

UNIT-5 [Database Design using EER to Relational Mapping]

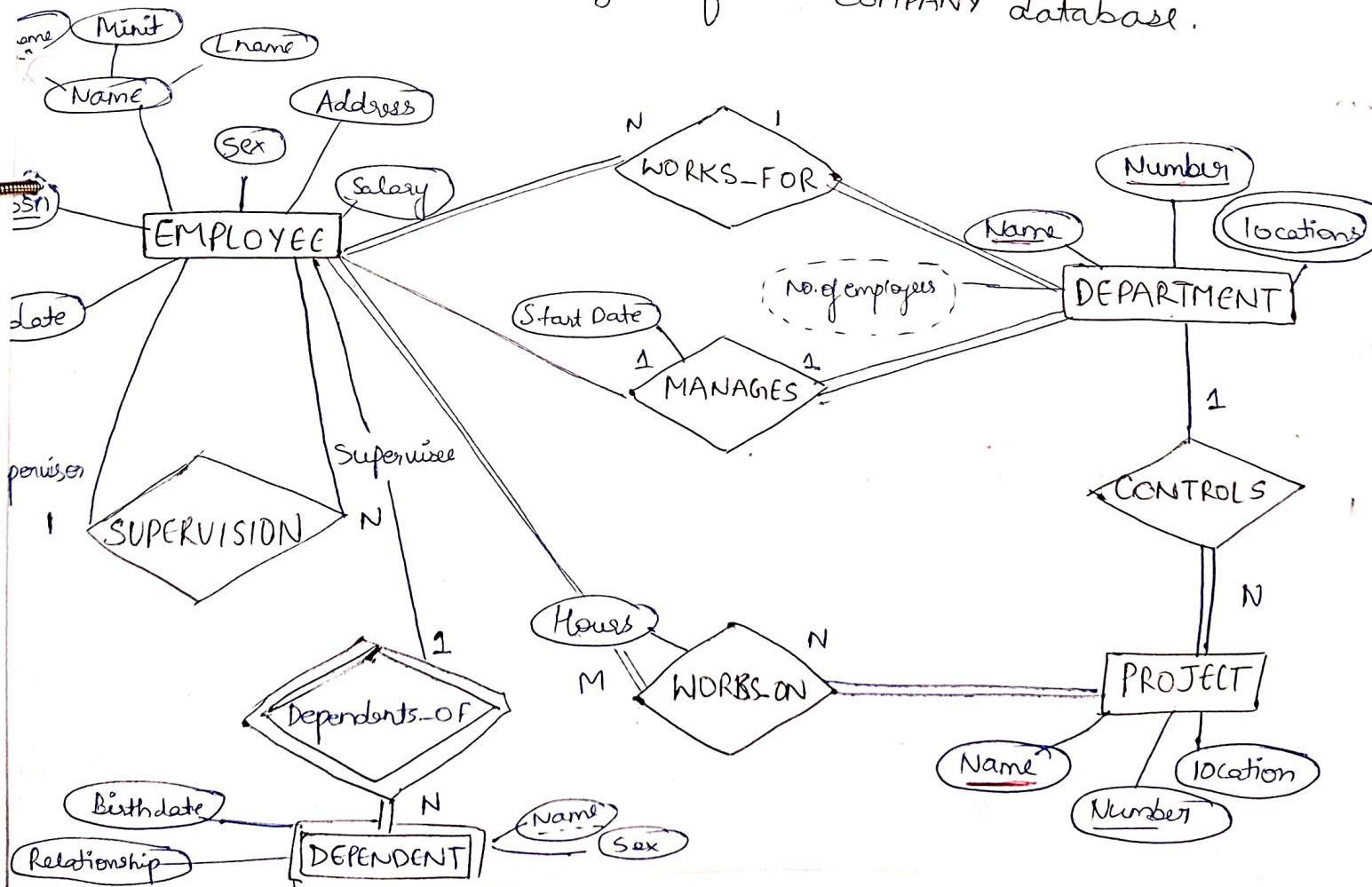
1. Mapping of Regular Entity Types.

- 1) For each regular (Strong) entity type E in the ER Schema, Create a relation R that includes all the simple attributes of E .
- 2) Choose one of the key attributes of E as the primary key for R .
- 3) If the chosen key of E is Composite, the set of simple attributes that form it will together form the primary key of R .

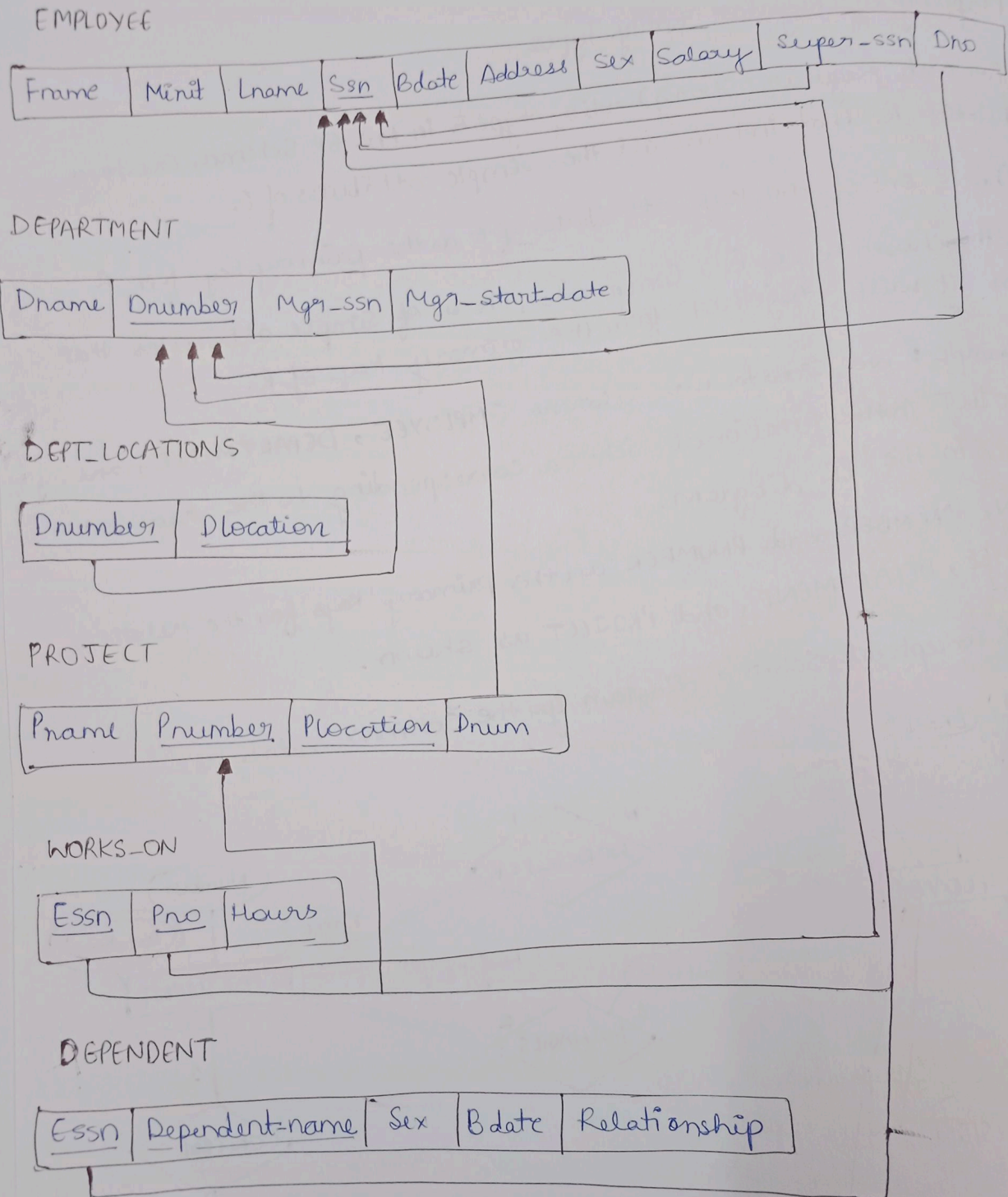
Example : we create the relations EMPLOYEE, DEPARTMENT, and PROJECT in the relational Schema corresponding to the regular entities in the ER diagram.

SSN, DNUMBER and PNUMBER are the primary keys for the relations EMPLOYEE, DEPARTMENT, and PROJECT as shown.

The ER Conceptual Schema diagram for the COMPANY database.



Result of mapping the COMPANY ER Schema into a relational Schema.



Result of mapping the
COMPANY ER Schema into
relational database Schema

Result of mapping the COMPANY ER Schema into a relational Schema.

EMPLOYEE

Frame	Minit	Lname	<u>Ssn</u>	Bdate	Address	Sex	Salary	Super-ssn	Dno
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DEPARTMENT

Dname	<u>Dnumber</u>	Mgr-ssn	Mgr-start-date
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DEPT-LOCATIONS

<u>Dnumber</u>	<u>Dlocation</u>
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PROJECT

Pname	<u>Pnumber</u>	<u>Plocation</u>	Dnum
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WORKS-ON

<u>Essn</u>	<u>Pno</u>	<u>Hours</u>
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DEPENDENT

<u>Essn</u>	<u>Dependent-name</u>	Sex	Bdate	Relationship
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Result of mapping the
COMPANY ER Schema into
relational database Schema

■ Mapping of Weak Entity Types

- For each weak entity type W in the ER Schema with owner entity type E , Create a Relation R & include all simple attributes (or simple components of composite attributes) of W as attributes of R .
- Also, include as Foreign Key attributes of R the primary key attributes of the relation(s) that correspond to the owner entity type(s).
- The primary key K of R is the combination of the primary key(s) of the owner(s) and the partial key of the weak entity type W , if any.

Example : Create the relation **DEPENDENT** in this step to correspond to the weak entity type **DEPENDENT**.

- Include the primary key **SSN** of the **EMPLOYEE** relation as a foreign key attribute of **DEPENDENT** (renamed to **ESSN**).
- The primary key of the **DEPENDENT** relation is the combination of **ESSN**, **DEPENDENT NAME** because **DEPENDENT_NAME** is the partial key of **DEPENDENT**.

■ Mapping of Binary 1:1 Relation Types

- For each binary 1:1 relationship type R in the ER Schema, Identify the relations S and T that correspond to the entity types participating in R .
- There are three possible approaches:
Foreign Key approach: Choose one of the relations - say S - and include a Foreign Key in S the primary key of T . It is better to choose an entity type with total participation in R in the role of S .

- Example: 1:1 relation manages. MANAGES is mapped by choosing the participating entity type DEPARTMENT to serve in the role of S, because its participation in the MANAGES Relationship type is total.
- Merged relation option: An alternate mapping of a 1:1 relationship type is possible by merging the two entity types and the relationship into a single relation. This may be appropriate when both participations are total.

Cross-reference or relationship relation option: The third alternative is to set up a third Relation R for the purpose of cross-referencing the primary keys of the two relations S and T representing the entity types.

■ Mapping of Binary 1:N Relationship Types.

- For each regular binary 1:N Relationship type R, identify the relation S that represent the participating entity type at the N-side of the relationship type.
- include as foreign key in S the primary key of the relation T that represents the other entity type participating in R.
- include any simple attributes of the 1:N relation type as attribute of S.

Example: 1:N relationship types WORKS_FOR, CONTROLS, and SUPERVISION in the figure.

- ⇒ For WORKS_FOR we include the primary key DNUMBER of the DEPARTMENT Relation as Foreign key in the EMPLOYEE relation and call it DNO.

■ Mapping of Binary M:N Relationship Types.

- For each regular binary M:N relationship type R , Create a new relation S to represent R .
- Include as Foreign Key attributes in S the primary keys of the relations that represent the participating entity types; their combination will form the primary key of S .
- Also include any simple attributes of the M:N relationship type (or simple components of composite attributes) as attributes of S .

Example: The M:N relationship type WORKS-ON from the ER diagram is mapped by creating a relation WORKS-ON in the relational database schema.

- The primary keys of the PROJECT and EMPLOYEE relations are included as foreign keys in WORKS-ON and renamed PNO and ESSN, respectively.
- Attribute HOURS in WORKS-ON represents the HOURS attribute of the relation type. The primary key of the WORKS-ON relation is the combination of the foreign key attributes {ESSN, PNO}.

■ Mapping of Multivalued Attributes.

- For each multivalued attribute A , Create a new relation R .
- This relation R will include an attribute corresponding to A , plus the primary key attribute K as a foreign key in R of the relation that represents the entity type of relationship type that has A as an attribute.
- The primary key of R is the combination of A and K . If the multivalued attribute is composite, we include its simple components

Example: The relation DEPT-LOCATIONS is created.

→ The attribute LOCATION represents the multivalued attribute LOCATIONS of DEPARTMENT, while DNUMBER - as Foreign Key - represents the primary key of the DEPARTMENT relation.

→ The primary key of R is the combination of DNUMBER, DLOCATION.

■ Mapping of N-ary Relationship types.

→ For each n-ary relationship type R, where $n > 2$, create a new relationship S to represent R.

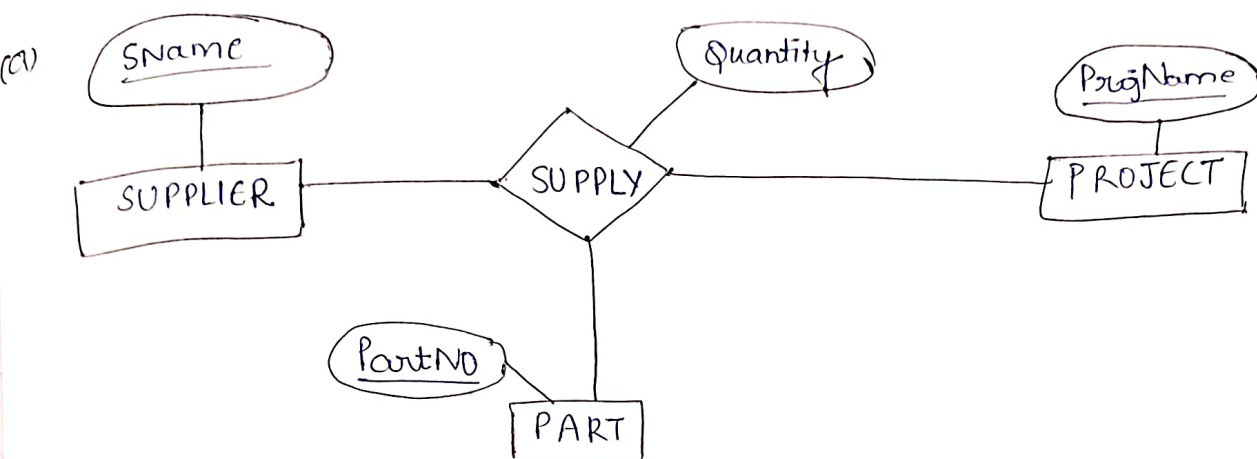
→ Include as Foreign Key attributes in S the primary keys of the relations that represent the participating entity types.

→ Also include any simple attributes of n-ary relationship type (or simple components of composite attributes) as attribute of S.

Example: The relationship type SUPPLY in the ER on the next slide.

→ This can be mapped to the relation SUPPLY shown in the relational schema, whose primary key is the combination of the three foreign keys SNAME, PARTNO, PROJNAME?

• Ternary relationship types. (a) The SUPPLY relationship.



• Mapping the n-ary relationship types SUPPLY from above digr.

SUPPLIER

<u>SNAME</u>	...
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PROJECT

<u>PROJNAME</u>	...
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PART

<u>PARTNO</u>	...
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SUPPLY

<u>SNAME</u>	<u>PROJNAME</u>	<u>PARTNO</u>	QUANTITY
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