SE-Computer-A	Roll number :9913
Experiment no. : 2	Date of Implementation : 6/2/2024

Related Course outcome : At the end of the course, Students will be able to design EER model and develop relational model

Rubrics for assessment of Experiment:

Indicator	Poor	Average	Good
Timeliness ● Maintains assignment deadline (3)	Assignment not done (0)	One or More than One week late (1-2)	Maintains deadline (3)
Completeness and neatness ● Complete all parts of ER diagram(3)	N/A	< 80% complete (1-2)	100% complete (3)
Originality ● Extent of plagiarism(2)	Copied it from someone else(0)	At least few questions have been done without copying(1)	Assignment has been solved completely without copying (2)
Knowledge ● In depth knowledge of the assignment(2)	Unable to answer 2 questions(0)	Unable to answer 1 question (1)	Able to answer 2 questions (2)

Assessment Marks :

Timeliness	
Completeness and neatness	
Originality	
Knowledge	
Total	

Total : (Out of 10)

Teacher's Sign :

Name Student	Mark lopes	**Roll No.**	9913
Lab Experiment No.	2	**Date**	6/2/2024
Expt. Title	Mapping / Convert EER diagram to Relational Model of Problem		

Aim /objective: To map ER/EER diagram to relational model.

Theory:

- ER diagram is converted into the tables in relational model.
- This is because relational models can be easily implemented by RDBMS like MySQL, Oracle etc.

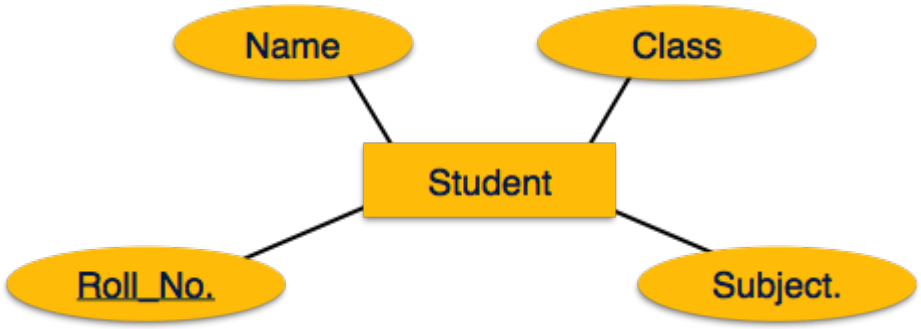
ER diagrams mainly comprise of −

- Entity and its attributes
- Relationship, which is association among entities.

1)Mapping of ER model to Relational Model

Mapping Entity

An entity is a real-world object with some attributes.

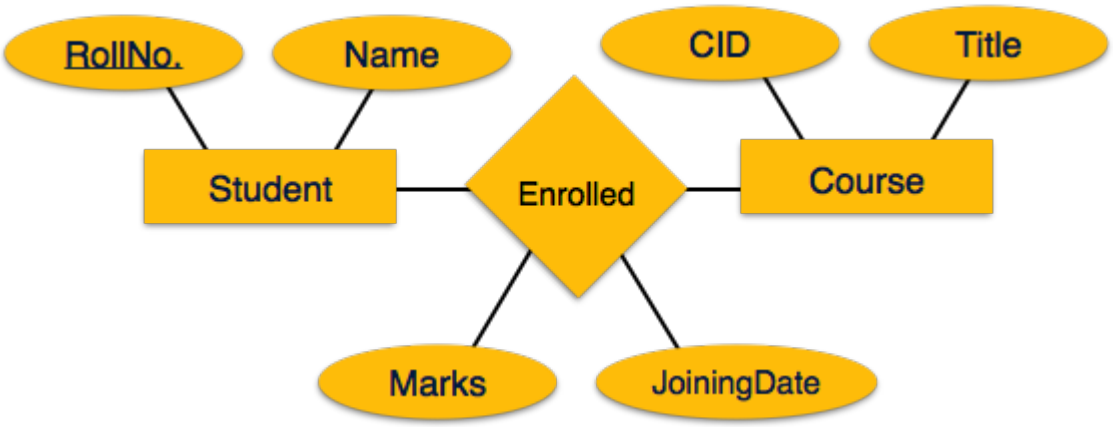


Mapping Process (Algorithm)

- Create table for each entity set.
- Entity's attributes should become fields of tables with their respective data types.
- Declare primary key.

Mapping Relationship

A relationship is an association among entities.

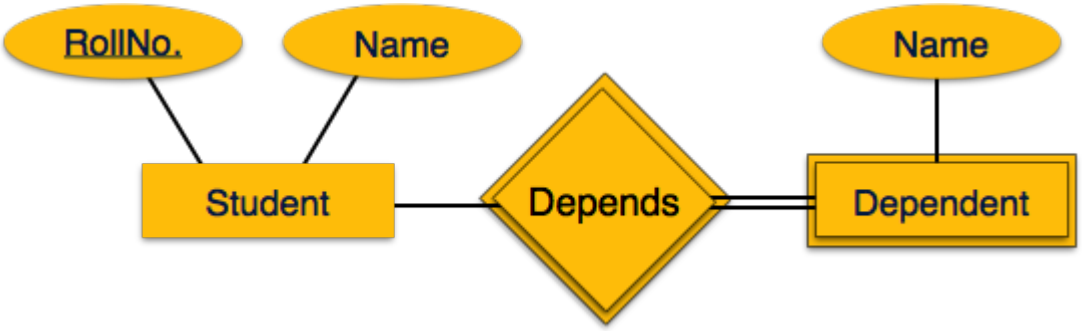


Mapping Process

- Create table for a relationship.
- Add the primary keys of all participating Entities as fields of table with their respective data types.
- If relationship has any attribute, add each attribute as field of table.
- Declare a primary key composing all the primary keys of participating entities.
- Declare all foreign key constraints.

Mapping Weak Entity Sets

A weak entity set is one which does not have any primary key associated with it.

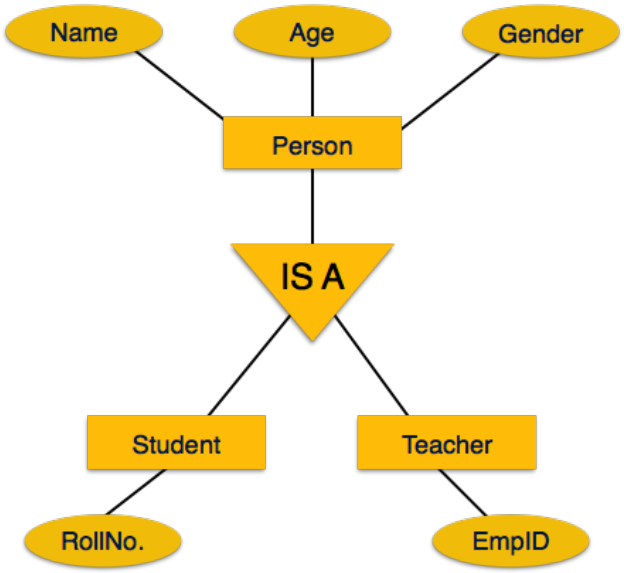


Mapping Process

- Create table for weak entity set.
- Add all its attributes to table as field.
- Add the primary key of identifying entity set.
- Declare all foreign key constraints.

Mapping Hierarchical Entities

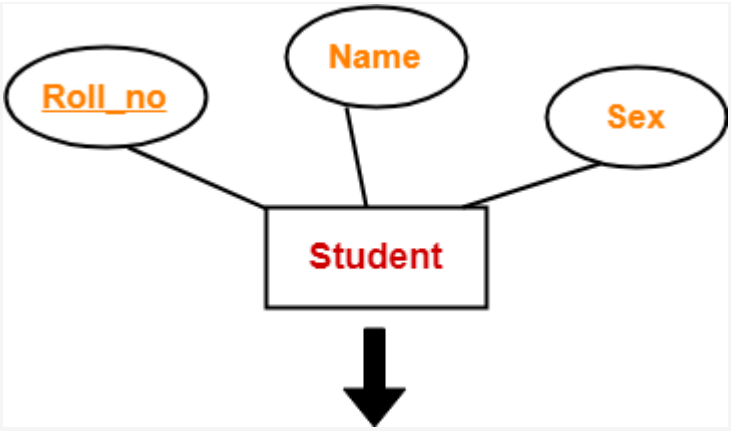
ER specialization or generalization comes in the form of hierarchical entity sets.



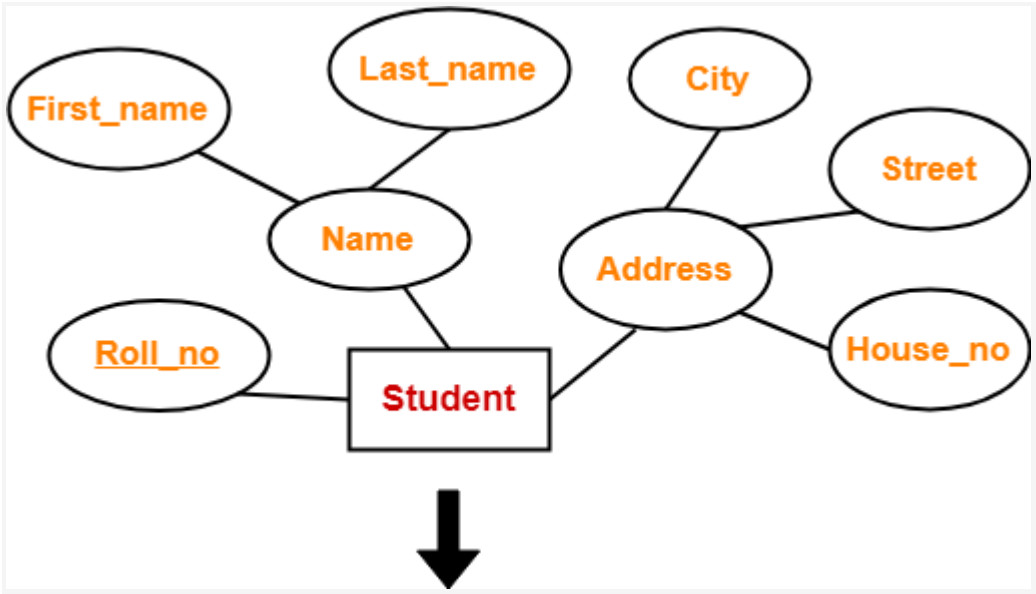
Mapping Process

- Create tables for all higher-level entities.
- Create tables for lower-level entities.
- Add primary keys of higher-level entities in the table of lower-level entities.
- In lower-level tables, add all other attributes of lower-level entities.
- Declare primary key of higher-level table and the primary key for lower-level table.
- Declare foreign key constraints.

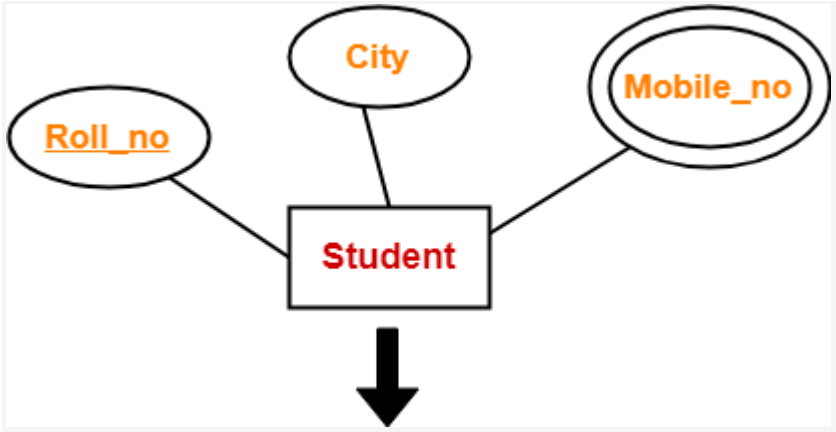
Rules:



Roll_no	Name	Sex

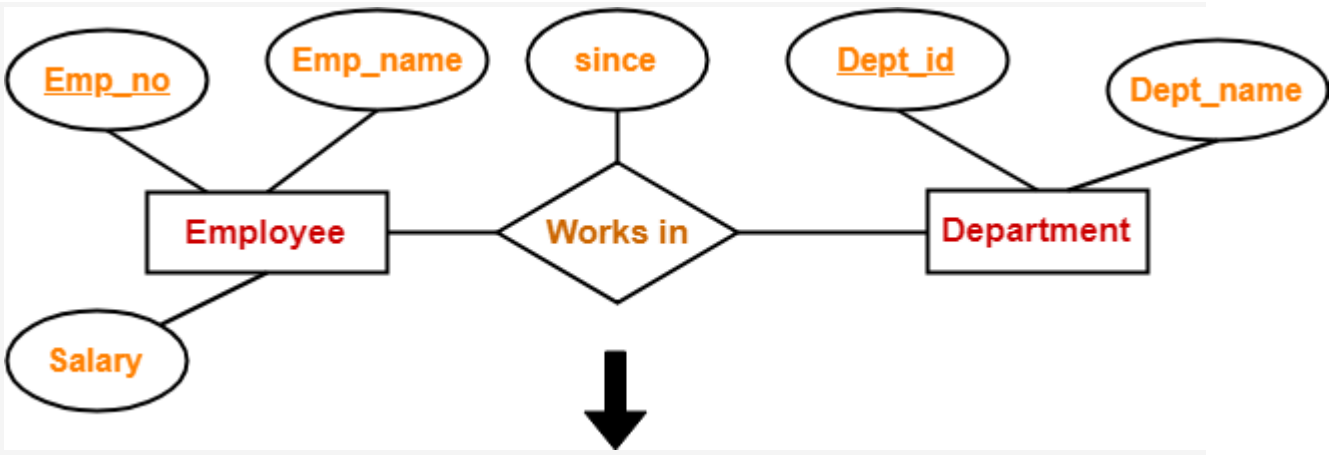


Roll_no	First_name	Last_name	House_no	Street	City

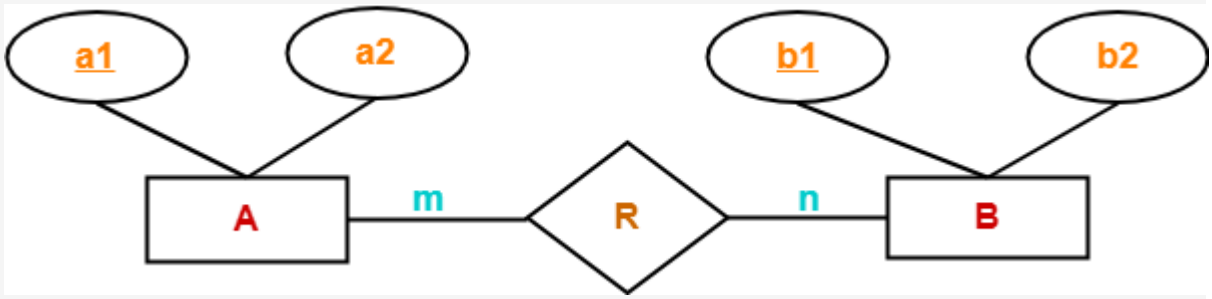


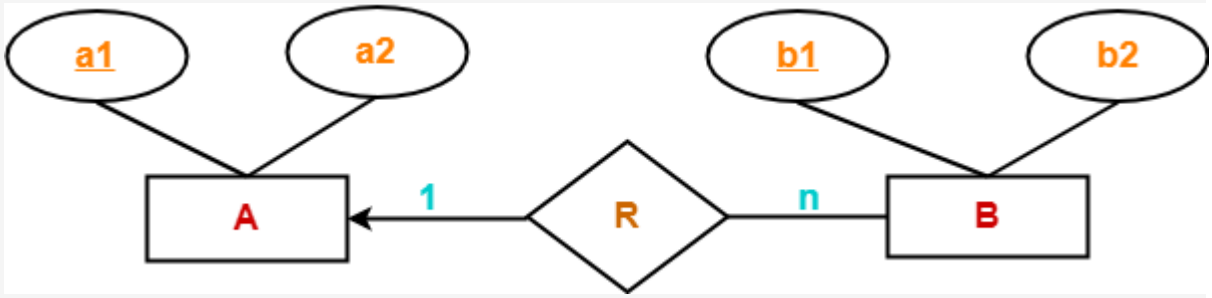
Roll_no	City

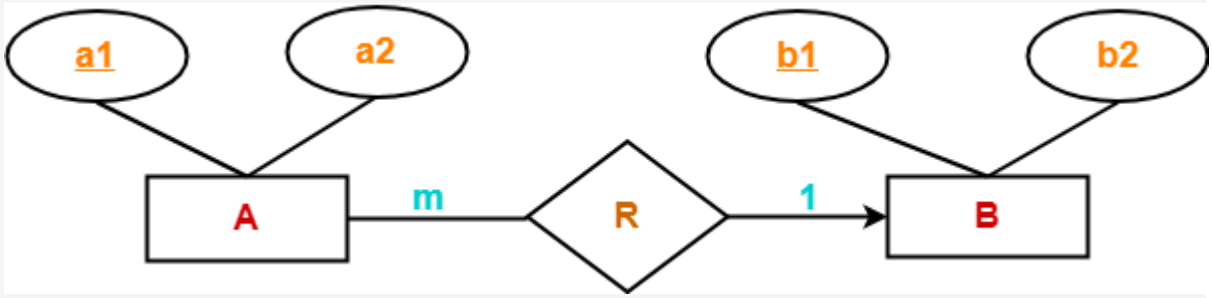
Roll_no	Mobile_no

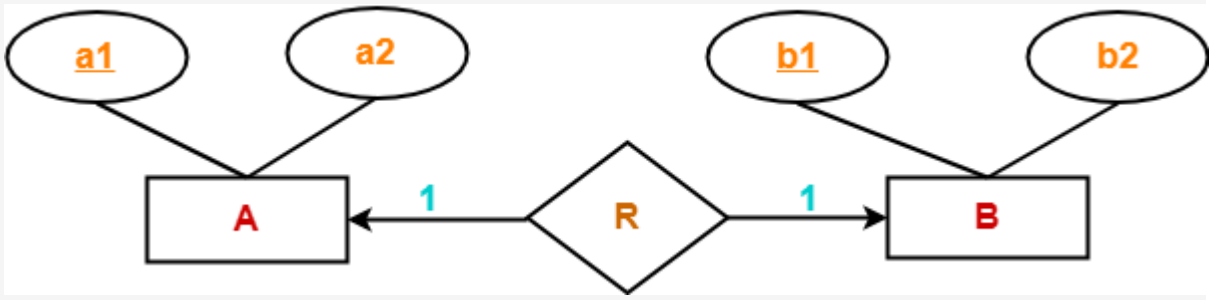


Emp_no	Dept_id	since





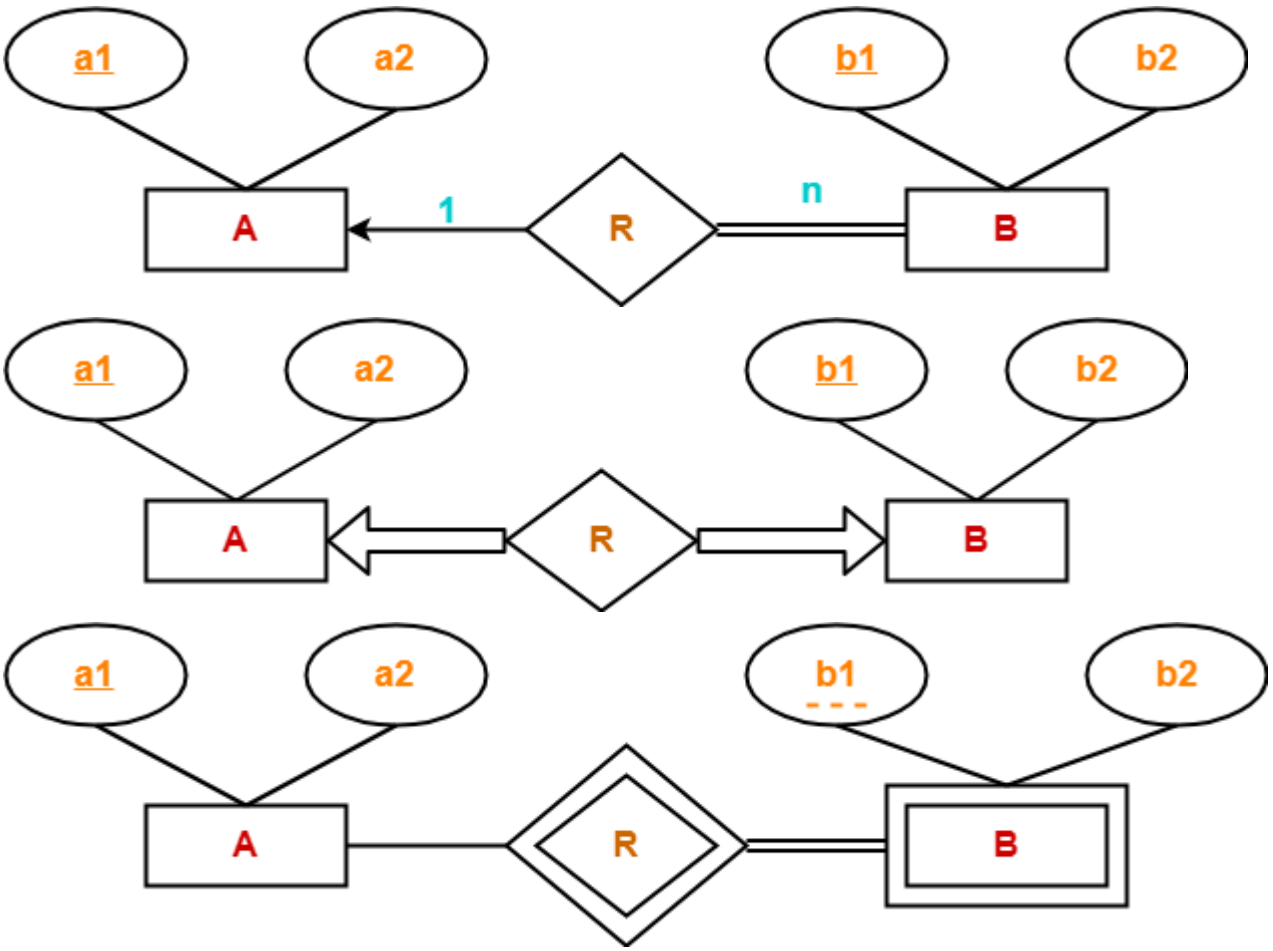




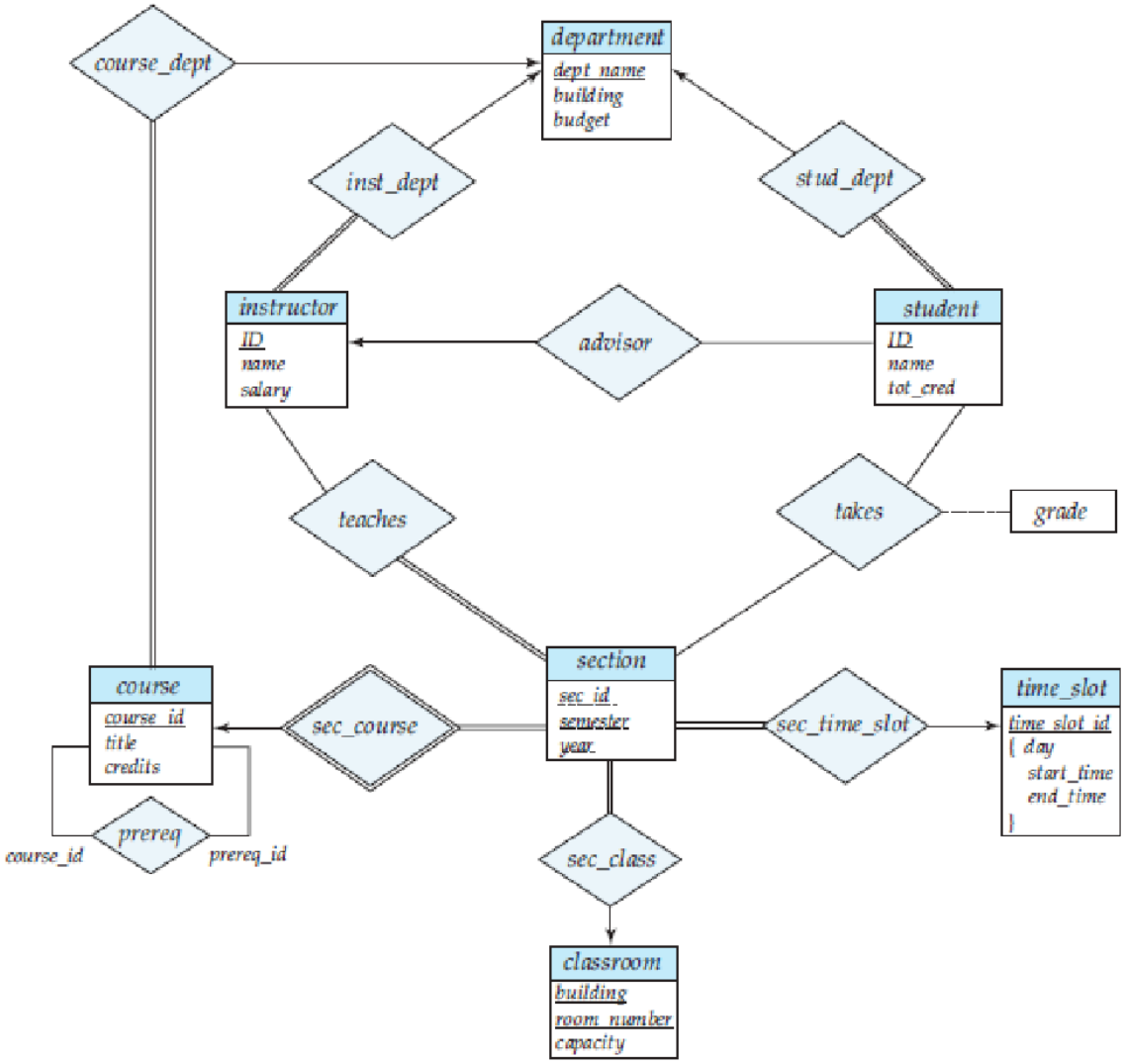
Thumb Rules to Remember

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.
- 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.
- 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.

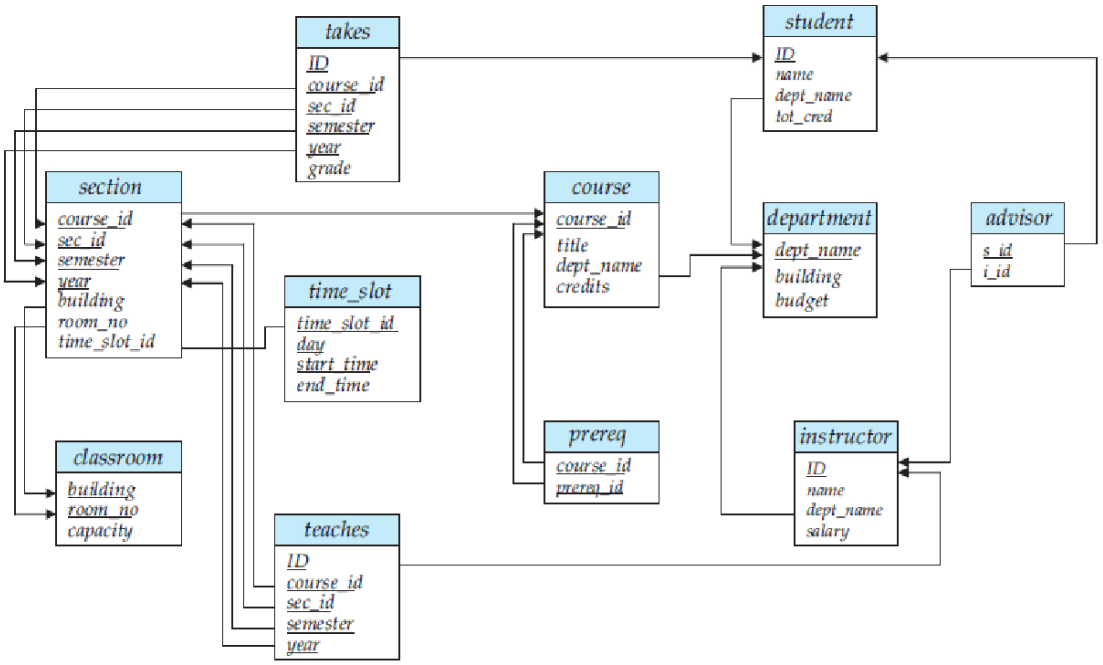

a1
a2
b1
b2
A
1
R
n
B
a1
a2
b1
b2
A
R
B
a1
a2
b1
b2
A
R
B

Sample Example



ER diagram of university database

teaches (*ID*, *course_id*, *sec_id*, *semester*, *year*)
takes (*ID*, *course_id*, *sec_id*, *semester*, *year*, *grade*)
prereq (*course_id*, *prereq_id*)
advisor (*s_ID*, *i_ID*)
sec_course (*course_id*, *sec_id*, *semester*, *year*)
sec_time_slot (*course_id*, *sec_id*, *semester*, *year*, *time_slot_id*)
sec_class (*course_id*, *sec_id*, *semester*, *year*, *building*, *room_number*)
inst_dept (*ID*, *dept_name*)
stud_dept (*ID*, *dept_name*)
course_dept (*course_id*, *dept_name*)



Schema diagram /relational model of University database

classroom(<u>*building*</u>, <u>*room_number*</u>, *capacity*)
department(<u>*dept_name*</u>, *building*, *budget*)
course(<u>*course_id*</u>, *title*, *dept_name*, *credits*)
instructor(<u>*ID*</u>, *name*, *dept_name*, *salary*)
section(<u>*course_id*</u>, <u>*sec_id*</u>, <u>*semester*</u>, <u>*year*</u>, *building*, *room_number*, *time_slot_id*)
teaches(<u>*ID*</u>, <u>*course_id*</u>, <u>*sec_id*</u>, <u>*semester*</u>, <u>*year*</u>)
student(<u>*ID*</u>, *name*, *dept_name*, *tot_cred*)
takes(<u>*ID*</u>, <u>*course_id*</u>, <u>*sec_id*</u>, <u>*semester*</u>, <u>*year*</u>, *grade*)
advisor(<u>*s_ID*</u>, *i_ID*)
time_slot(<u>*time_slot_id*</u>, <u>*day*</u>, <u>*start_time*</u>, *end_time*)
prereq(<u>*course_id*</u>, <u>*prereq_id*</u>)

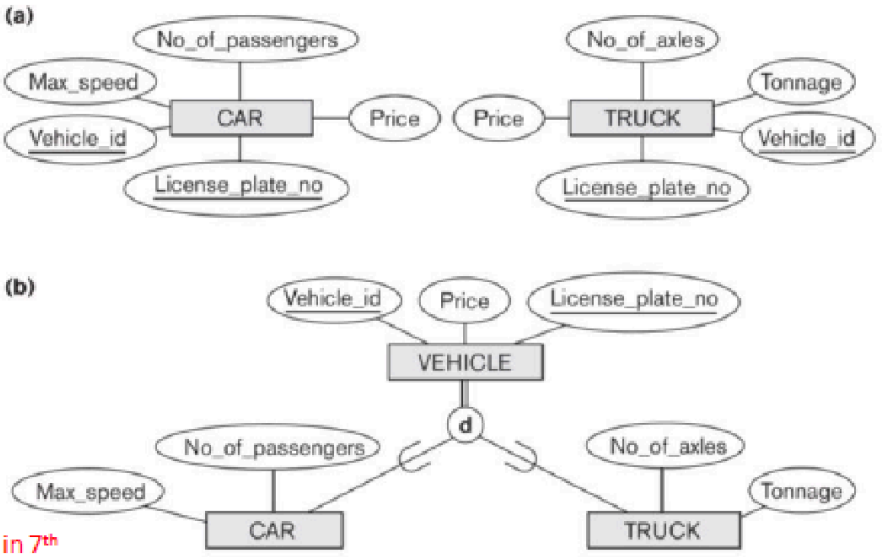
2) Mapping of Specialization or Generalization

- Step 8: Options for Mapping Specialization or Generalization.
  Can be used for shared subclasses.
  - Option 8A: Multiple relations—one for the superclass and one for each subclass
    - For any specialization
      (total or partial, disjoint or overlapping)
    - PK of subclass relation is FK to superclass relation.
    - An equi-join is needed to get all attributes for an entity that is an instance of a subclass. An entity can be represented many times.
    - Consider Figure 9.5a)

- Option 8B: Multiple relations but only for subclasses
  - Only for subclassing that is *total*
  - If specialization is overlapping there can be entities represented in more than one relation
  - Example, see figure 9.5b)

- Option 8C: Single relation representing all classes including one type attribute
  - A type (discriminating) attribute indicates subclass
  - Subclasses must be disjoint
  - Potential for generating many NULL values if many specific attributes exist in the subclasses
  - Example 9.5c)

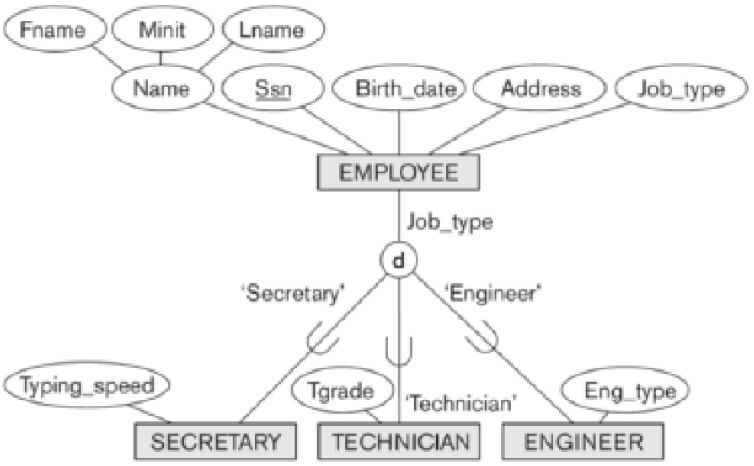
- Option 8D: Single relation representing all classes including multiple type attributes
  - Useful for overlapping subclasses
  - Potential for generating many NULL values if many specific attributes exist in the subclasses
  - Example 9.5d)



4.3 in 7th

Figure 8.3
Generalization. (a) Two entity types, CAR and TRUCK. (b) Generalizing CAR and TRUCK into the superclass VEHICLE.

Figure 8.4
EER diagram notation for an attribute-defined specialization on Job_type.



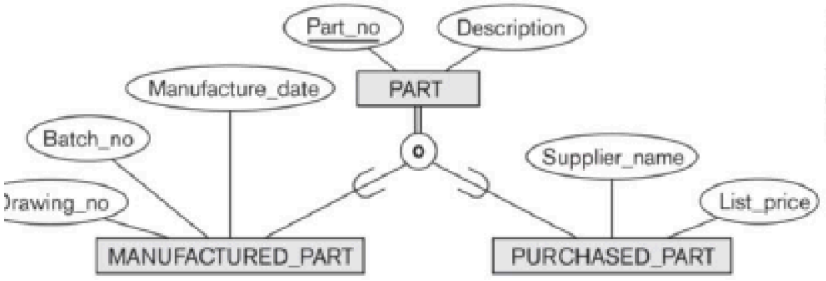


Figure 8.5
EER diagram notation for an overlapping (nondisjoint) specialization.

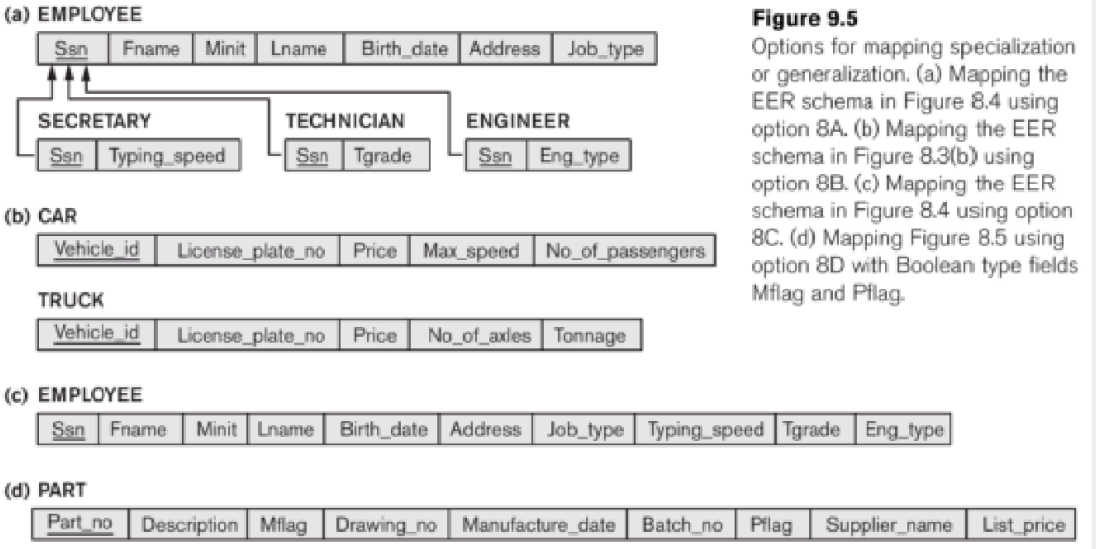


Figure 9.5
Options for mapping specialization or generalization. (a) Mapping the EER schema in Figure 8.4 using option 8A. (b) Mapping the EER schema in Figure 8.3(b) using option 8B. (c) Mapping the EER schema in Figure 8.4 using option 8C. (d) Mapping Figure 8.5 using option 8D with Boolean type fields Mflag and Pflag.

EXAMPLE

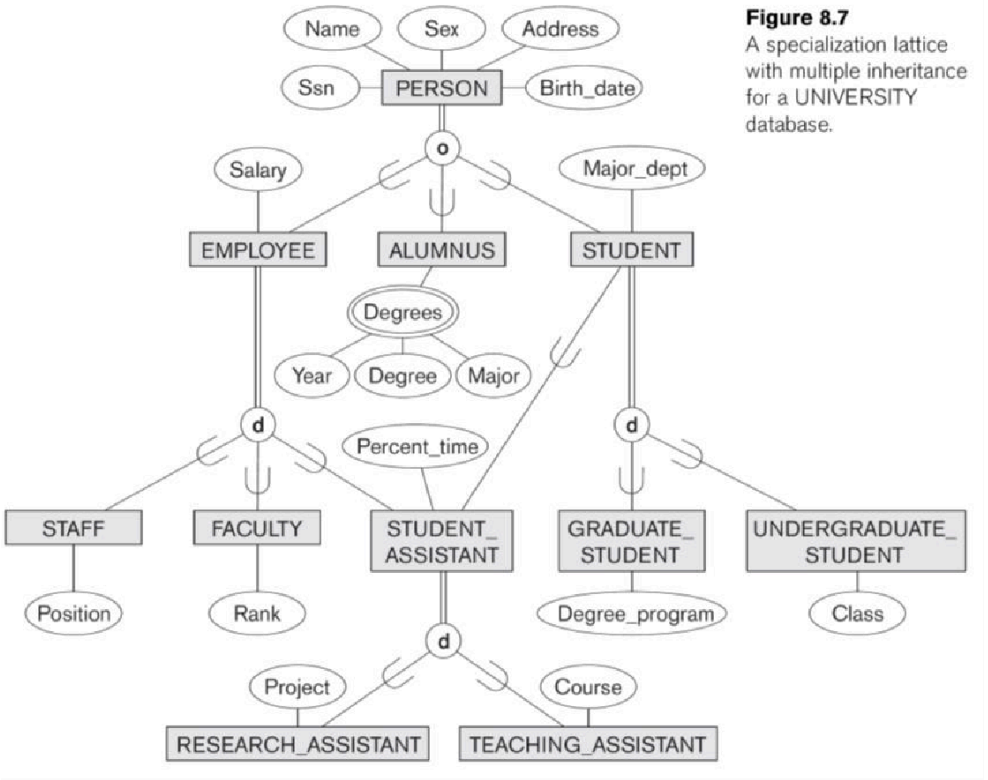


Figure 8.7
A specialization lattice with multiple inheritance for a UNIVERSITY database.

Applied 8A to Person, Employee, Alumnus, Student

Applied 8C to Employee, Staff, Faculty, Student Assistant – *Employee type*

Applied 8D to Student Assistant, Research Assistant, Teaching Assistant – *Ta flag, Ta flag*

Applied 8D to Student, Student Assistant, Graduate Student, Undergraduate Student – *Grad flag, Undergrad flag, Student assist flag*

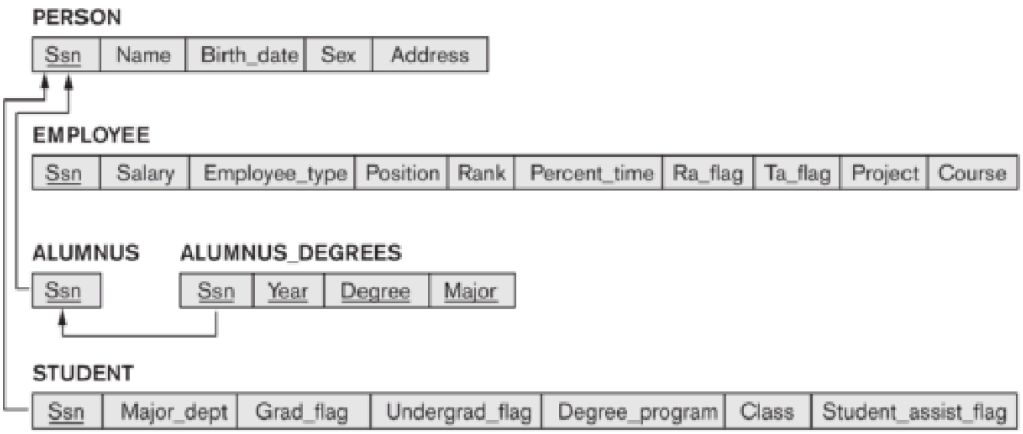
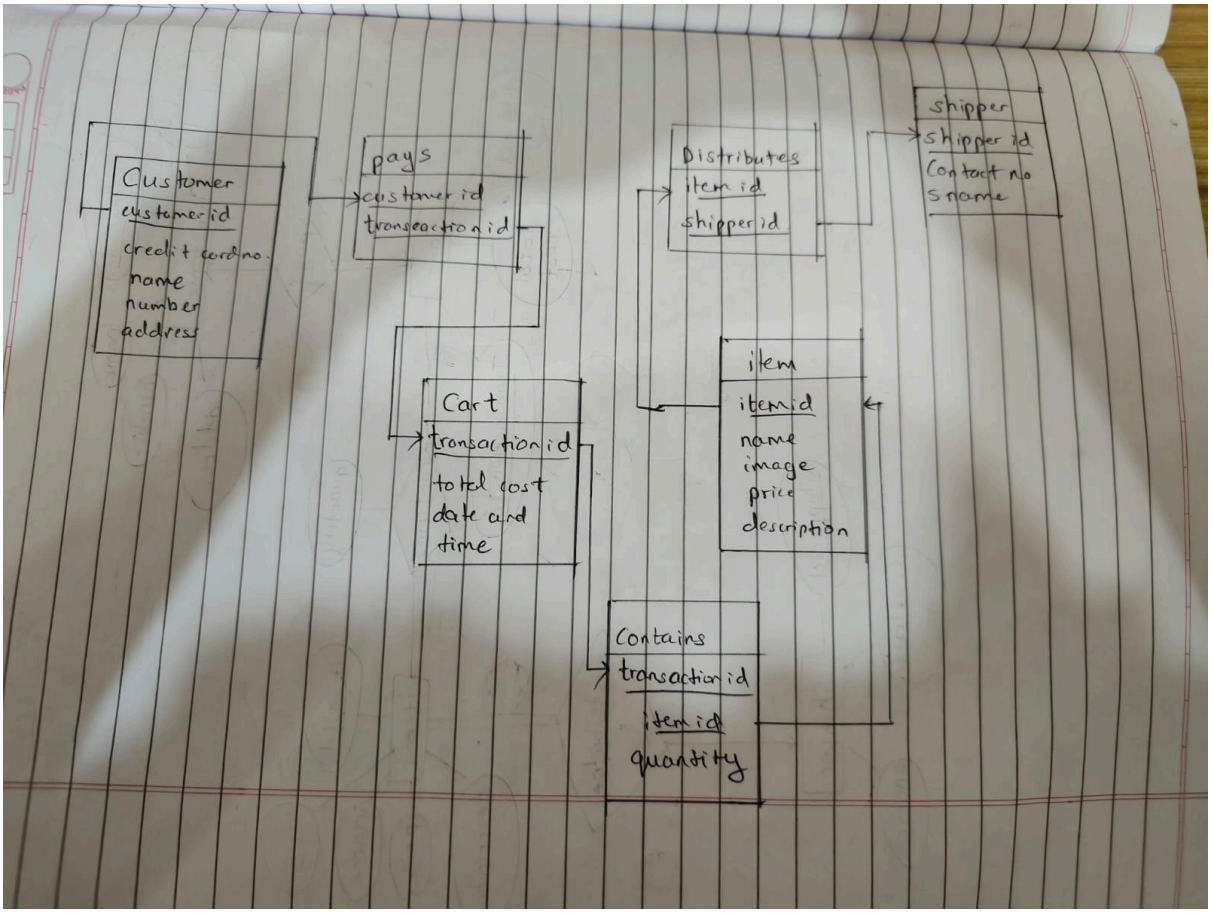


Table 9.1 Correspondence between ER and Relational Models

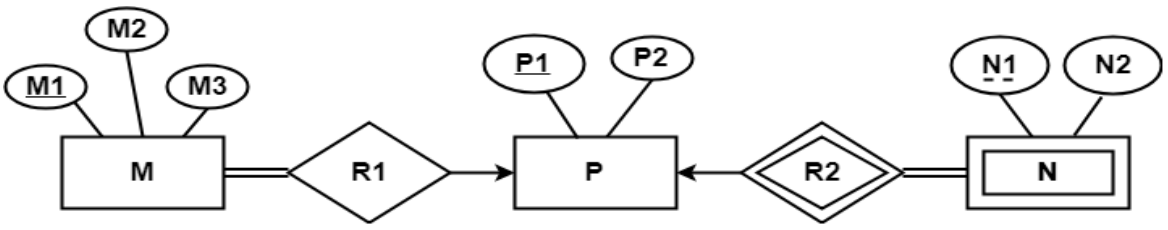
ER MODEL	RELATIONAL MODEL
Entity type	*Entity* relation
1:1 or 1:N relationship type	Foreign key (or *relationship* relation)
M:N relationship type	*Relationship* relation and *two* foreign keys
n-ary relationship type	*Relationship* relation and *n* foreign keys
Simple attribute	Attribute
Composite attribute	Set of simple component attributes
Multivalued attribute	Relation and foreign key
Key attribute	Primary (or secondary) key

Relational Model of Problem

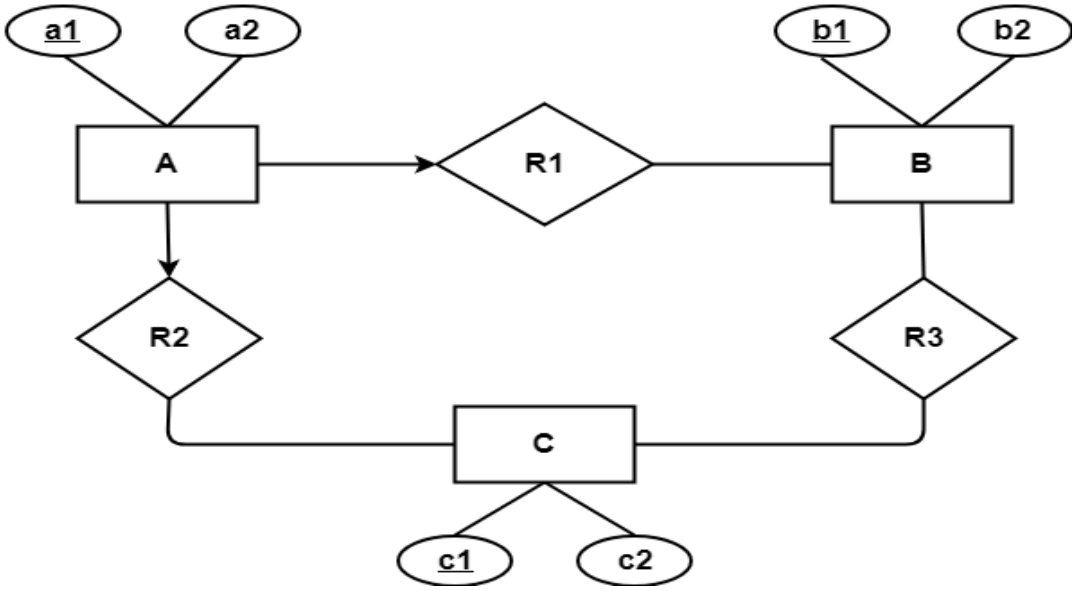


Post Lab Assignment:

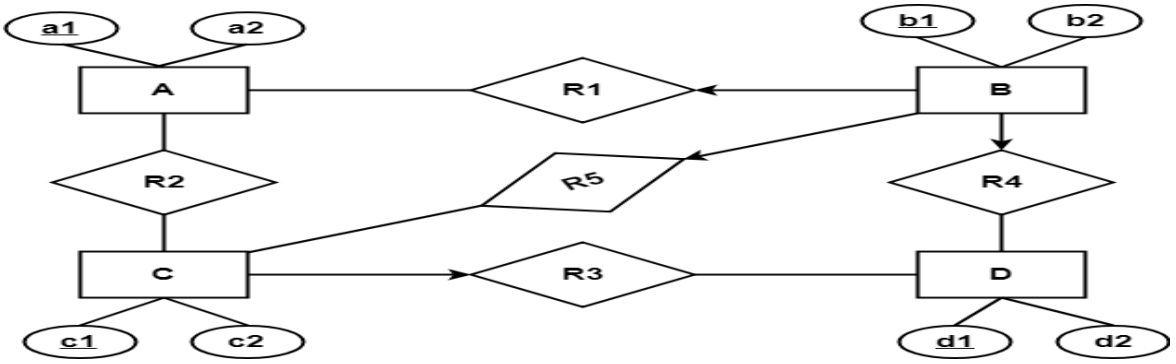
1) Find the minimum number of tables required for the following ER diagram in relational model-

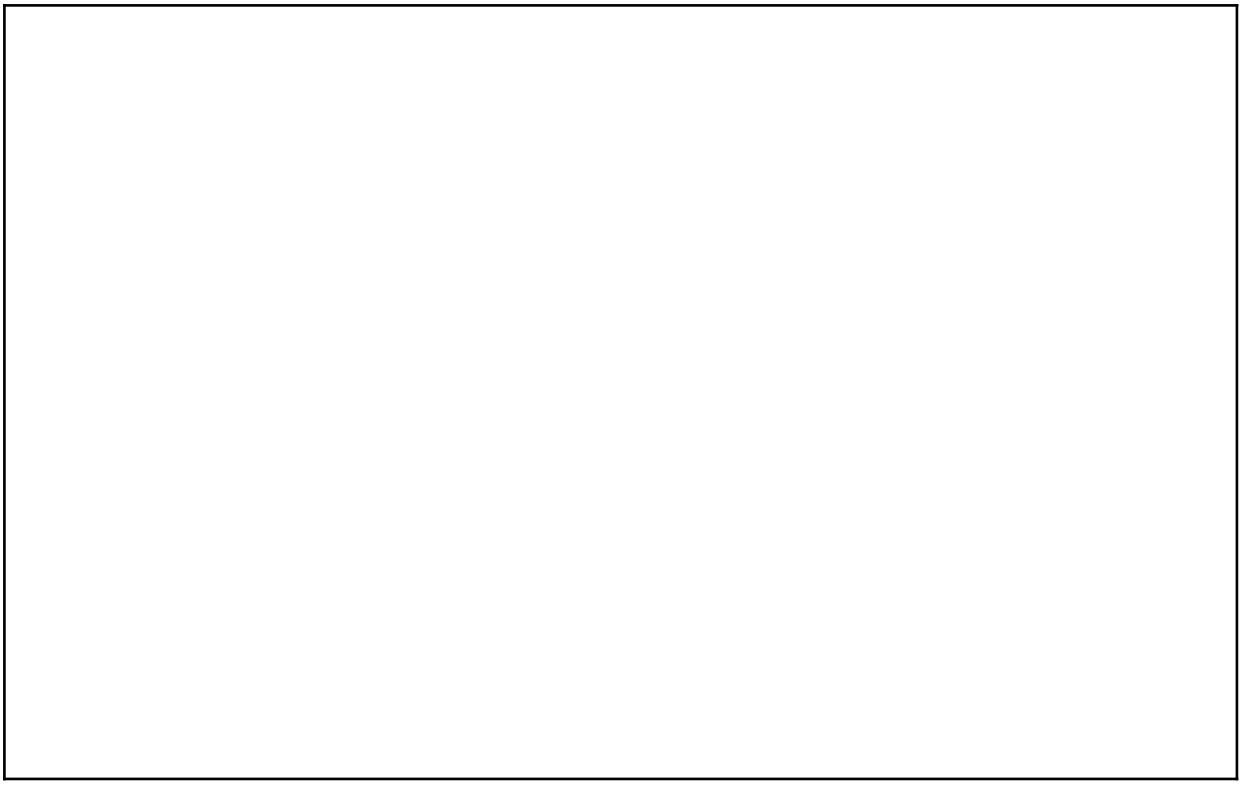


2) Find the minimum number of tables required to represent the given ER diagram in relational model-



3) Find the minimum number of tables required to represent the given ER diagram in relational model-

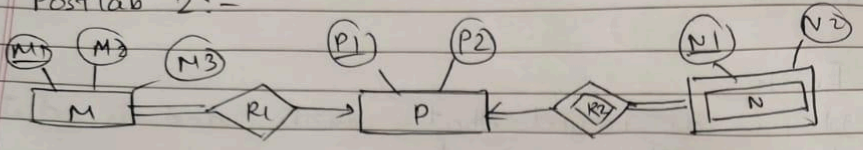




9913
Mark Lopes
SE comps A-batch-C

Postlab 2:-

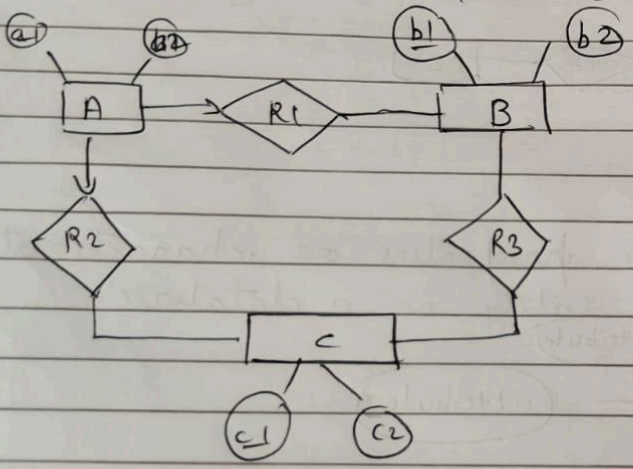
1)



MR1 (M1, M2, M3, P1) ✓
P (P1, P2) ✓
NA2 (N1, N2, P1) ✓

∴ minimum three (3) tables

2)

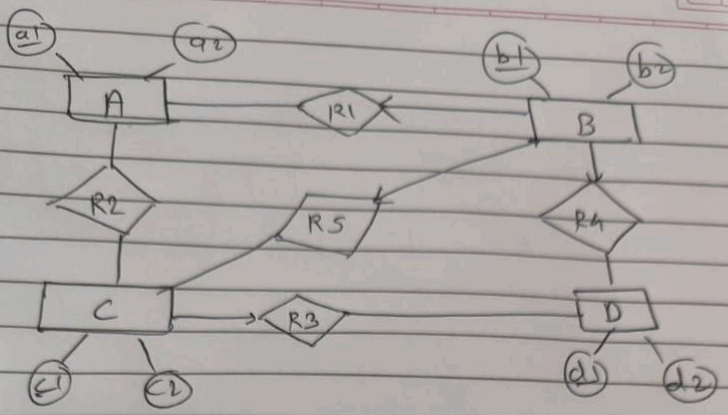


AR1 (a1, a2, b1)
B (b1, b2) ✓
AR2 (a1, a2, c1)
C (c1, c2) ✓
R3 (c1, b1) ✓

→ AR1R2 (a1, a2, b1, c1) ✓

∴ 4 tables minimum

3)



BR1 (b1, b2, a1)
BR5 (b1, b2, c1) → BR1R4R5 (b1, b2, a1, d1, c1) ✓
BR4 (b1, b2, d1)
CR3 (c1, c2, d1) ✓
A (a1, a2) ✓
R2 (a1, c1) ✓
D (d1, d2) ✓

∴ minimum 5 tables