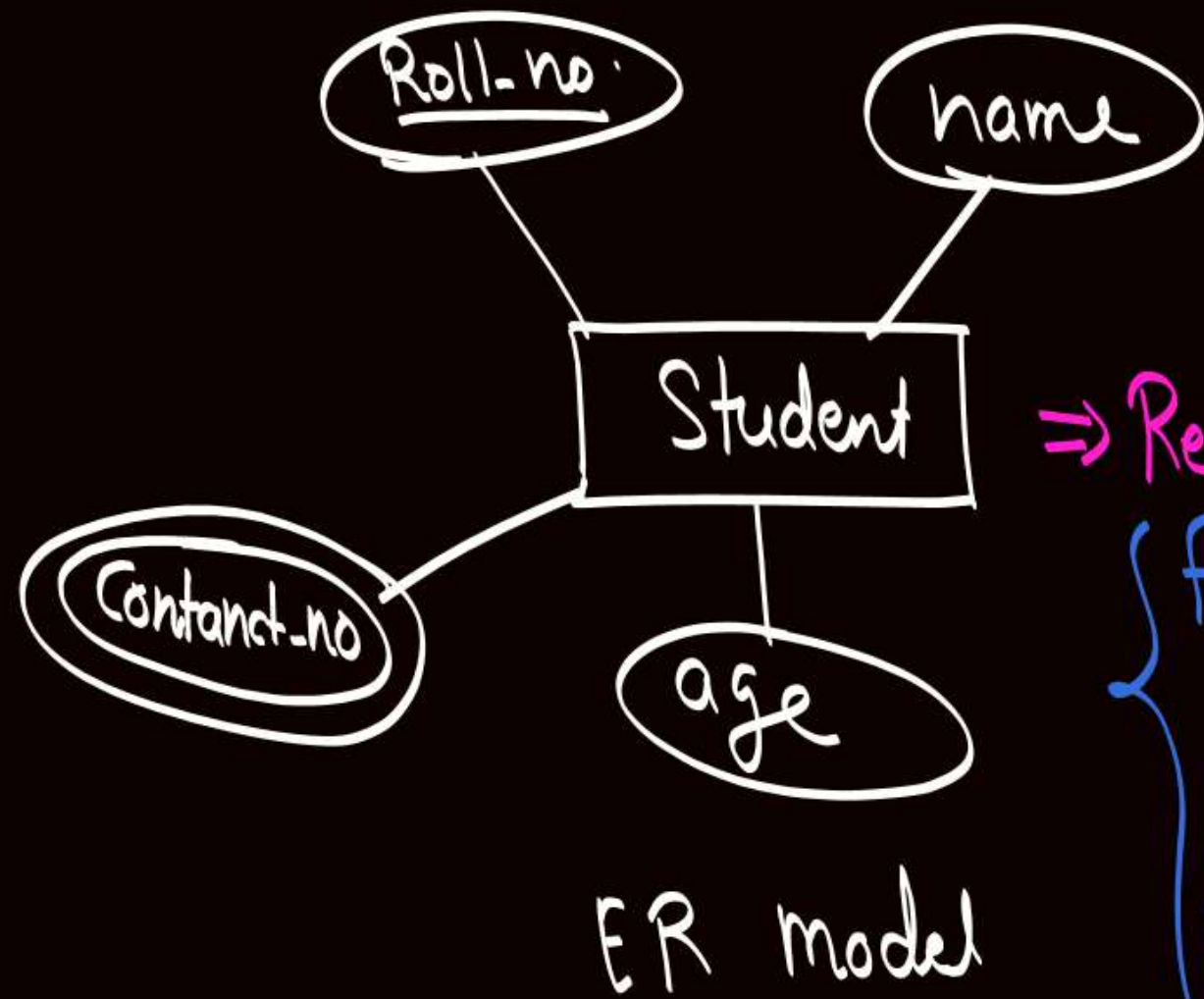
⇒ Relational tables ⇒ Two tables

(one w.r.t all simple attributes)

one w.r.t multivalued attribute

{ for each multivalued attribute a seperate table will be required }

Relational Model

Contact. into

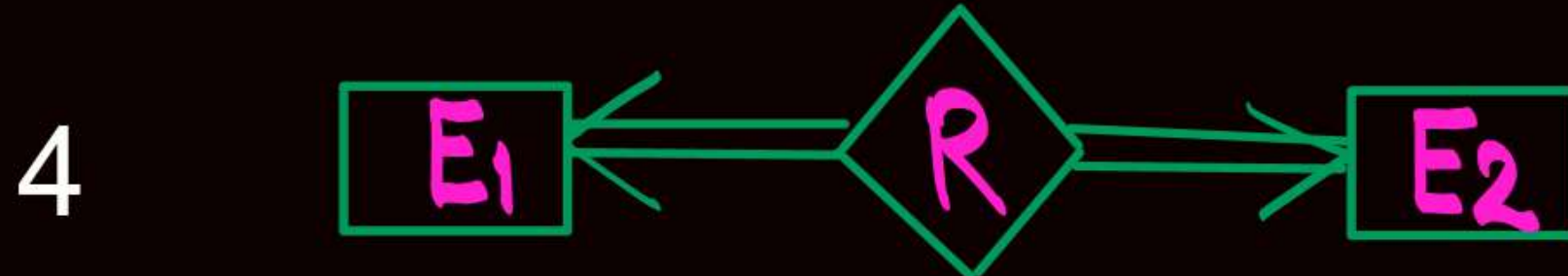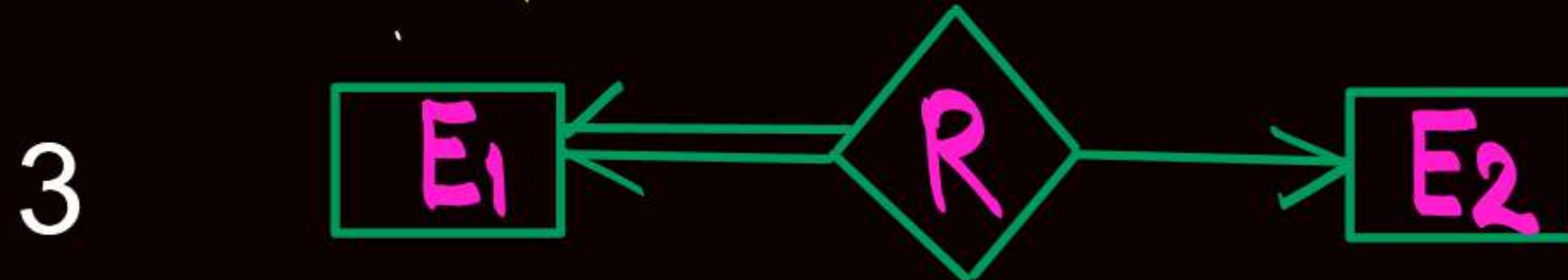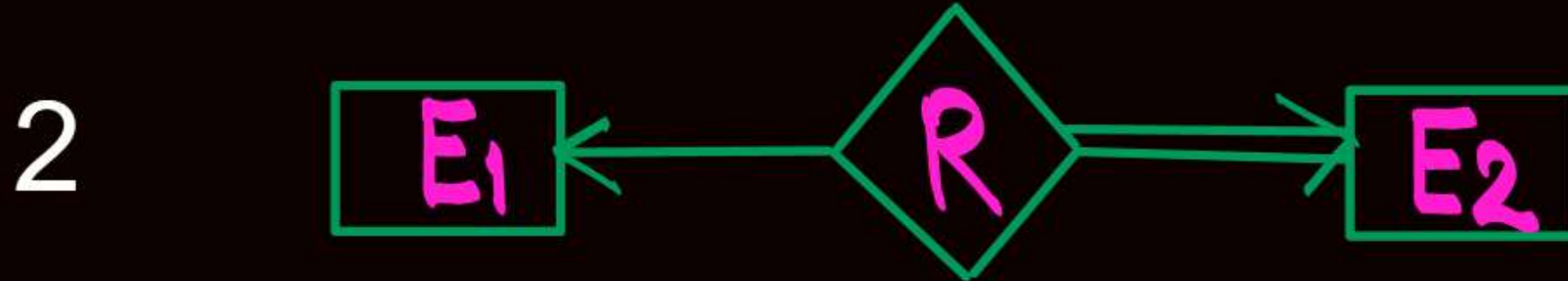| Roll-no	Contact-no

Note: There is no representation of Composite attributes and multivalued attributes in relational model

ER Model to Relational Table

① One to One Relation

1
$$E_1 \longleftarrow R \longrightarrow E_2$$

2
$$E_1 \longleftarrow R \Longrightarrow E_2$$

3
$$E_1 \Longleftarrow R \longrightarrow E_2$$

4
$$E_1 \Longleftarrow R \Longrightarrow E_2$$

ER Model to Relational Table

① one to one Relation { Partial Participation of both Side entities }
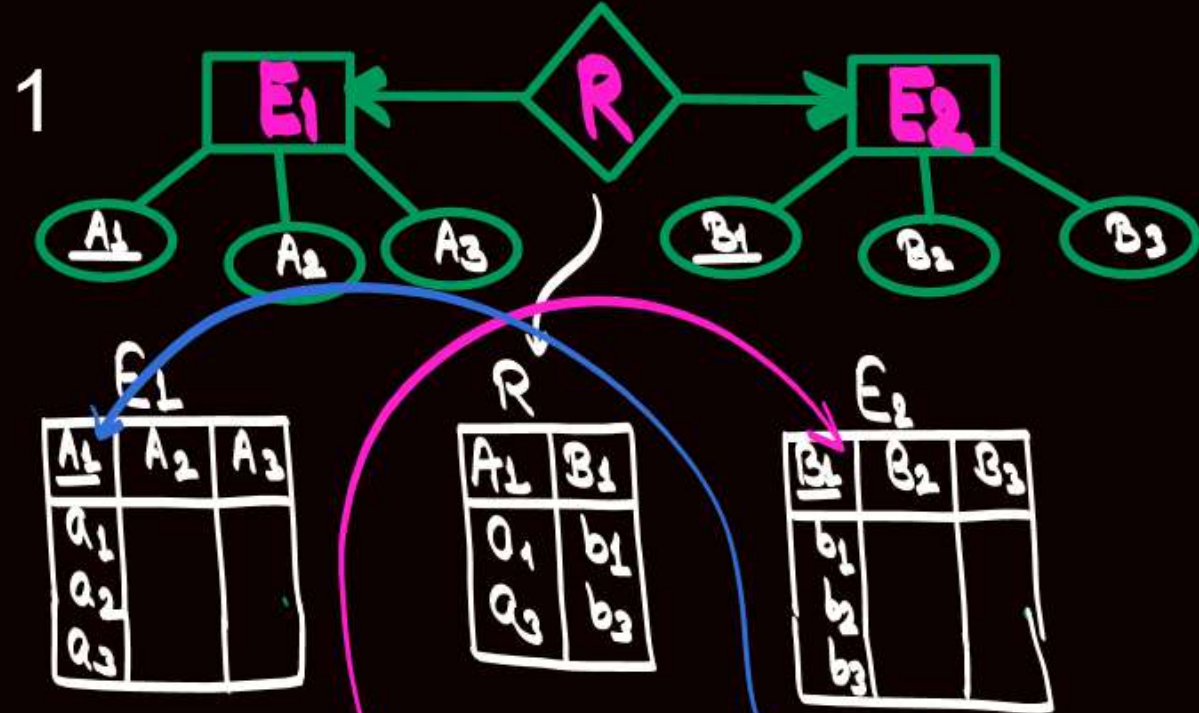
E₁ E₂ R

A₁	A₂	A₃	B₁	B₂	B₃
a₁	—	—	b₁	—	—
a₂	—	—	NULL	NULL	NULL
a₃	—	—	b₃	—	—
NULL	NULL	NULL	b₂	—	—

Can not be Combined into a Single table because no Primary key can be defined

E₁

A₁	A₂	A₃
a₁		
a₂		
a₃		

R

A₁	B₁
a₁	b₁
a₃	b₃

E₂

B₁	B₂	B₃
b₁		
b₂		
b₃		

P.K.

E₁ R

A₁	A₂	A₃	B₁
a₁	—	—	b₁
a₂	—	—	NULL
a₃	—	—	b₃

f.k

(Or)

P.K.

E₂ R

B₁	B₂	B₃	A₁
b₁	—	—	a₁
b₂	—	.	NULL
b₃	—	.	a₃

f.k.

ER Model to Relational Table

① **One to One Relation** { total Participation of one entity }

2

E_1 E_2 R

A_1	A_2	A_3	B_1	B_2	B_3
a_1	—	—	b_1	—	—
a_2	—	—	b_2	—	—
a_3	—	—	Null	—	—

E_1

A_1	A_2	A_3
a_1		
a_2		
a_3		

R

A_1	B_1
a_1	b_1
a_2	b_2

E_2
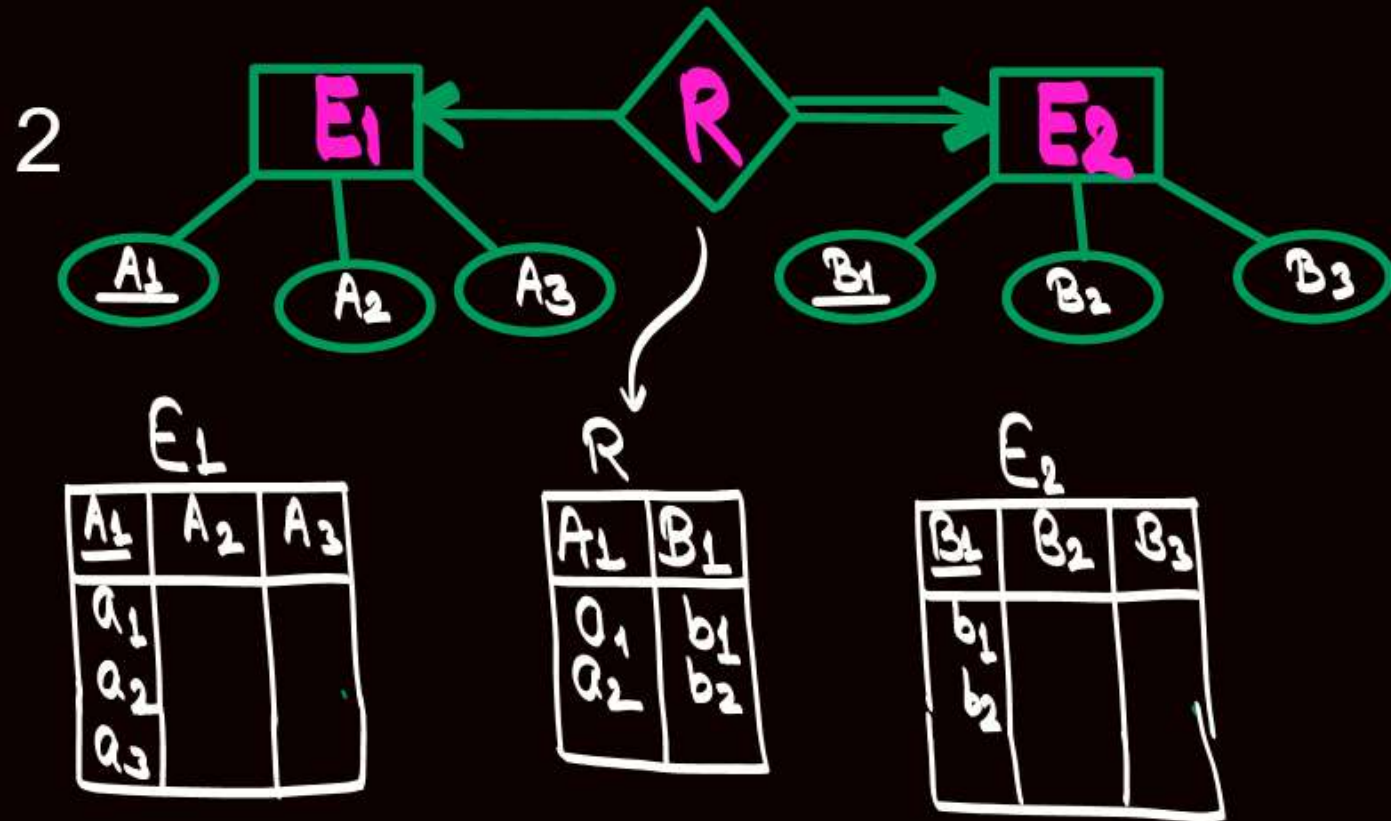
B_1	B_2	B_3
b_1		
b_2		

We can Combine Into a Single table, and P.K. of Combined relation will be Same as Primary key of Entity with Partial Participation i.e. P.K will be Same as P.K. of E_1

ER Model to Relational Table

① One to one Relation { total Participation of one entity}

3

E_1

A_1	A_2	A_3
a_1		
a_2		

R

A_1	B_1
a_1	b_1
a_2	b_2

E_2
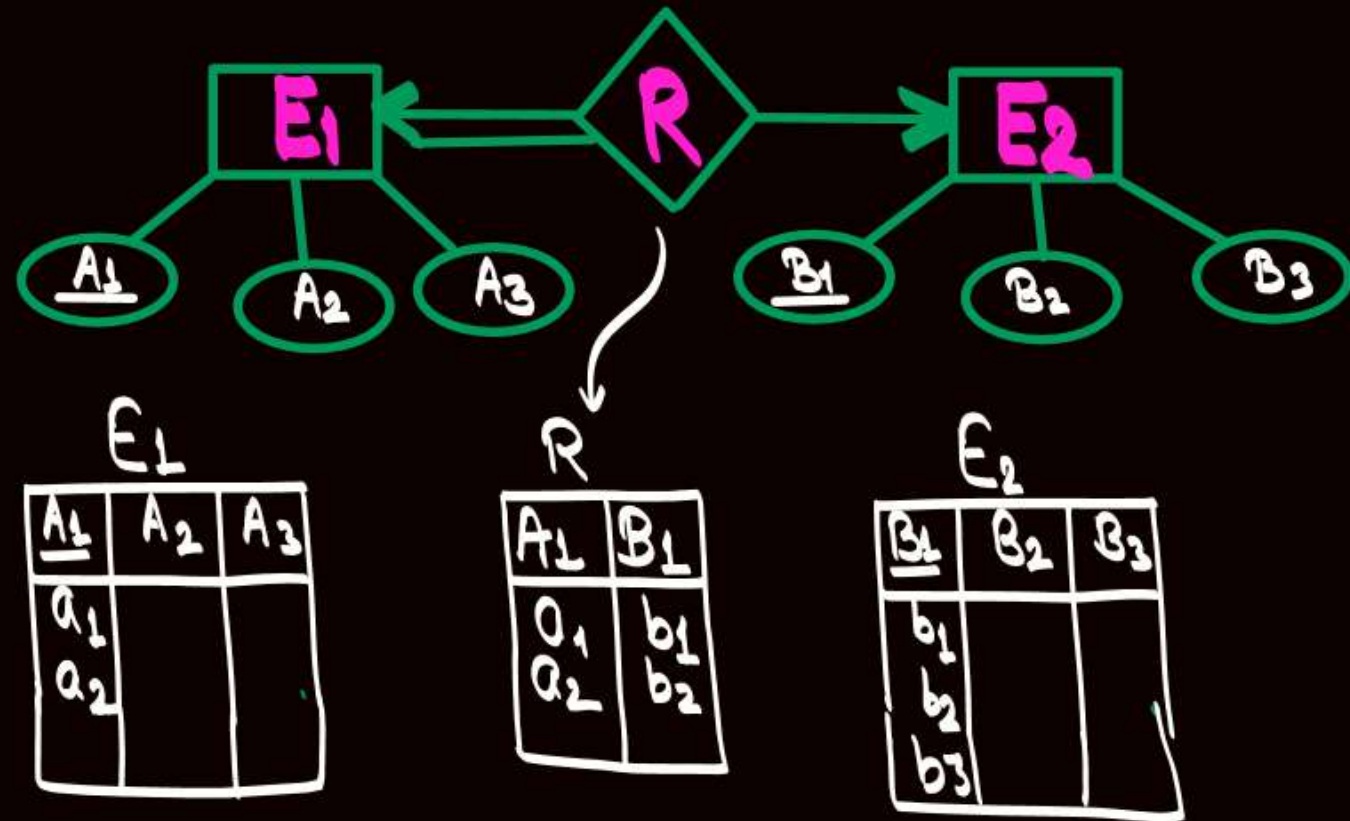
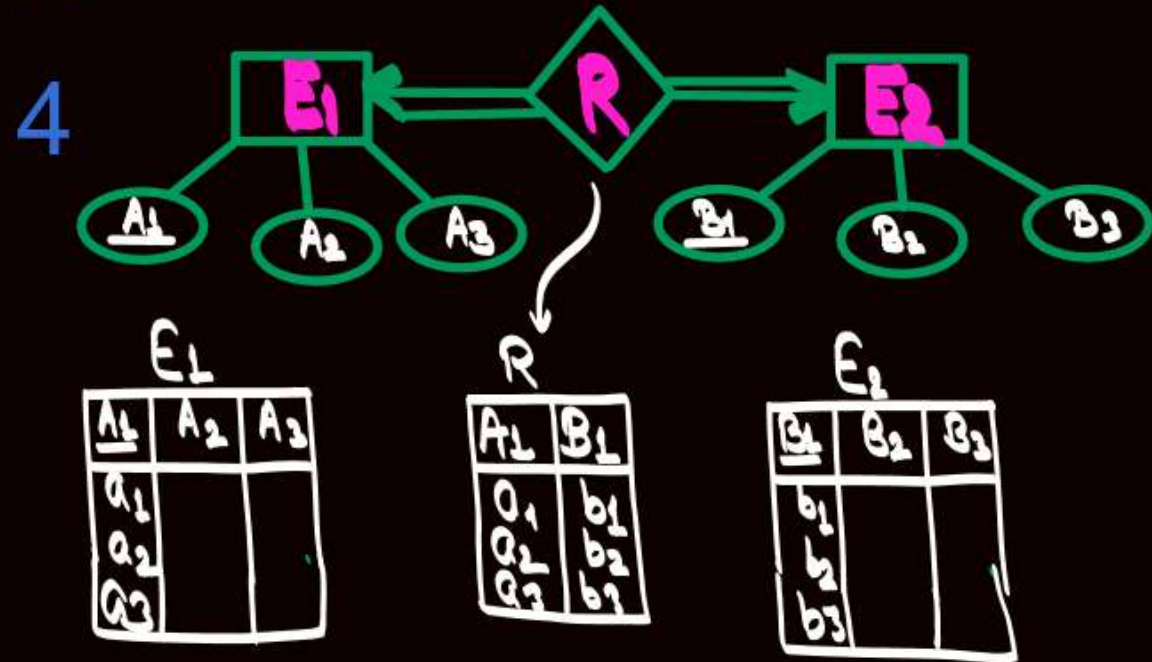| B_1	B_2	B_3
b_1		
b_2		
b_3		

Same as previous case,
they can be combined into
a single table.

And P.K of combined Relation
will be same as P.K. of Entity set E_2

ER Model to Relational Table

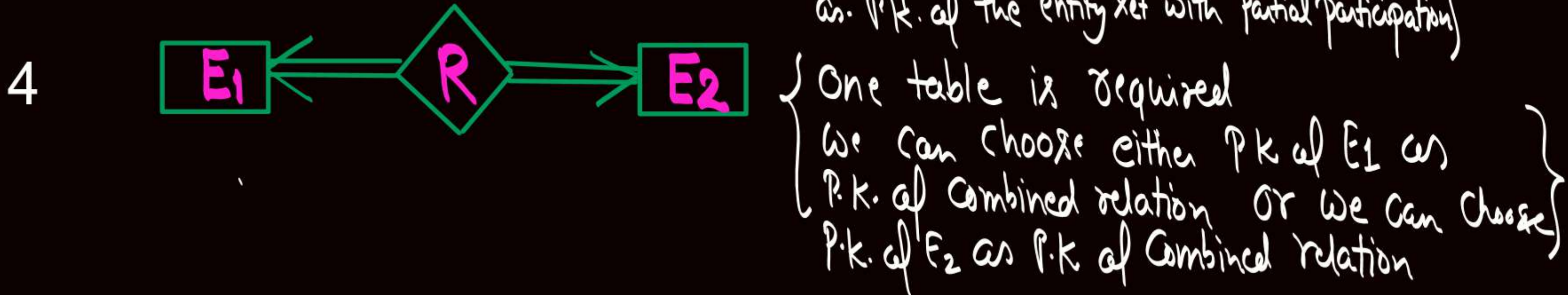① one to one Relation { total Participation of both side entity set }

4

E₁ E₂ R

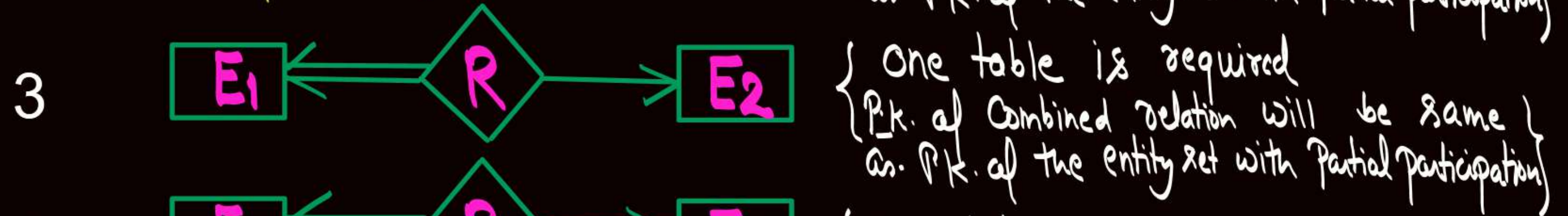| A₁	A₂	A₃	B₁	B₂	B₃
a₁	—	—	b1	—	—
a₂	—	—	b2	—	—
a₃	—	—	b3	—	—

Can be combined into a single relation.

P.k. of Combined relation can be P.k. of E₁ or P.k. of E₂

ER Model to Relational Table

① One to One Relation

1   E₁ ←— R —→ E₂   { Minimum two tables are required }

2   E₁ ←— R ⇒ E₂   { One table is required
                       P.k. of Combined relation will be same
                       as P.k. of the entity set with Partial Participation }

3   E₁ ⇐ R —→ E₂   { One table is required
                       P.k. of Combined relation will be same
                       as P.k. of the entity set with Partial Participation }

4   E₁ ⇐ R ⇒ E₂   { One table is required
                       We can choose either P.k of E₁ as
                       P.k. of Combined relation Or we can choose
                       P.k. of E₂ as P.k of Combined relation }

ER Model to Relational Table
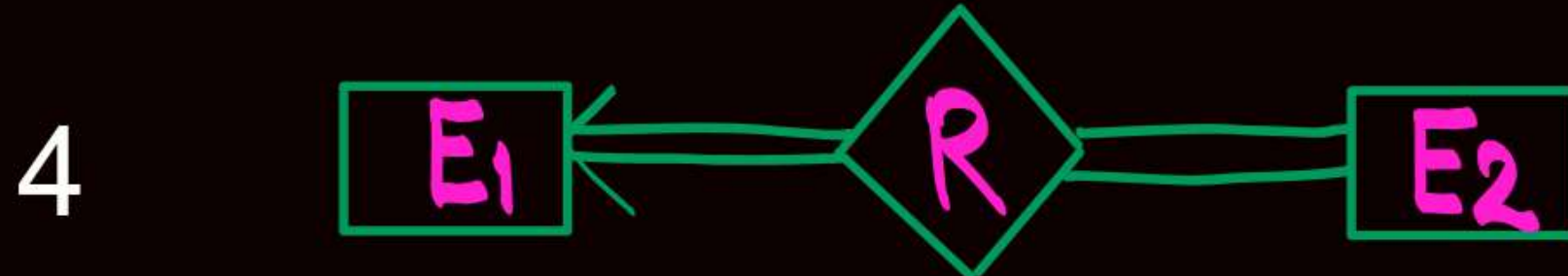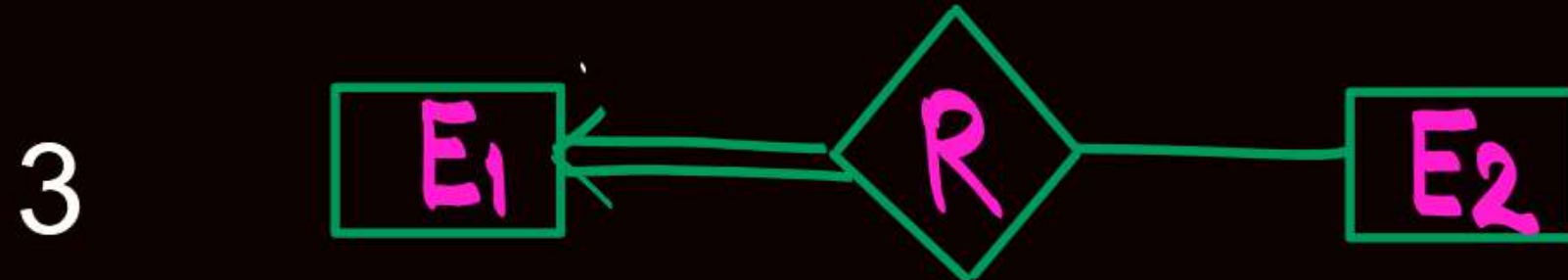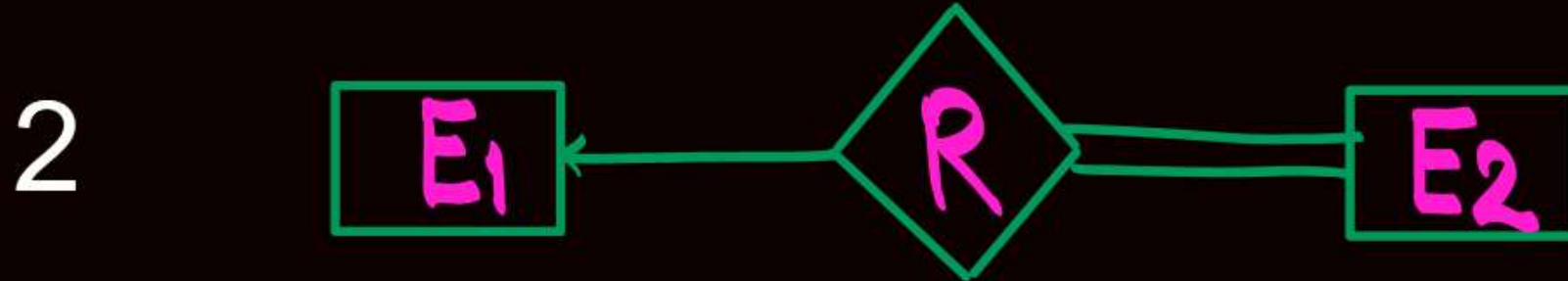
② One to Many Relation

1   E₁ ◄——— R ——— E₂

2   E₁ ◄——— R ═══ E₂

3   E₁ ◄═══ R ——— E₂

4   E₁ ◄═══ R ═══ E₂

ER Model to Relational Table

② **one to Many Relation** { Partial Participation of both side entities }

1

E₁ ── R ── E₂

A₁ A₂ A₃   B₁ B₂ B₃

{ We can not combine all three i.e; E₁, E₂ & R into single table }

E₁
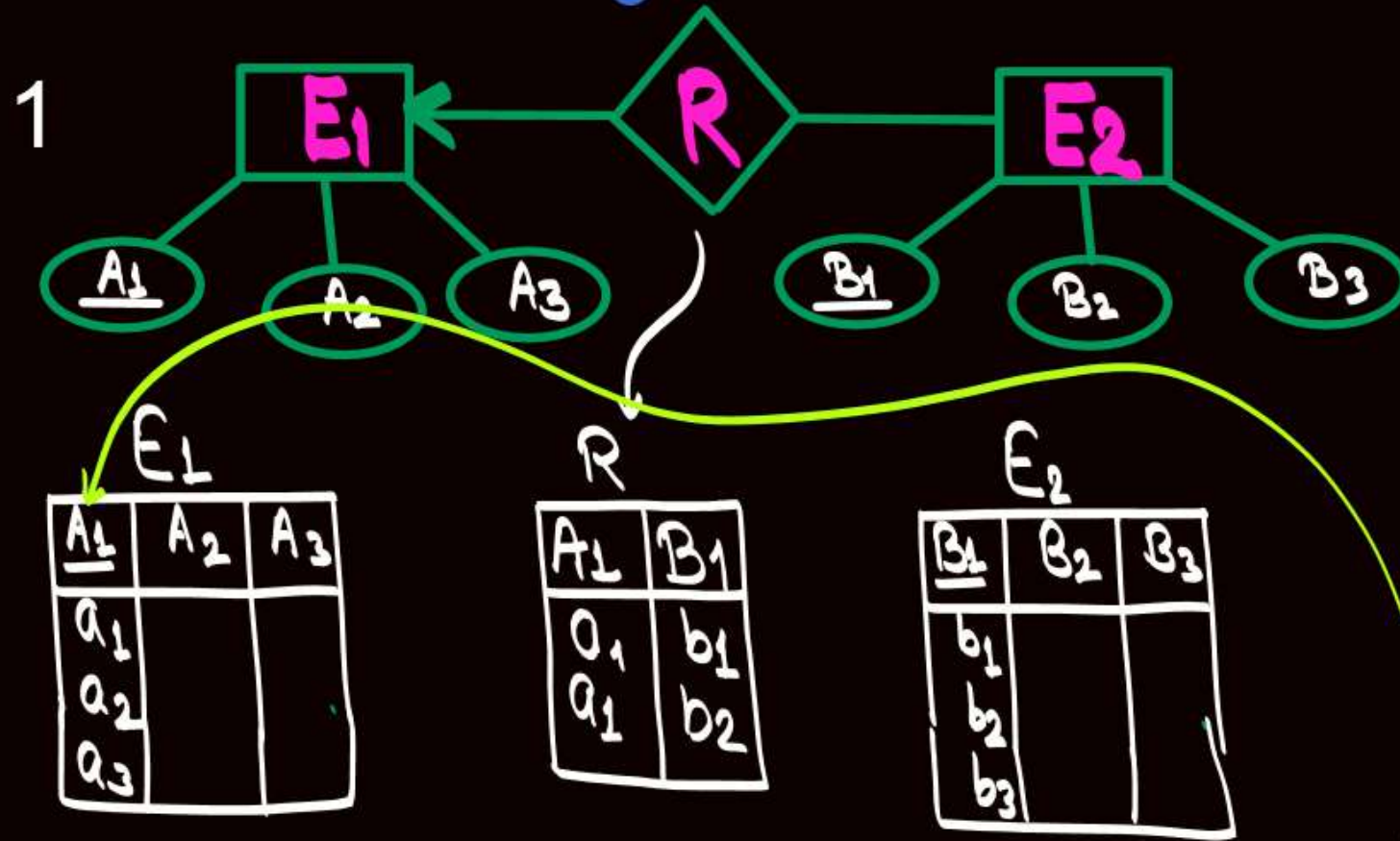
A₁	A₂	A₃
a₁		
a₂		
a₃		

R

A₁	B₁
a₁	b₁
a₁	b₂

E₂

B₁	B₂	B₃
b₁		
b₂		
b₃		

E₁ R

No. P.K.

A₁	A₂	A₃	B₁
a₁	—	—	b₁
a₁	—	—	b₂
a₂	—	—	NULL
a₃	—	—	NULL

{ We can not combine R with E₁ }

E₂ R

P.k

B₁	B₂	B₃	A₁
b₁	—	—	a₁
b₂	—	—	a₁
b₃	—	—	NULL

f.k.

R can be combined with E₂ { i.e. Many side entity }

P.k. will be same as P.k. of many side entity

ER Model to Relational Table

② **one to Many Relation** { Partial Participation of '1' side entity set,
Total Participation of 'Many' side entity set

2

We can not combine all three i.e; E_1, E_2 & R into Single table

E_1

A_1	A_2	A_3
a_1		
a_2		
a_3		

R

A_1	B_1
a_1	b_1
a_1	b_2
a_2	b_3

E_2

B_1	B_2	B_3
b_1		
b_2		
b_3		

$E_1 R$

No. P.K {

A_1	A_2	A_3	B_1
a_1	—	—	b_1
a_1	—	—	b_2
a_2	—	—	b_3
a_3	—	—	NULL

We can not Combine R with E_1

$E_2 R$

P.k {

B_1	B_2	B_3	A_1
b_1	—	—	a_1
b_2	—	—	a_1
b_3	—	—	a_2

f.k.

R Can be combined with E_2 { i.e. Many side } entity
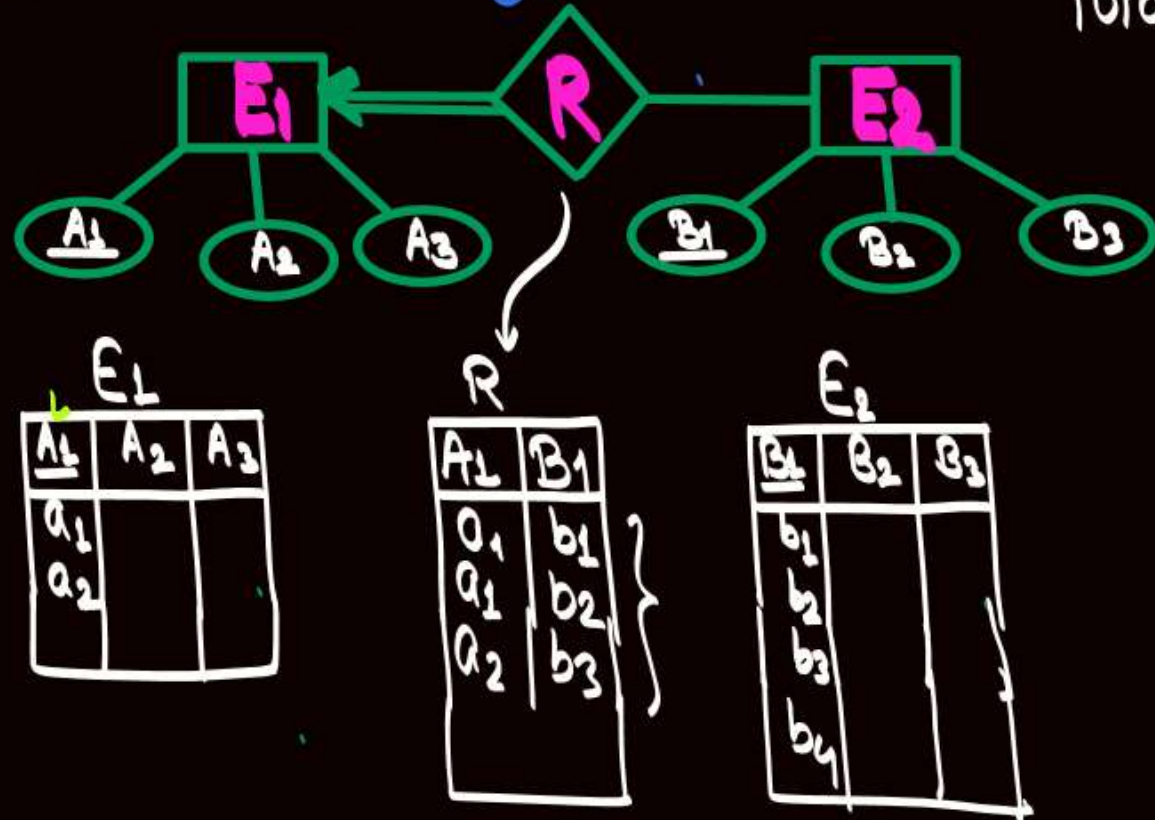
P.k. will be same as P.k. of many side entity

ER Model to Relational Table

② **one to Many Relation** { Partial Participation of "many" side entity set, Total Participation of "1" sid entity set
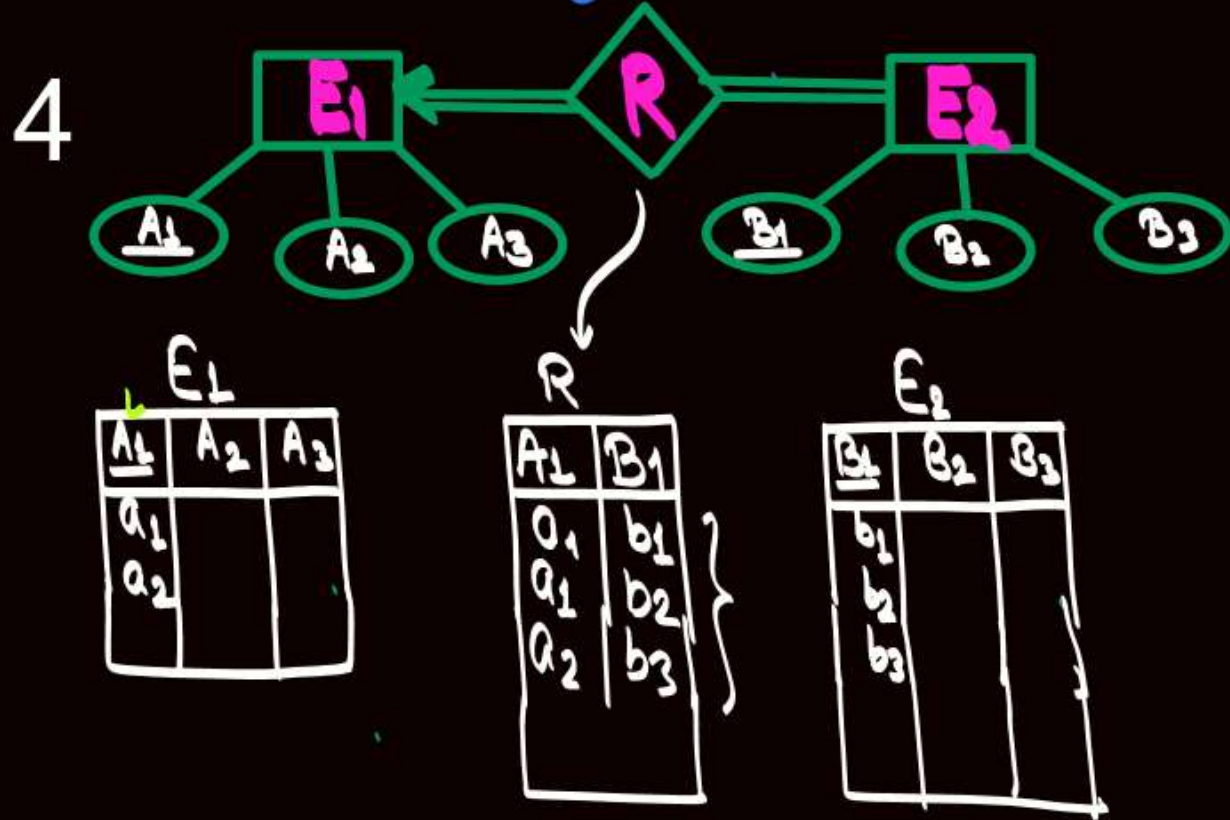
3

E_1 E_2 R

A_1	A_2	A_3	B_1	B_2	B_3
a_4	—	—	b_1	—	—
a_1	—	—	b_2	—	—
a_2	—	—	b_3	—	—
NULL	—	—	b_4	—	—

Can be combined into a single table, and P.K. of Combined relation will be same as P.K. of "many side" entity set.

ER Model to Relational Table

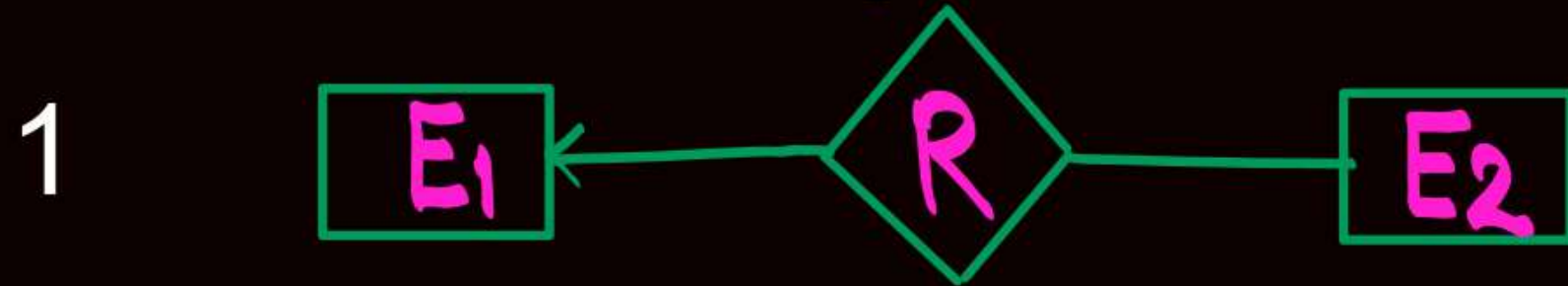② **one to Many Relation** { Total participation of both entity set }

4

E_1 E_2 R

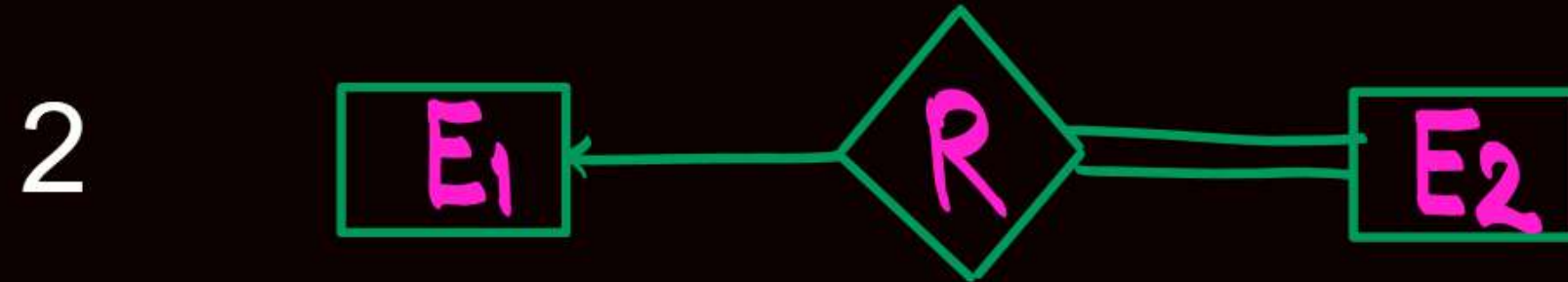| A_1	A_2	A_3	B_1	B_2	B_3
a_4	–	–	b_1	–	–
a_1	–	–	b_2	–	–
a_2	–	–	b_3	–	–
	–	–		–	–

Can be combined into a single table, and P.K. of Combined relation will be same as P.K. of "Many side" entity set.
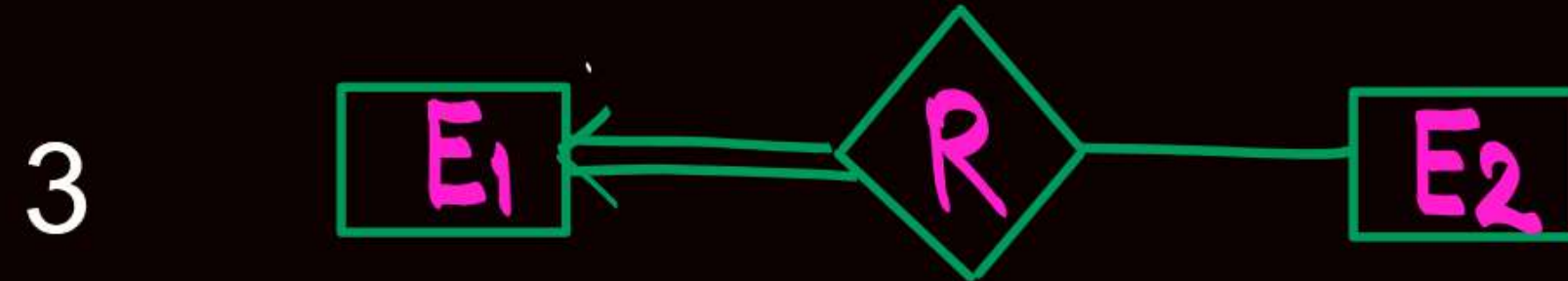
ER Model to Relational Table
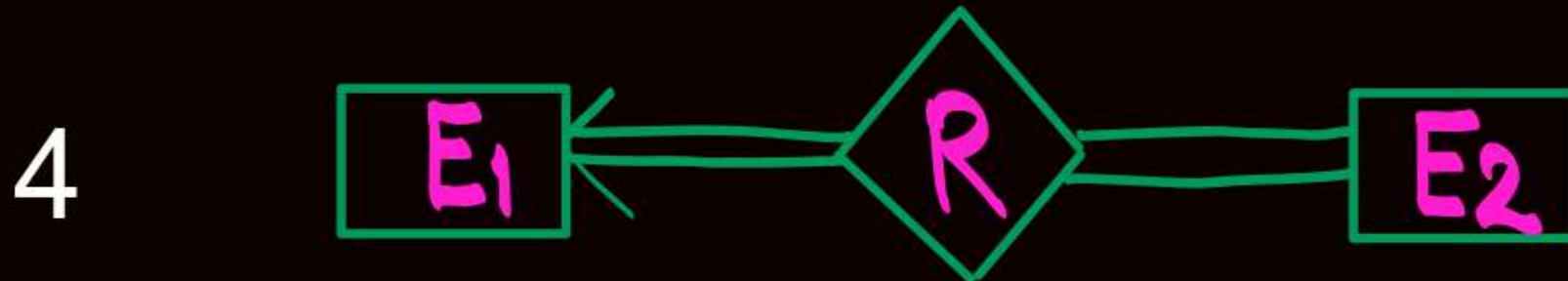
② One to Many Relation

1 $E_1 \leftarrow R \rightarrow E_2$ — Two tables are required. Relation will merge with many side entity set

2 $E_1 \leftarrow R = E_2$ — Two tables are required. Relation will merge with "many" side entity set

3 $E_1 = R \rightarrow E_2$ — only one table is required, P.K. of merged relation will be same as P.K. of many side entity

4 $E_1 = R = E_2$ — only one table is required, P.K. of merged relation will be same as P.K. of many side entity

ER Model to Relational Table

③ Many to One Relation

1 — E_1 — R → E_2 { Two tables are required
Relation will merge with
many side entity set }

2 — E_1 — R ⇒ E_2 { only one table is required,
P.K. of merged relation will be same
as P.K of many side entity }

3 — E_1 ⇒ R → E_2 { Two tables are required
Relation will merge with
"many" side entity set }
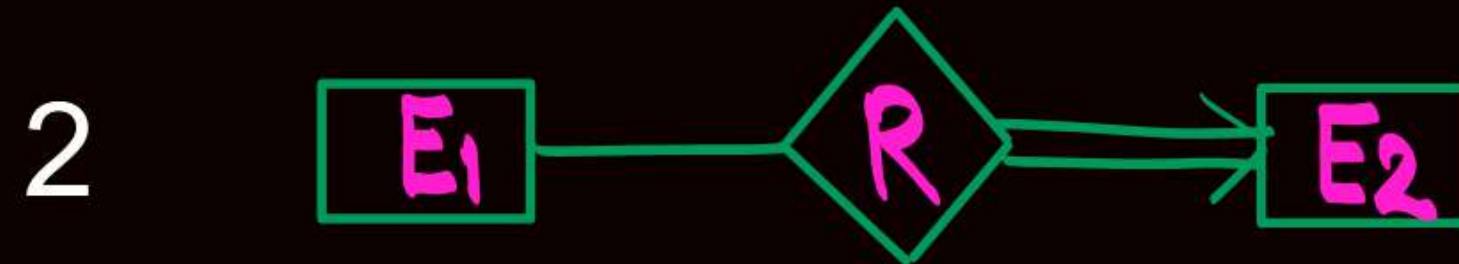
4 — E_1 ⇒ R ⇒ E_2 { only one table is required,
P.K. of merged relation will be same
as P.K of many side entity }

ER Model to Relational Table

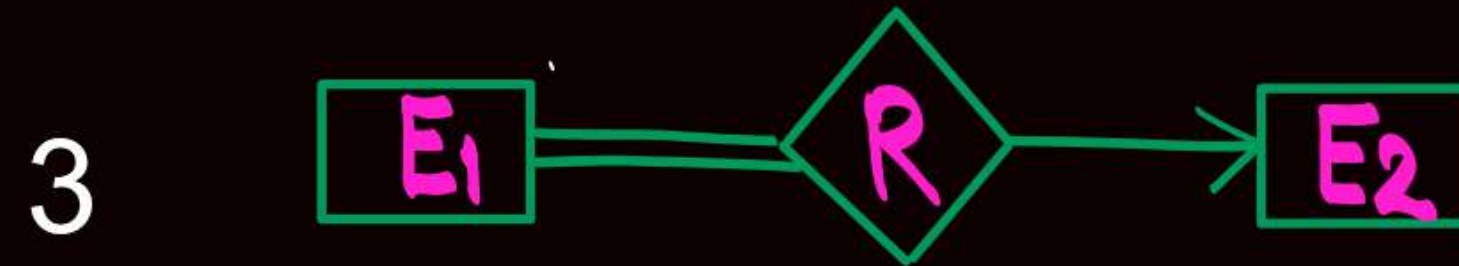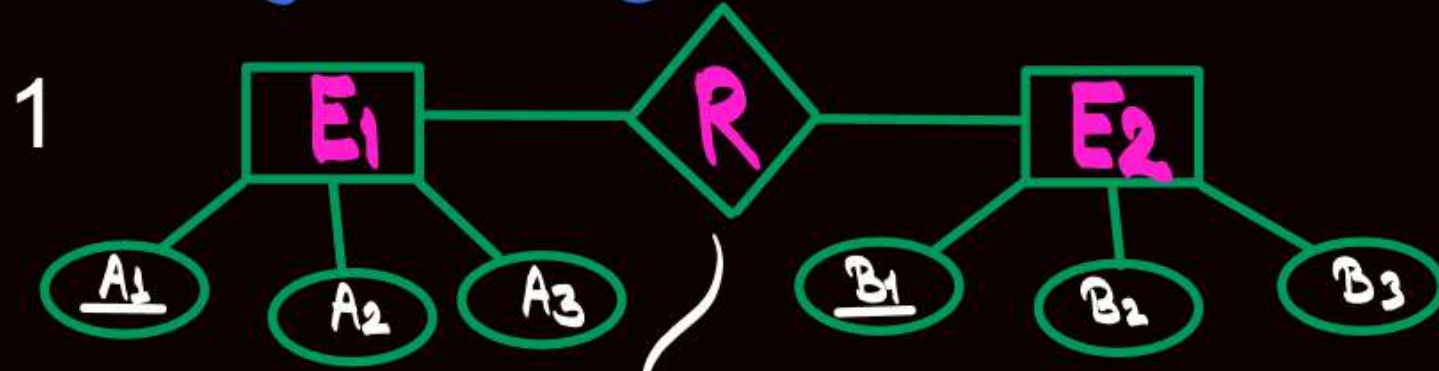④ Many to Many Relation { Partial Participation of both side entities }

1

E_1 —— R —— E_2

E_1: A_1, A_2, A_3

E_2: B_1, B_2, B_3

We will require all three tables in relational model

E_1

A_1	A_2	A_3
a_1		
a_2		
a_3		

R

A_1	B_1
a_1	b_1
a_1	b_2
a_2	b_2

E_2

B_1	B_2	B_3
b_1		
b_2		
b_3		

$E_1 R$

No. P.K {

A_1	A_2	A_3	B_1
a_1	—	—	b_1
a_1	—	—	b_2
a_2	—	—	b_2
a_3	—	—	NULL

$E_2 R$

No. P.K {

B_1	B_2	B_3	A_1
b_1	—	—	a_1
b_2	—	—	a_1
b_2	—	—	a_2
b_3	—	—	NULL

ER Model to Relational Table

④ Many to Many Relation { Partial Participation at one side, total Participation at another side }

2

E_1 — R — E_2

A_1 A_2 A_3 B_1 B_2 B_3

{ we can not combine all three into a single table }

E_1

A_1	A_2	A_3
a_1		
a_2		
a_3		

R

A_1	B_1
a_1	b_1
a_1	b_2
a_1	b_3
a_2	b_3

E_2

B_1	B_2	B_3
b_1		
b_2		
b_3		

F.K. together P.K

$E_1 R$

A_1	A_2	A_3	B_1
a_1	—	—	b_1
a_1	—	—	b_2
a_1	—	—	b_3
a_2	—	—	b_3
a_3	—	—	NUll

NO. }
P.K. }

$E_2 R$

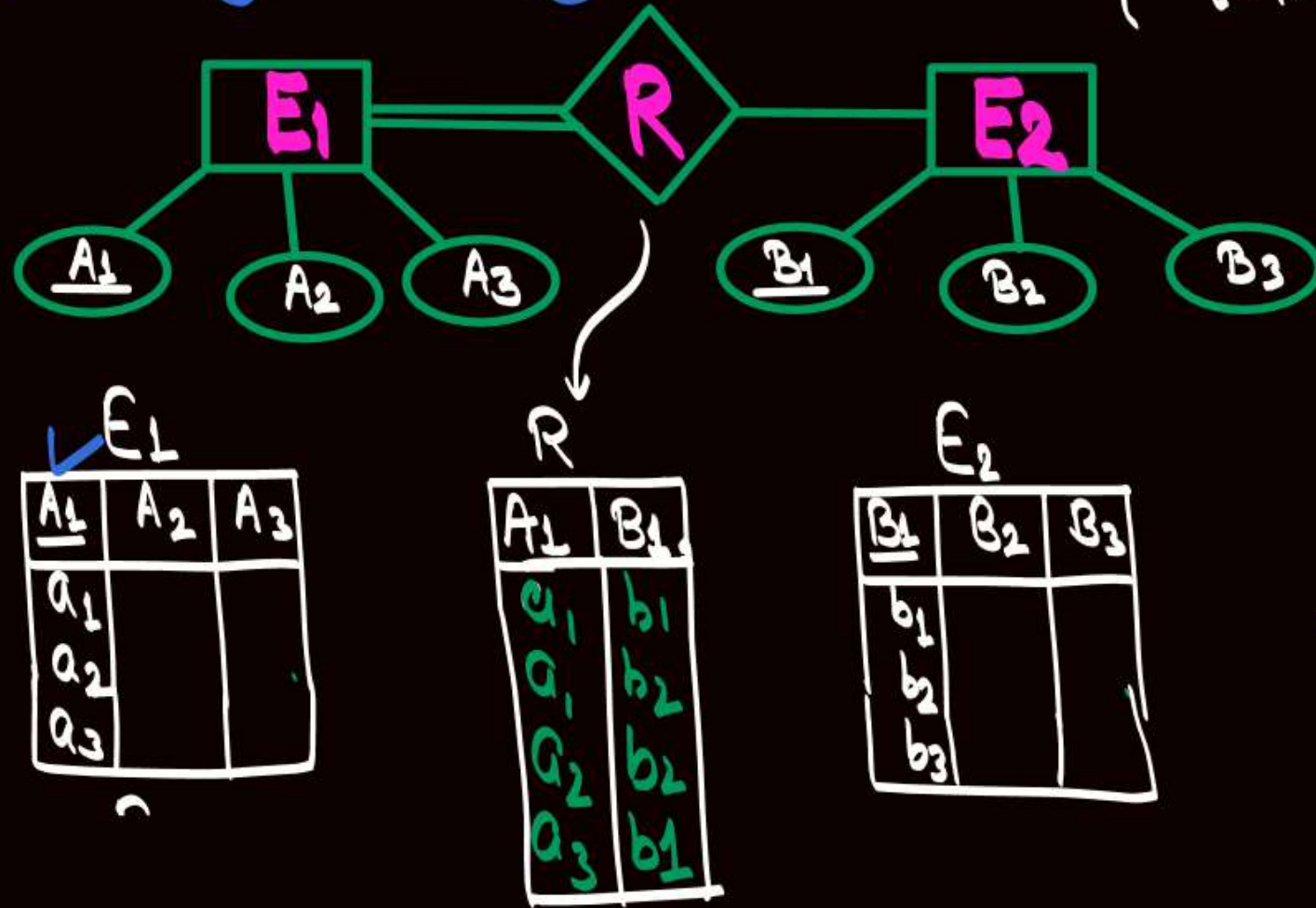| B_1	B_2	B_3	A_1
b_1	—	—	a_1
b_2	—	—	a_1
b_3	—	—	a_1
b_3	—	—	a_2

{ 'R' can be combined with the entity set which have total Participation. And Primary Key will be formed by Combining P.K.s of both entity Sets }

ER Model to Relational Table

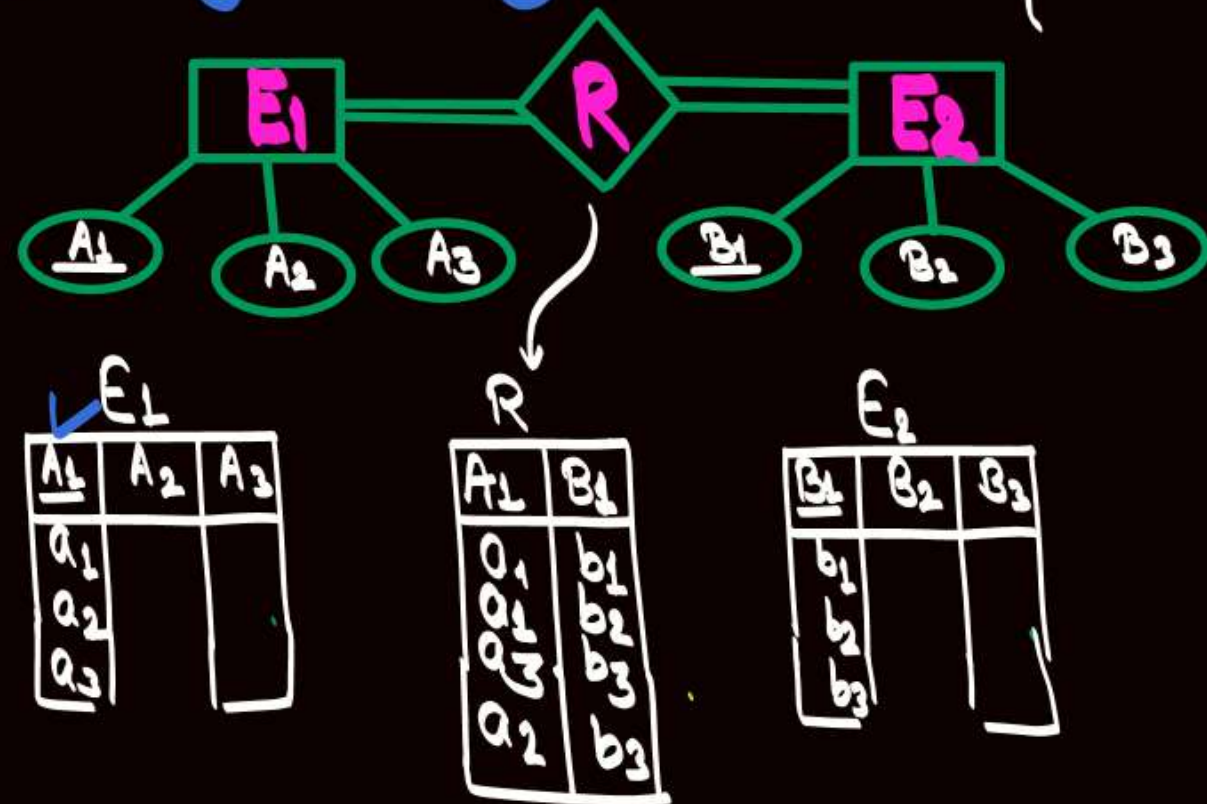④ Many to Many Relation { Partial Participation at one side, total Participation at another side }

3

Same concept as
Previous case

E₁

A₁	A₂	A₃
a_1		
a_2		
a_3		

R

A₁	B₁
a_1	b_1
a_1	b_2
a_2	b_2
a_3	b_1

E₂

B₁	B₂	B₃
b_1		
b_2		
b_3		

ER Model to Relational Table

④ **Many to Many Relation** { Total Participation at both side }

$E_1 E_2 R$

A_1	A_2	A_3	B_1	B_2	B_3
a_1	—	–	b_1	—	–
a_1		–	b_2		–
a_3	–	–	b_3	—	—
a_2	—	–	b_3	–	–

} Can be merged into a single table, and P.K. will be formed by Combining P.K.s of both Entity Sets.

together they are unique
or P.K. = (A_1, B_1)

E₁

A_1	A_2	A_3
a_1		
a_2		
a_3		

R

A_1	B_1
a_1	b_1
a_1	b_2
a_3	b_3
a_2	b_3

E₂

B_1	B_2	B_3
b_1		
b_2		
b_3		

ER Model to Relational Table

④ Many to Many Relation

1 — E_1 — R — E_2 { minimum three tables are required [No merging of tables] }

2 — E_1 — R === E_2 { Two tables are required, relation R will merge with entity set with total participation, and P.K. of merged Reln will the P.Ks of both the entitysets together }

3 — E_1 === R — E_2 { Two tables are required, relation R will merge with entity set with total participation, and P.K. of merged Reln will the P.Ks of both the entitysets together }

4 — E_1 === R === E_2 { only one table is required. P.K. of merged Reln will be formed by combining P.Ks of both the entitysets }

④ ER model to relational model w.r.t. Week entity set
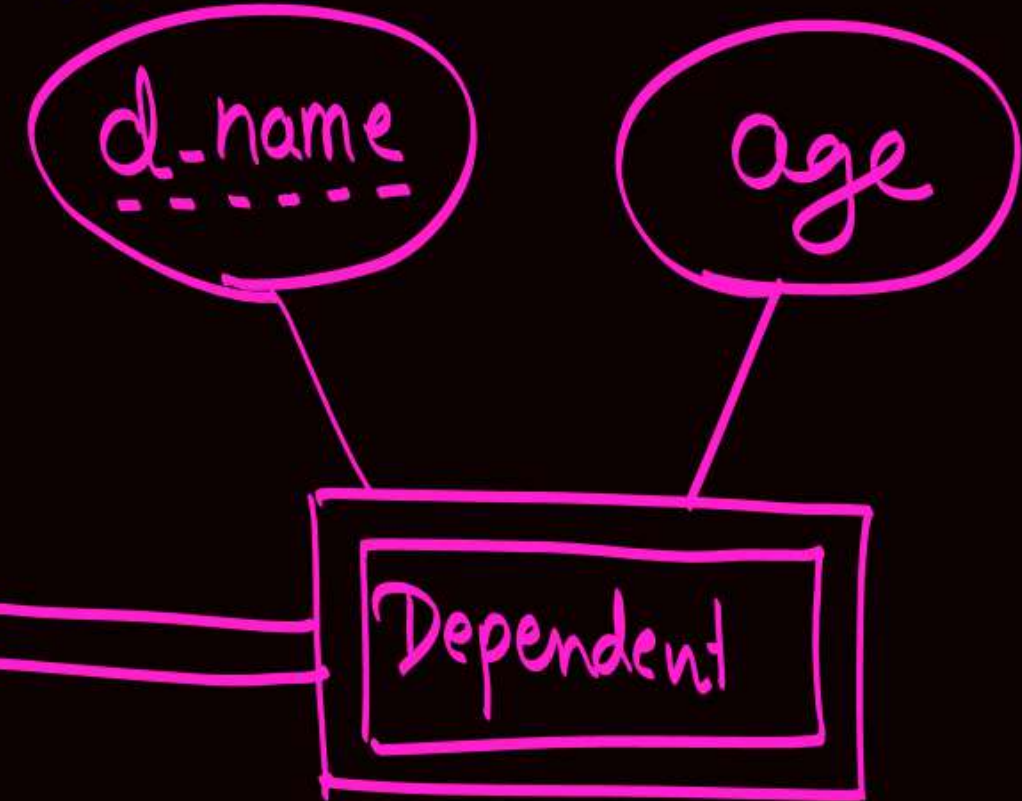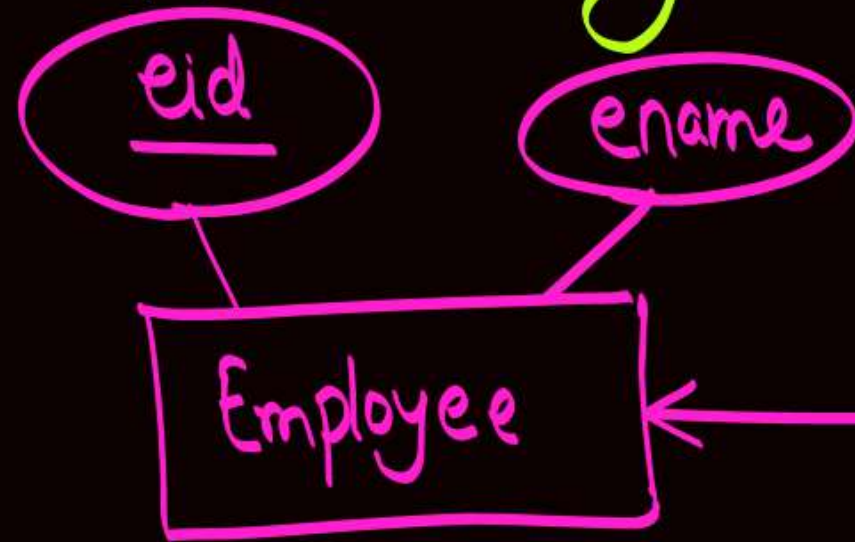
Relation w.r.t. Employee Entity Set

Primary Key

eid	ename

Employee

Relation w.r.t. dependent

Dependent

Pk

eid	D_name	Age

Topic ER model to relational model

Slide

THANK - YOU