Database Design (bottom-up)

1. For each entity type create a separate table.
   For each attribute of the entity type create a column in the table.
   Identify primary key for the table.

2. Examine all relationships:
   a) 1:1
      It needs to be represented as part of one of the entity types (preferably with total participation).
   b) 1:n
      It needs to be represented as part of the table corresponding to the many side of the relationship.
   c) m:n
      The relationship has to be stored as a separate table.

For each table, identify the primary key.
Foreign key constraints need to be defined for columns that represent relationship semantics.
ER-to-Relational DB

1. Create a table for each entity type.
   - For every attribute of the entity type, add a column to the table.

2. Relationships:
   - 1:1: Represent the relationship as column(s) in either table of the entity types participate in the relationship. Also, entity types with total participation.
Logical View of Relationship

1:1 Relationship

Manager

Dept

Total Participation

Dept

Partial Participation

Employee

SSN Name Title Dept

(i) Manage as a part of Employee

(ii) Manage as a part of Dept

(iii) Manages as a separate table, slows down every processing.
1:N Relationship

Represent the relationship as column(s) in the table (entity type) corresponding to the "N" role (many).

M:N Relationship

Represent it as a separate table with primary keys of the participating entity types.
For all tables

- Specify Primary key constraint

- For each referencing column(s) in a table
  Specify a Foreign key constraint

- For attributes that require only a specific set of values
  Specify a Check constraint (Legal-values)
  e.g. Sex in ('m', 'f')
Reflexive relationship

<table>
<thead>
<tr>
<th>SSN</th>
<th>Super SSN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Emp

\[ e_1 \rightarrow e_2 \]
\[ e_2 \rightarrow e_4 \]
\[ e_1 \leftarrow e_4 \]
\[ e_3 \leftarrow e_4 \]

Supervision

Supervisor Subordinate

Supervision

\[ e_2 - e_1 \]
\[ e_2 - e_4 \]
\[ e_4 - e_3 \]

Only a specific set of values, constraint