# CSE301 – DATABASE

ER Model

How to Convert ER Diagram into Relation or Table?

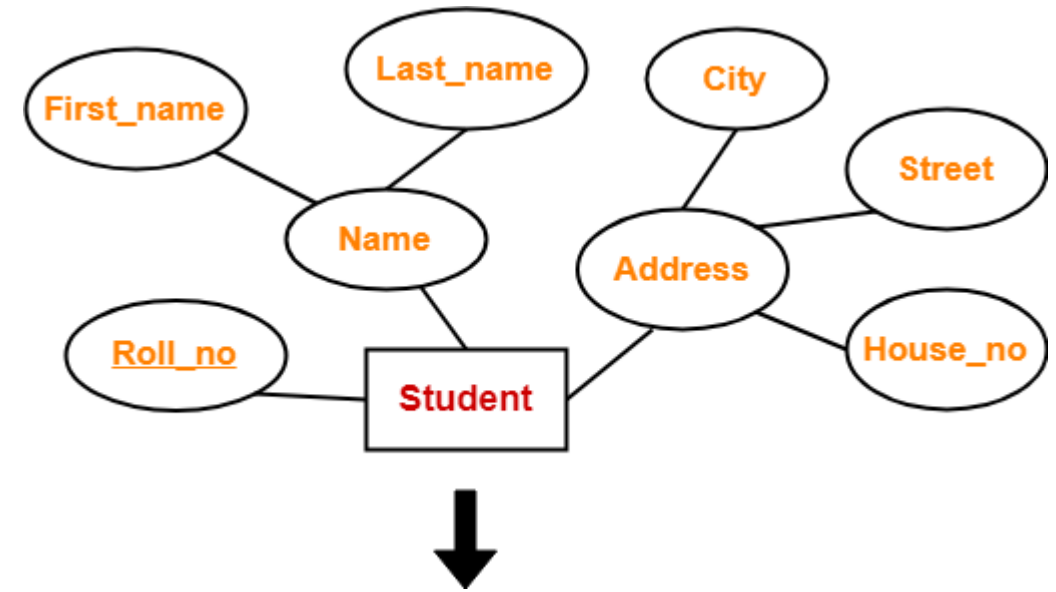# Rule 1: Strong Entity Set With Only Simple Attributes

❑ A strong entity set with only simple attributes will require only one table or relation in relation model.

❑ Attributes of table will be the attributes of the entity set.

❑ The primary key of the table will be the key attribute of the entity set.

Roll_no	Name	Sex

Schema : Student (Roll_no , Name , Sex)
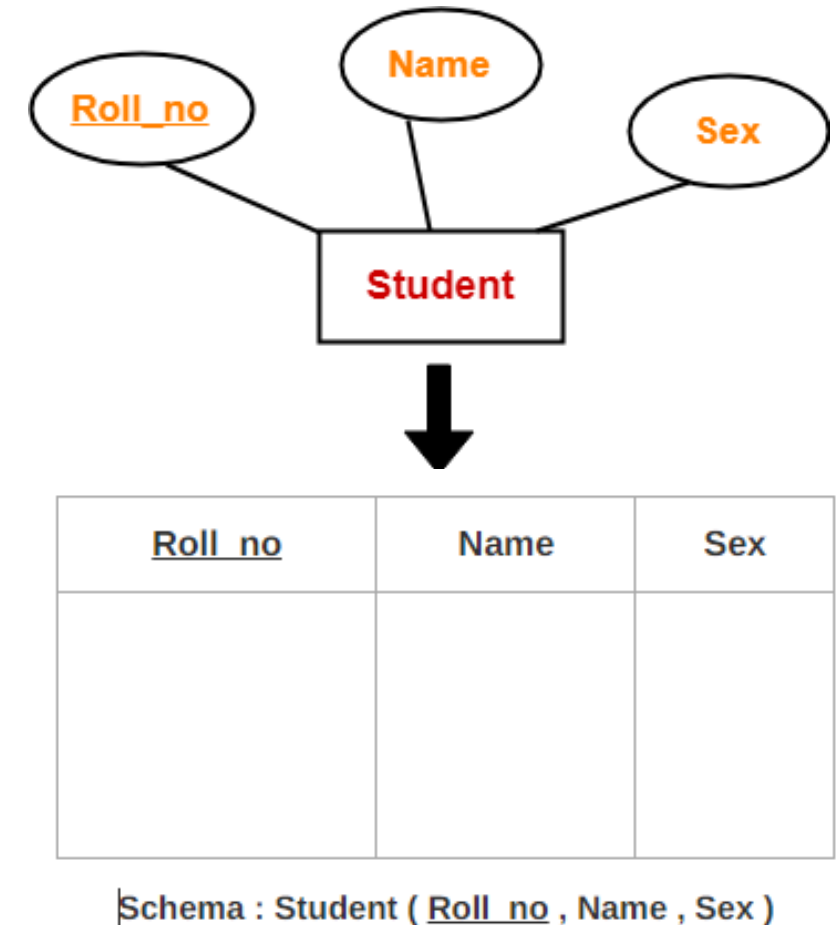
Rule 2: Strong Entity Set With Composite Attributes

❑ A strong entity set with any number of composite attributes will require only one table or relation in relation model.

❑ While conversion, simple attributes of the composite attributes are taken into account and not the composite attribute itself.


Roll_no	First_name	Last_name	House_no	Street	City

Schema : Student (Roll_no , First_name , Last_name , House_no , Street , City)

Rule 3: Strong Entity Set With Multi-Valued Attributes

❑ A strong entity set with any number of multi-valued attributes will require two tables or relations in relation model.

❑ One table or relation will contain all the simple attributes with the primary key.

❑ Other table will contain the primary key and all the multi-valued attributes.
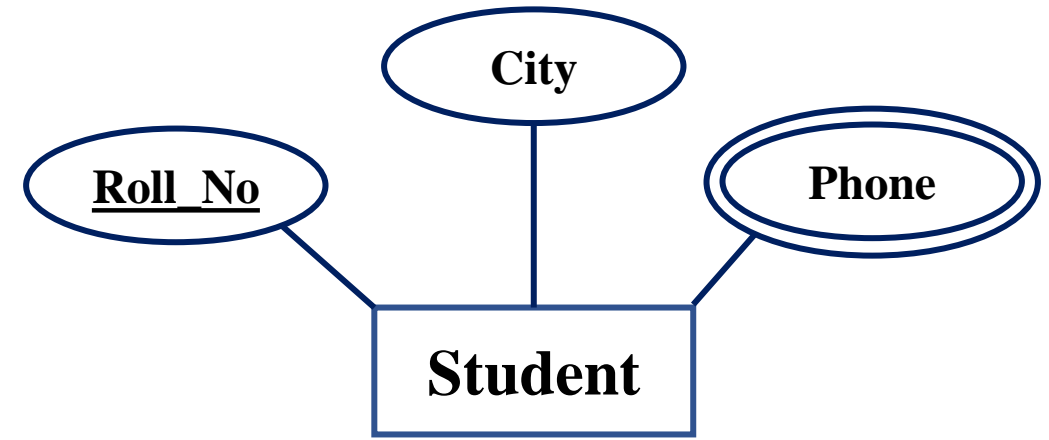
Roll_No	City

Roll_No	Phone

Rule 4: Relationship Set into a Table

❑ A relationship set require one table or relation in relational model.

❑ Attributes of the table are:
  ➢ Primary key attributes of the participating entity set.
  ➢ Its own descriptive attributes if any.

❑ Set of non-descriptive attributes will be the primary key.

❑ Given ER diagram requires three tables or relations in relational model.
  ➢ One table for entity set "Employee"
  ➢ One table for entity set "Department"
 ➢ One table for relationship set "Works in"
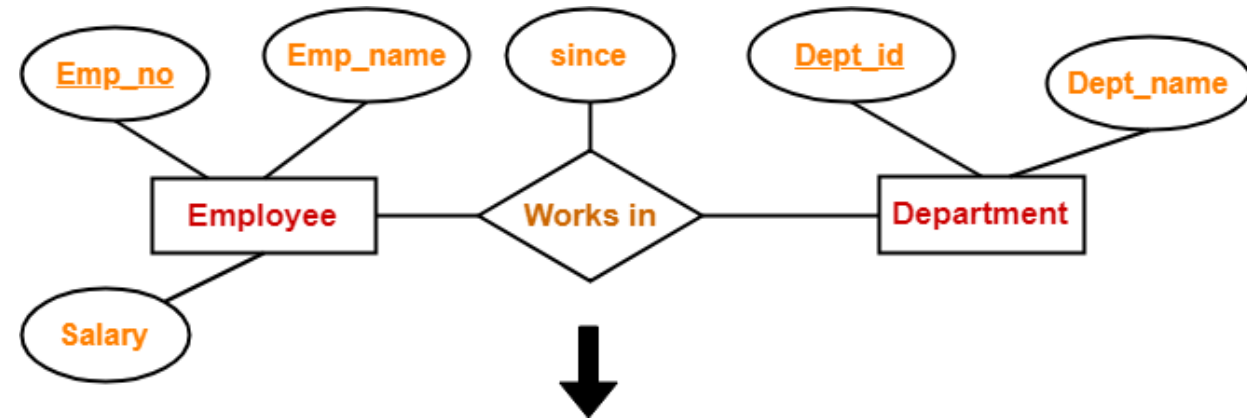
Emp_no	Dept_id	since

Schema : Works in (Emp_no , Dept_id , since)

Rule 5: For Binary Relationships With Cardinality Ratios

❑ The following four cases are possible-

➢ Case-01: Binary relationship with cardinality ratio m:n

➢ Case-02: Binary relationship with cardinality ratio 1:n

➢ Case-03: Binary relationship with cardinality ratio m:1
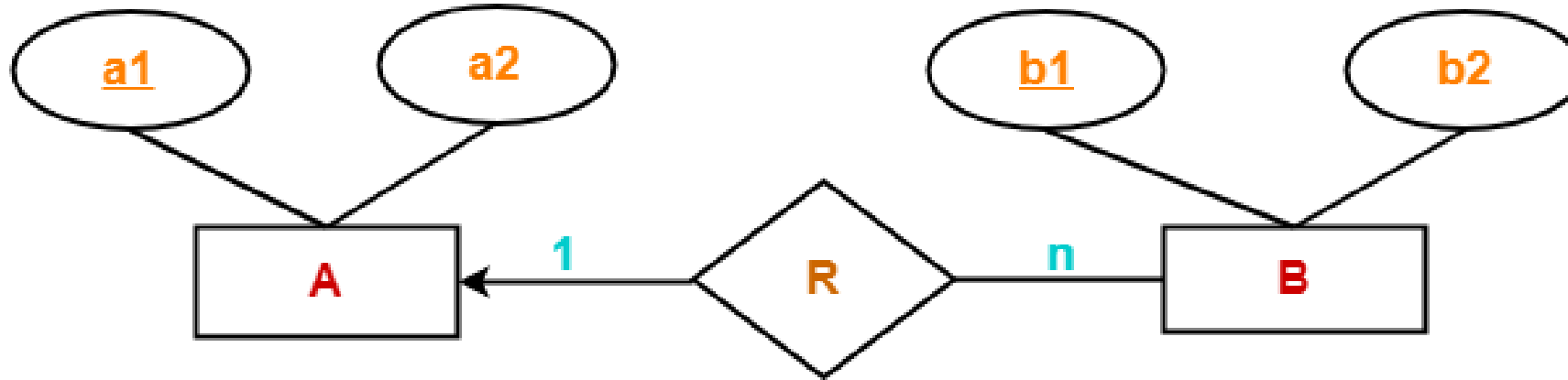
➢ Case-04: Binary relationship with cardinality ratio 1:1

Case-01: Binary Relationship with Cardinality Ratio m:n
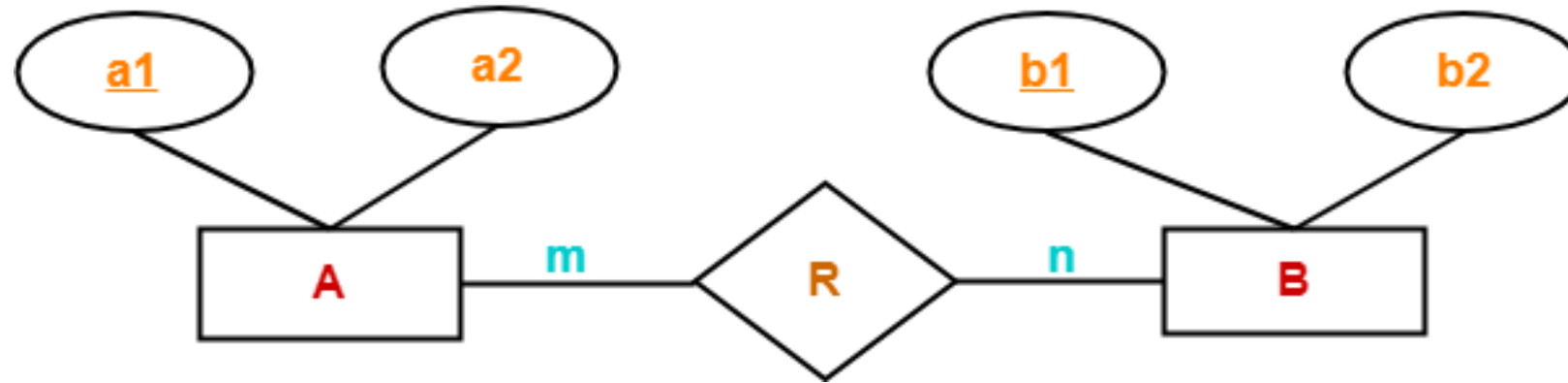
❑ In Many-to-Many, three tables will be required-

➢ A (a1 , a2)

➢ R (a1 , b1)

➢ B (b1 , b2)

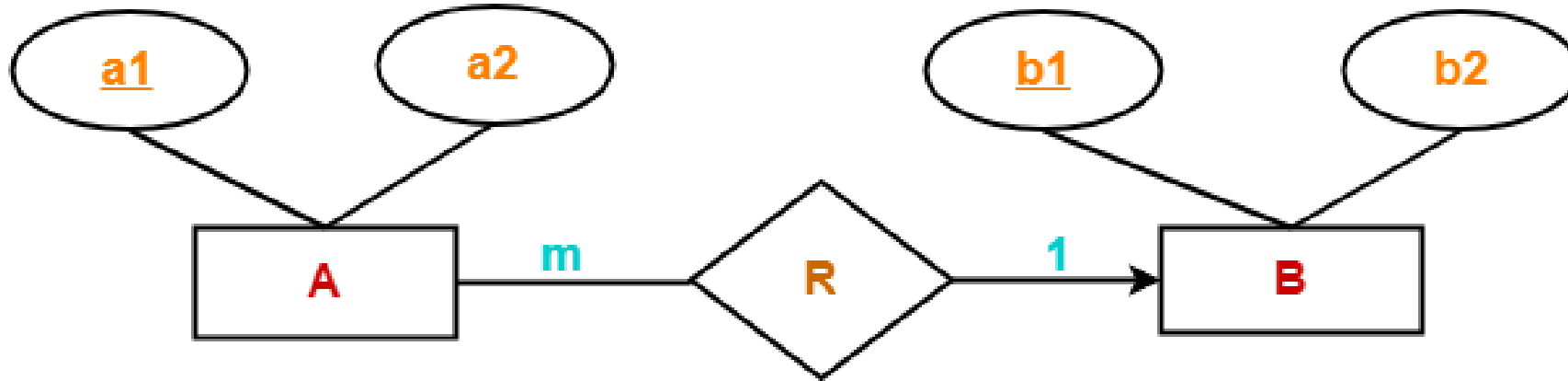# Case-02: Binary Relationship with Cardinality Ratio 1:n

❑ In One-to-Many, two tables will be required-

➢ A (a1 , a2)

➢ BR (a1 , b1 , b2)

NOTE- Here, combined table will be drawn for the entity set B and relationship set R.

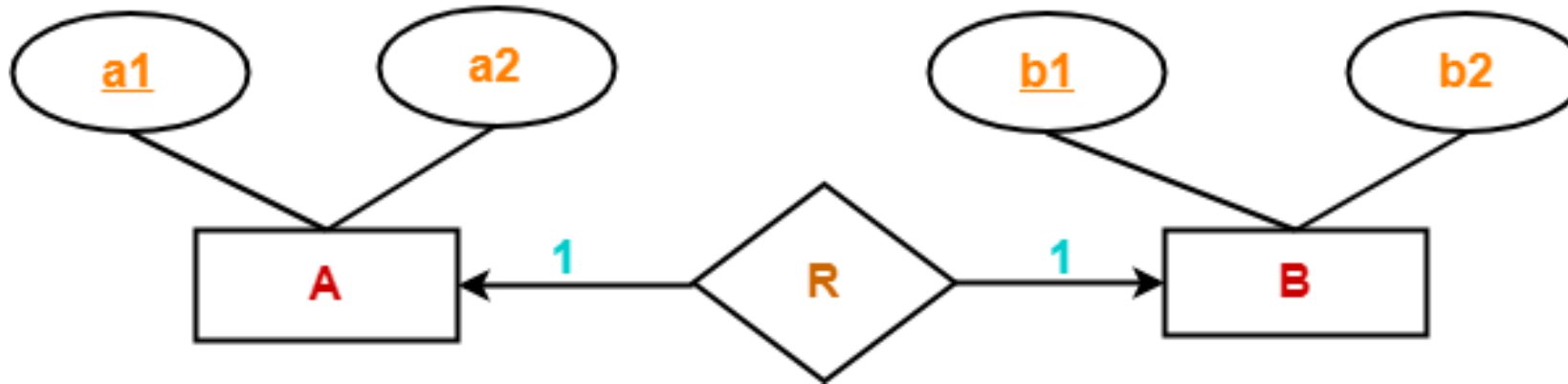# Case-03: Binary Relationship with Cardinality Ratio m:1

❑ In Many-to-One, two tables will be required-

➢ AR (a1 , a2, b1)

➢ B (b1 , b2)

NOTE- Here, combined table will be drawn for the entity set A and relationship set R.

Case-04: Binary Relationship with Cardinality Ratio 1:1

❑ In One-to-One, two tables will be required-

❑ Way-01:
  ➢ AR (<u>a1</u> , a2 , b1)
  ➢ B (<u>b1</u> , b2)

❑ Way-02:
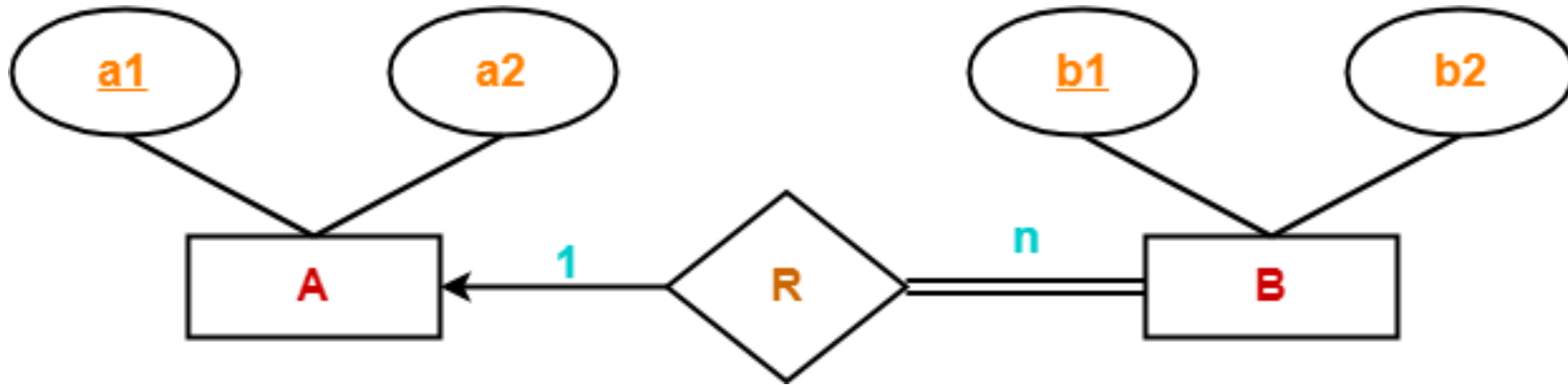 ➢ A (<u>a1</u> , a2)
  ➢ BR (a1 , <u>b1</u> , b2)

Thumb Rules to Remember

❑ While determining the minimum number of tables required for binary relationships with given cardinality ratios, following thumb rules must be kept in mind-

➢ For binary relationship with cardinality ration m : n ,

❖ *Separate and individual tables* will be drawn for each entity set and relationship. (***Three tables*** will be required).

➢ For binary relationship with cardinality ratio either m : 1 or 1 : n ,

❖ Always remember "*many side will consume the relationship*" i.e. a combined table will be drawn for many side entity set and relationship set. (***Two tables*** will be required).

➢ For binary relationship with cardinality ratio 1 : 1 ,

❖ Two tables will be required. You can *combine the relationship set with any one of the entity sets*. (***Two tables*** will be required).

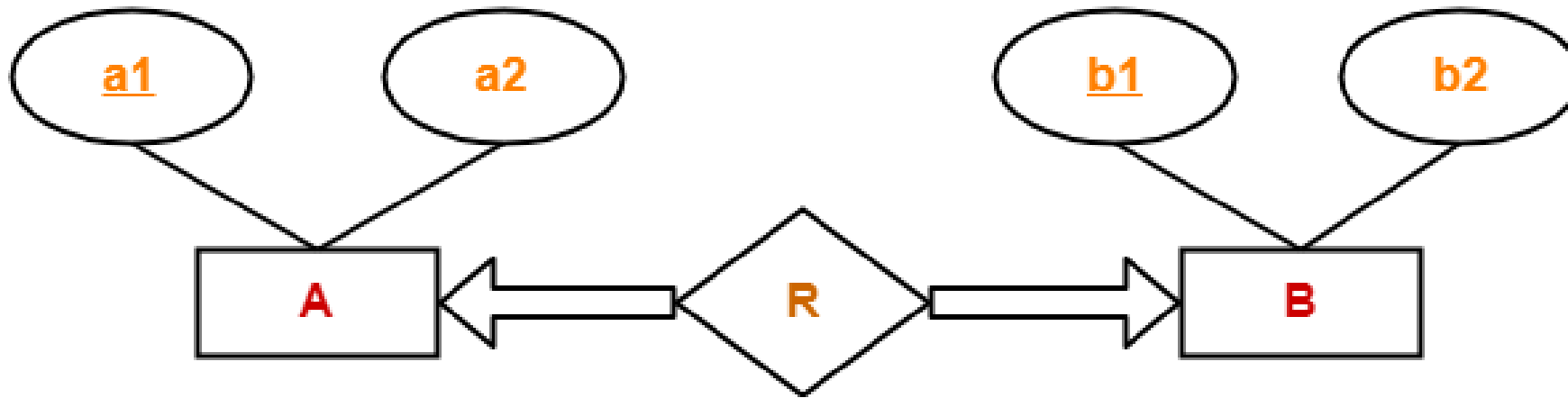# Rule-06: For Binary Relationship With Both Cardinality Constraints and Participation Constraints

❑ Cardinality constraints will be implemented as discussed in Rule-05.

❑ Because of the total participation constraint, foreign key acquires NOT NULL constraint, i.e. now foreign key can not be null.

❑ Two Cases:

➢ Case 1: For binary relationship with cardinality constraint and total participation constraint from one side.

➢ Case 2: For binary relationship with cardinality constraint and total participation constraint from both side.

Case-01: For Binary Relationship With Cardinality Constraint and Total Participation Constraint From One Side


❑ Because cardinality ratio = 1 : n , so we will combine the entity set B and relationship set R. Then, two tables will be required-

➢ A (<u>a1</u> , a2)

➢ BR (a1 , <u>b1</u> , b2)

❑ Because of total participation, *foreign key a1* has acquired *NOT NULL constraint*, so it can't be null now.

# Case-02: For Binary Relationship With Cardinality Constraint and Total Participation Constraint From Both Sides

❑ Because cardinality ratio = 1 : 1 , so we will combine the entity set B, entity set A and relationship set R.

❑ Here, Only one table is required.

➢ ARB (a1 , a2 , b1 , b2)

Rule-07: For Binary Relationship With Weak Entity Set
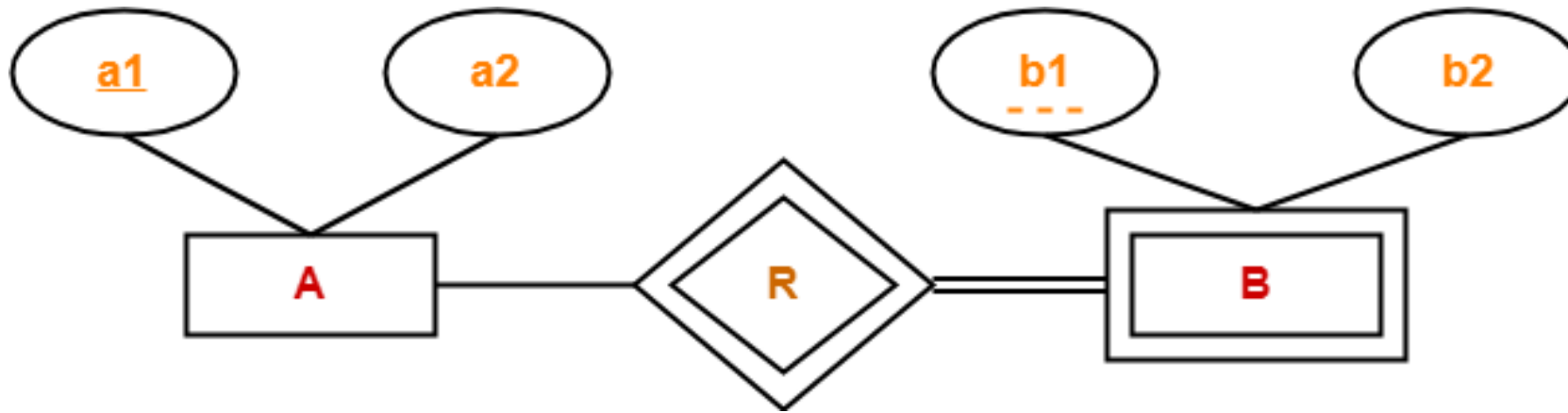
❑ Weak entity set always appears in association with identifying relationship with total participation constraint and there is always 1:n relationship from identifying entity set to weak entity set.

❑ Here, two tables will be required-

➢ A (a1 , a2)

➢ BR (a1 , b1 , b2)

Generalization / Specialization: How Schema or Tables can be formed?
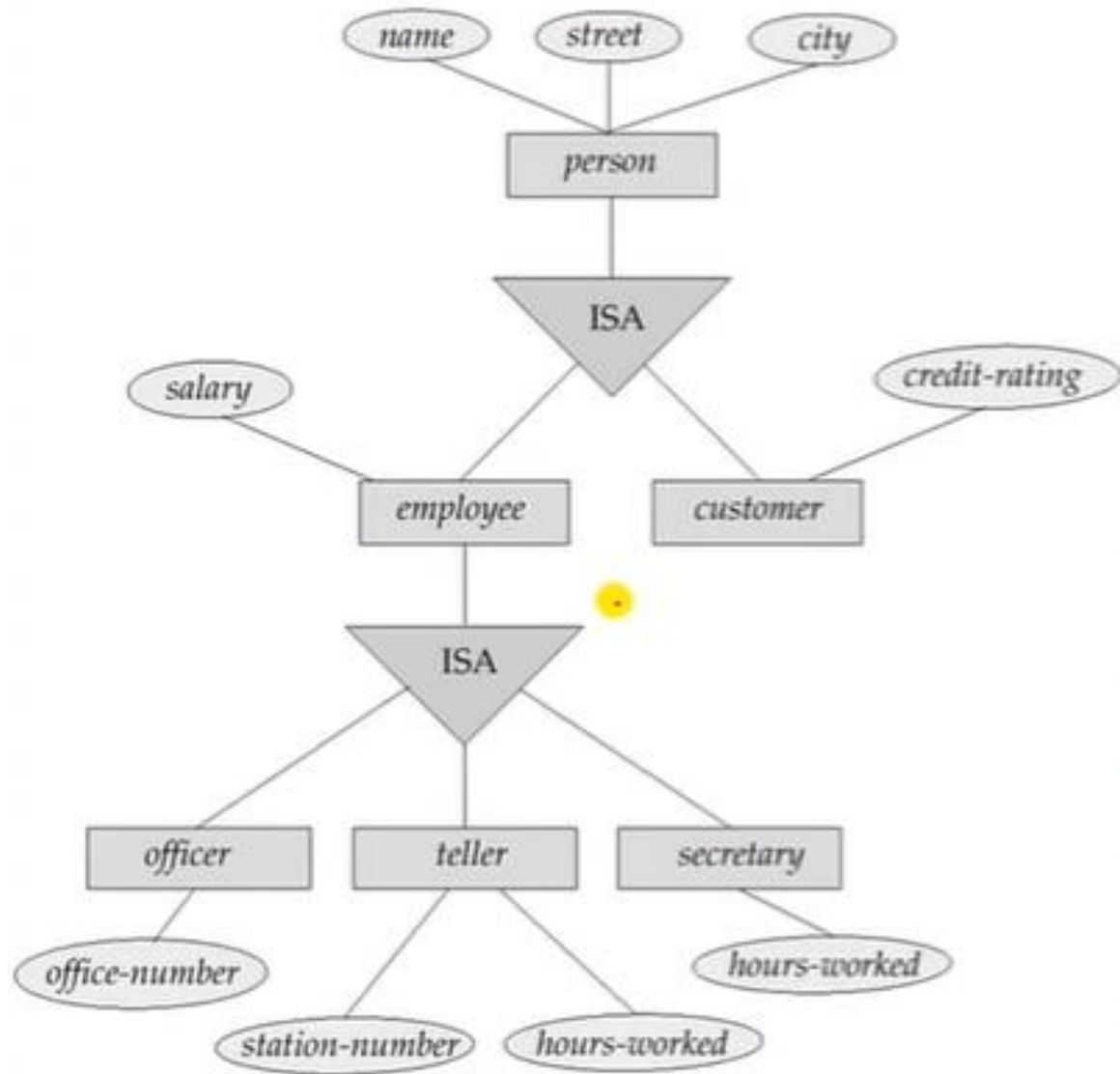
- Tables will be created only for leaf nodes or subclasses.

Four tables can be formed:

1. **customer** (name, street, city, credit_rating)

2. **officer** (name, street, city, salary, office_number)

3. **teller** (name, street, city, salary, station_number, hours_worked)

4. **secretary** (name, street, city, salary, hours_worked)

Practice Questions Based On Converting ER Diagram To Tables

Question 1

❑ Find the minimum number of tables required for the following ER diagram in relational model.
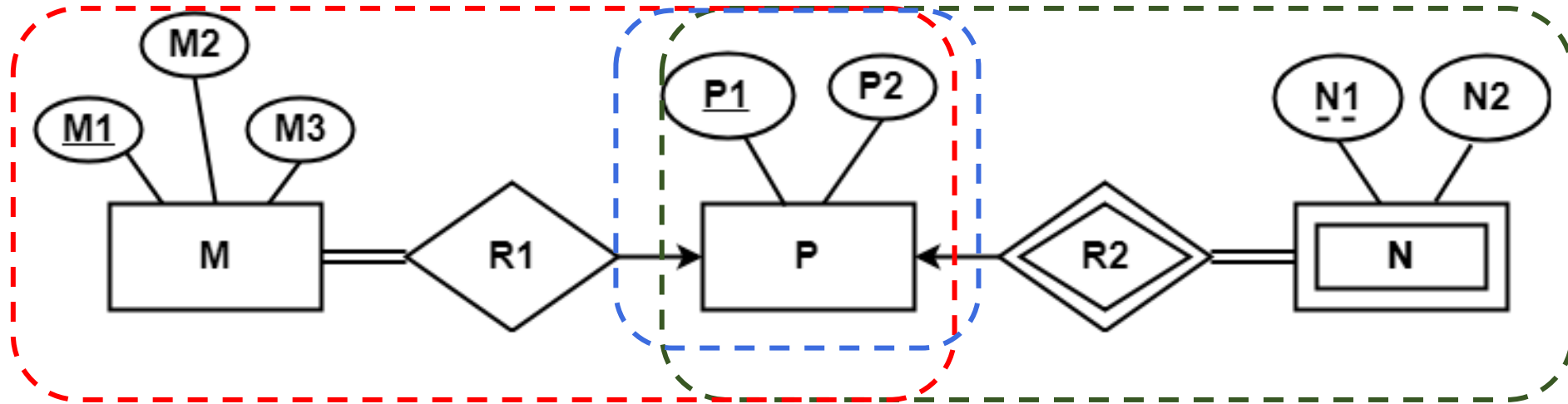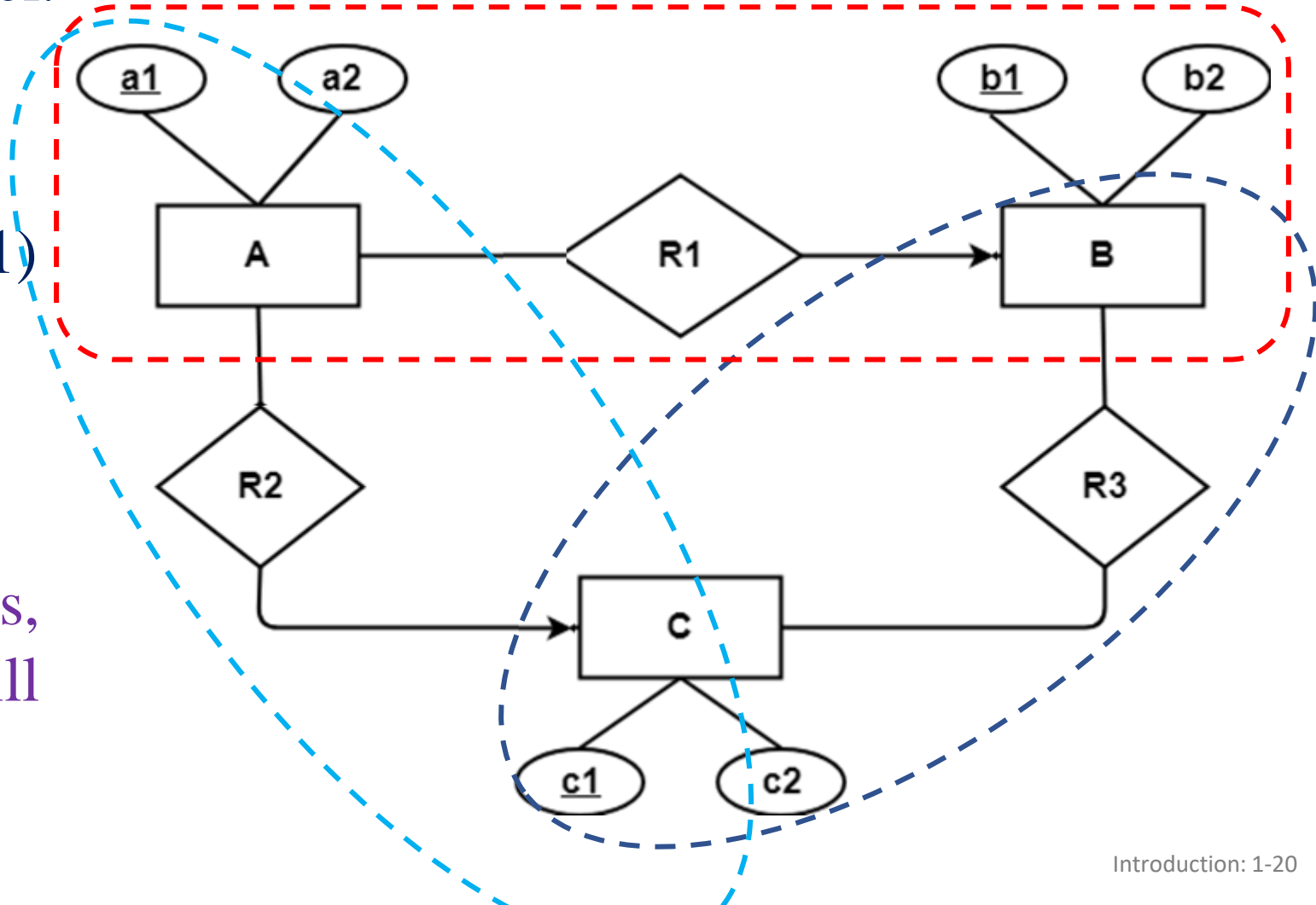

❑ Solution:

➢ MR1 (<u>M1</u> , M2 , M3 , P1)

➢ P (<u>P1</u> , P2)

➢ NR2 (<u>P1</u> , <u>N1</u> , N2)

➢ Applying the rules, minimum 3 tables will be required

Question 2

❑ Find the minimum number of tables required for the following ER diagram in relational model.

❑ Solution:
➢ AR1R2 (a1 , a2 , b1 , c1)
➢ B (b1 , b2)
➢ C (c1 , c2)
➢ R3 (b1 , c1)
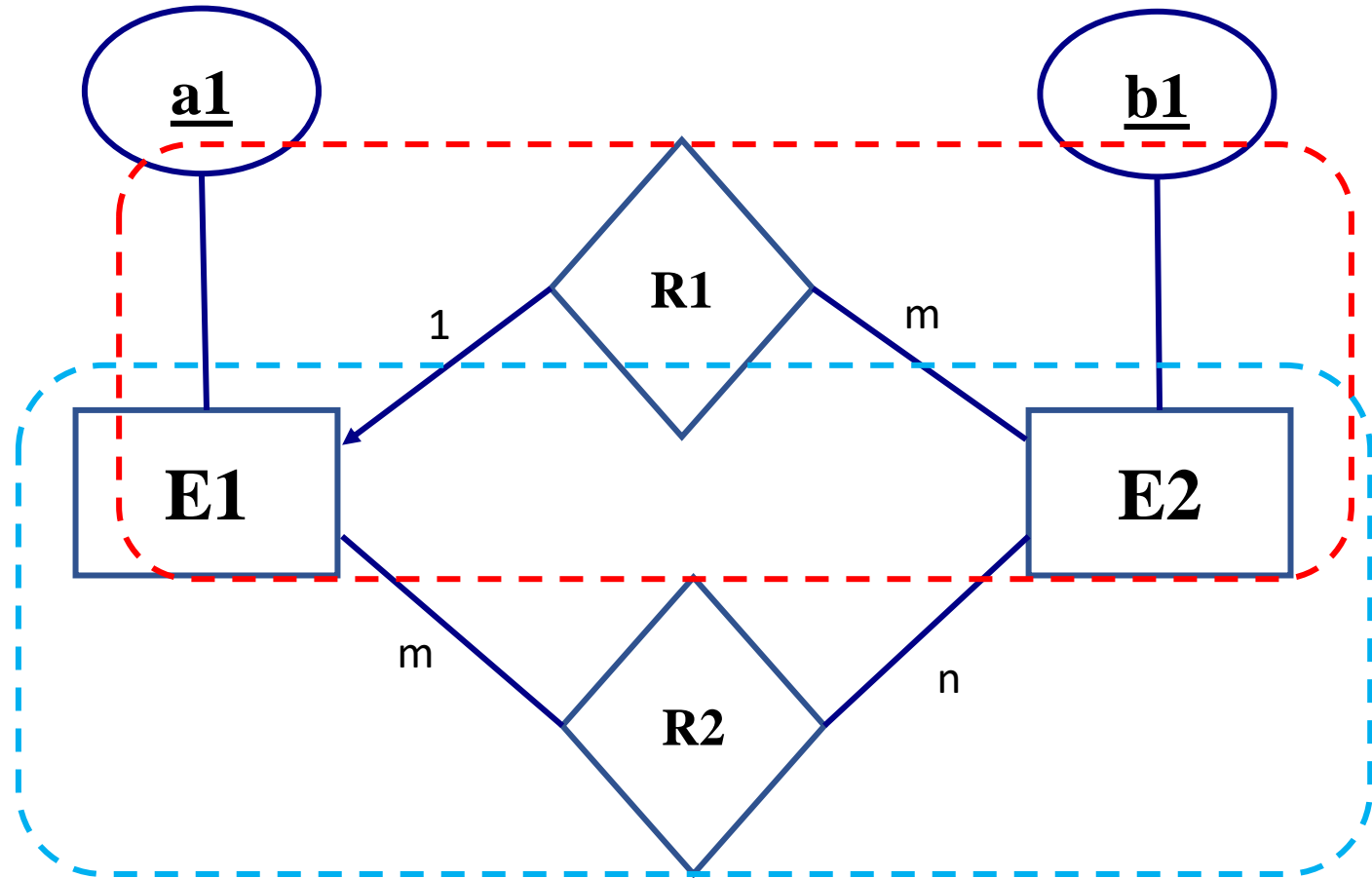➢ Applying the rules, minimum 4 tables will be required.

Question 3

❏ Find the minimum number of tables required for the following ER diagram in relational model.

❏ Solution:

➢ E2R1 (a1 , b1)

➢ E1(a1)

➢ R2 (a1 , b1)

➢ Applying the rules, minimum 3 tables will be required.
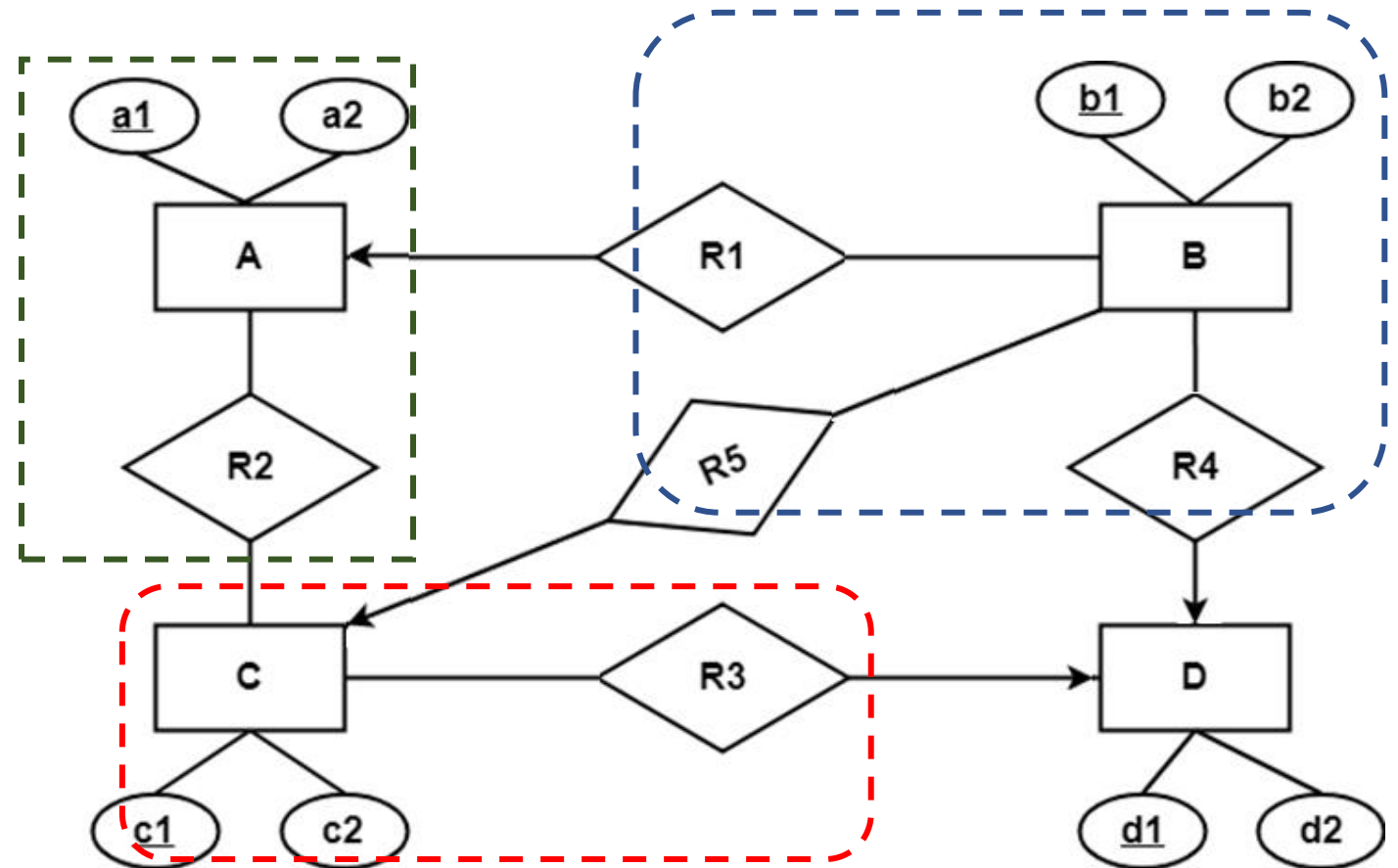
Question 4

❑ Find the minimum number of tables required for the following ER diagram in relational model.

❑ Solution:

➢ BR1R4R5 (<u>b1</u> , b2 , <u>a1</u> , <u>c1</u> , <u>d1</u>)

➢ CR3 (<u>c1</u> , c2 , d1)

➢ D (<u>d1</u> , d2)

➢ A (<u>a1</u> , a2)

➢ R2 (<u>a1</u> , <u>c1</u>)

➢ Applying the rules, minimum 5 tables will be required.

Question 5

❑ Find the minimum number of tables required for the following ER diagram in relational model.
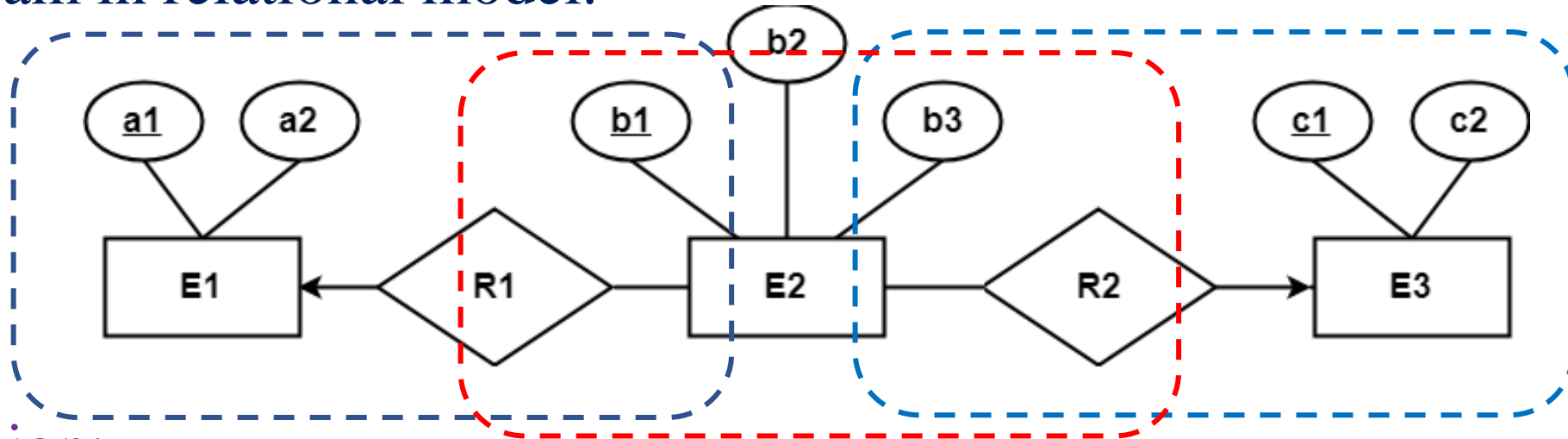

❑ Solution:

➢ E1 ($\underline{a1}$, a2)

➢ E2R1R2 ($\underline{b1}$, b2 , a1 , c1 , b3)

➢ E3 ($\underline{c1}$, c2)

➢ Applying the rules, minimum 3 tables will be required.

Question 6

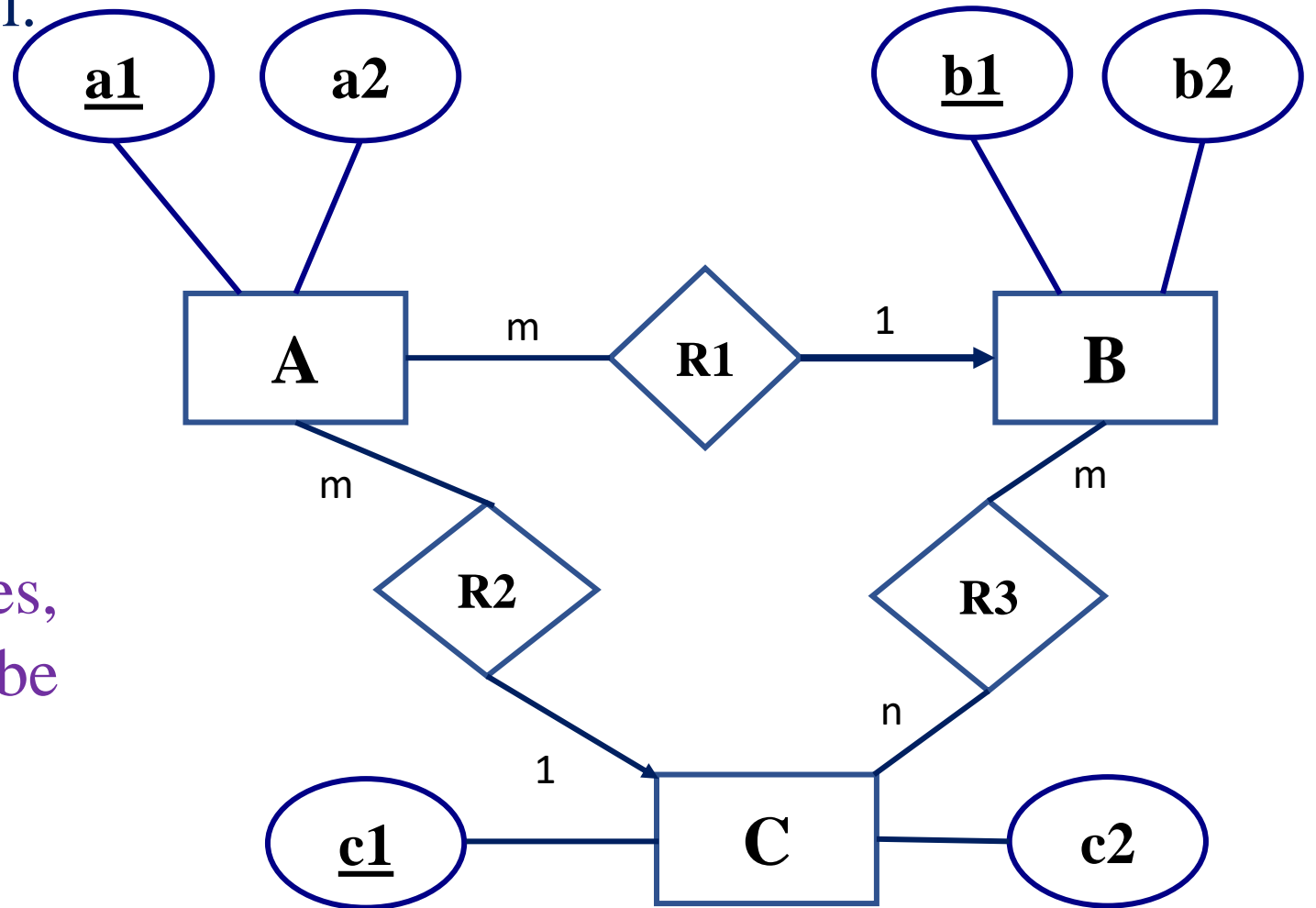❑ Find the minimum number of tables required for the following ER diagram in relational model.

❑ Solution:

➢ AR1R2 ($\underline{a1}$, a2 , b1, c1)

➢ B ($\underline{b1}$, b2)

➢ C ($\underline{c1}$, c2)

➢ R3 ($\underline{c1}$, $\underline{b1}$)

➢ Applying the rules, minimum 4 tables will be required.

Question 7

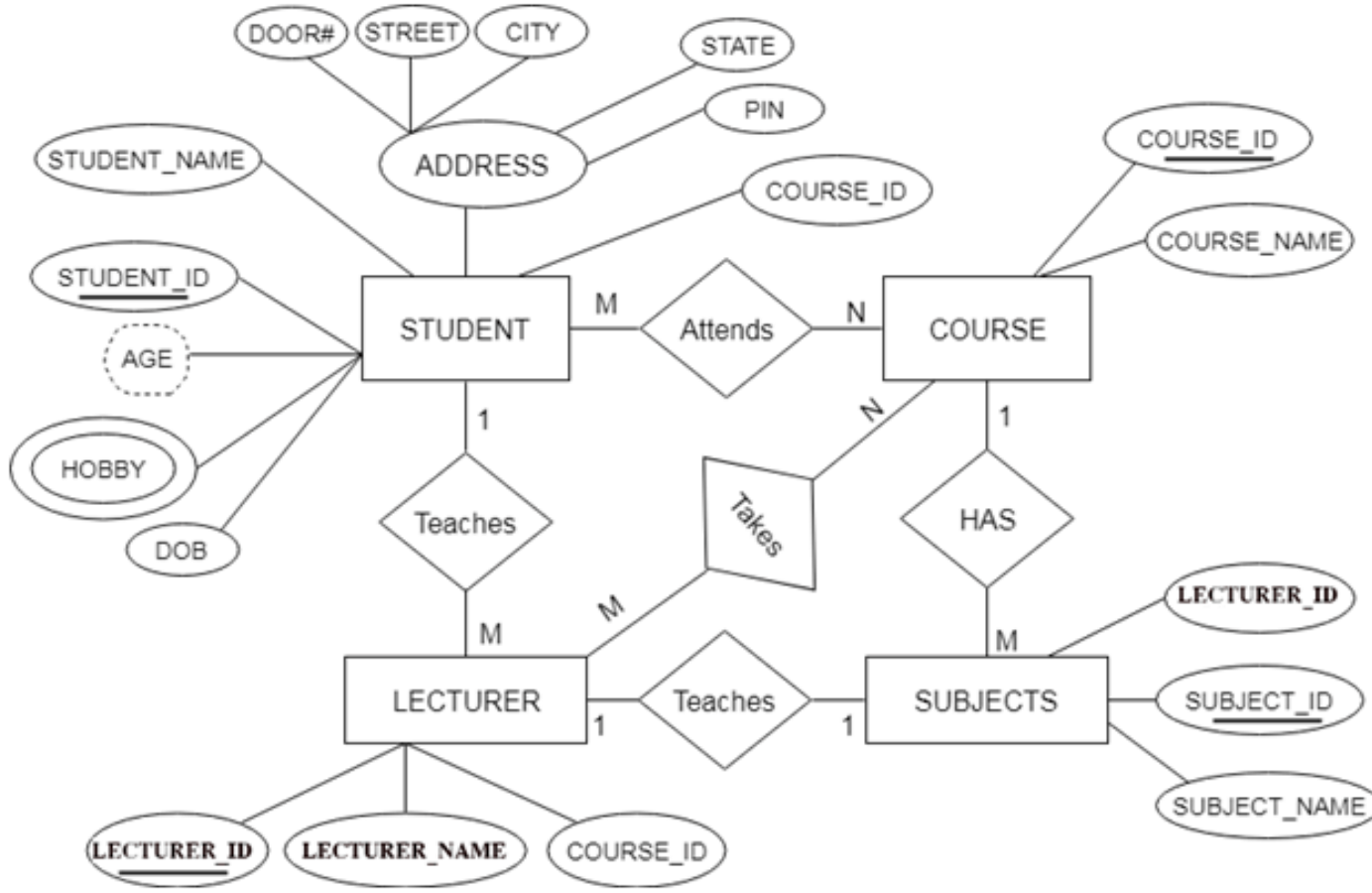❑ Find the minimum number of tables required for the following ER diagram in relational model.

❑ Solution:

➢ Account (<u>Ac_no</u>, Balance, b_name)

➢ Branch (<u>b_name</u>, b_city , Assets)

➢ Loan (<u>L_no</u>, Amt , b_name)

➢ Borrower (<u>C_name</u> , <u>L_no</u>)

➢ Customer (<u>C_name</u>, C_street , C_city)

➢ Depositor (<u>C_name</u>, <u>Ac_no</u>)

➢ Applying the rules,

minimum 6 tables will be required.
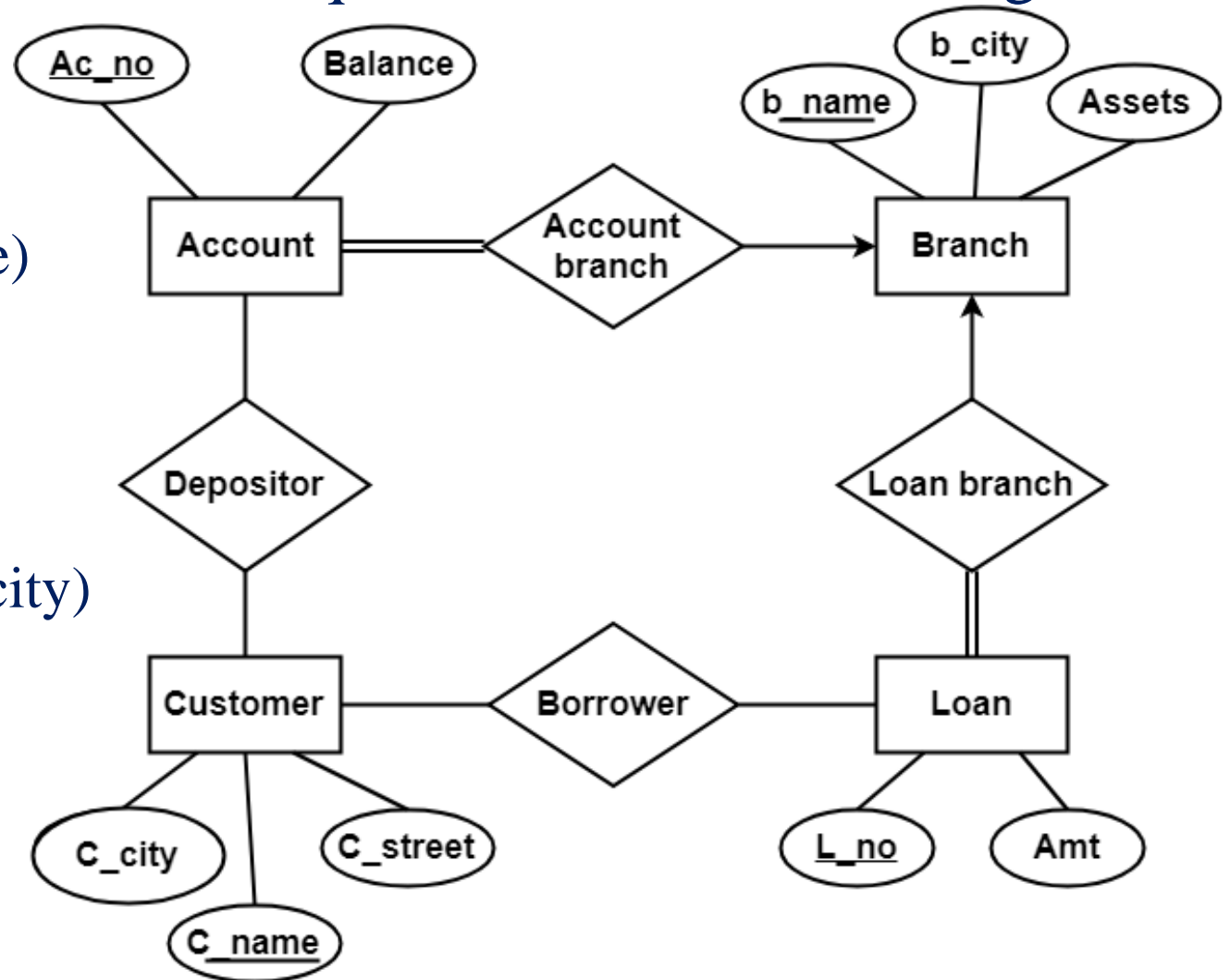
Question 8

☐ Find the minimum number of tables.

☐ Solution:

Minimum 7 tables will be required:

1. **Student** (Student_Id, Student_Name, DOB, Door#, Street, City, State, Pin, Course_Id)

2. **Lecturer** (Lecturer_Id, Lecturer_Name, Course_Id, Student_Id, Subject_Id)

3. **Course** (Course_Id, Course_Name)

4. **Subjects** (Subject_Id, Subject_Name, Lecturer_Id, Course_Id)

5. **Hobby** (Subject_Id, Hobby)

6. **Attends** (Subject_Id, Course_Id)

7. **Takes** (Lecturer_Id, Course_Id)