Relational Database Design by ER- and EER-to-Relational Mapping

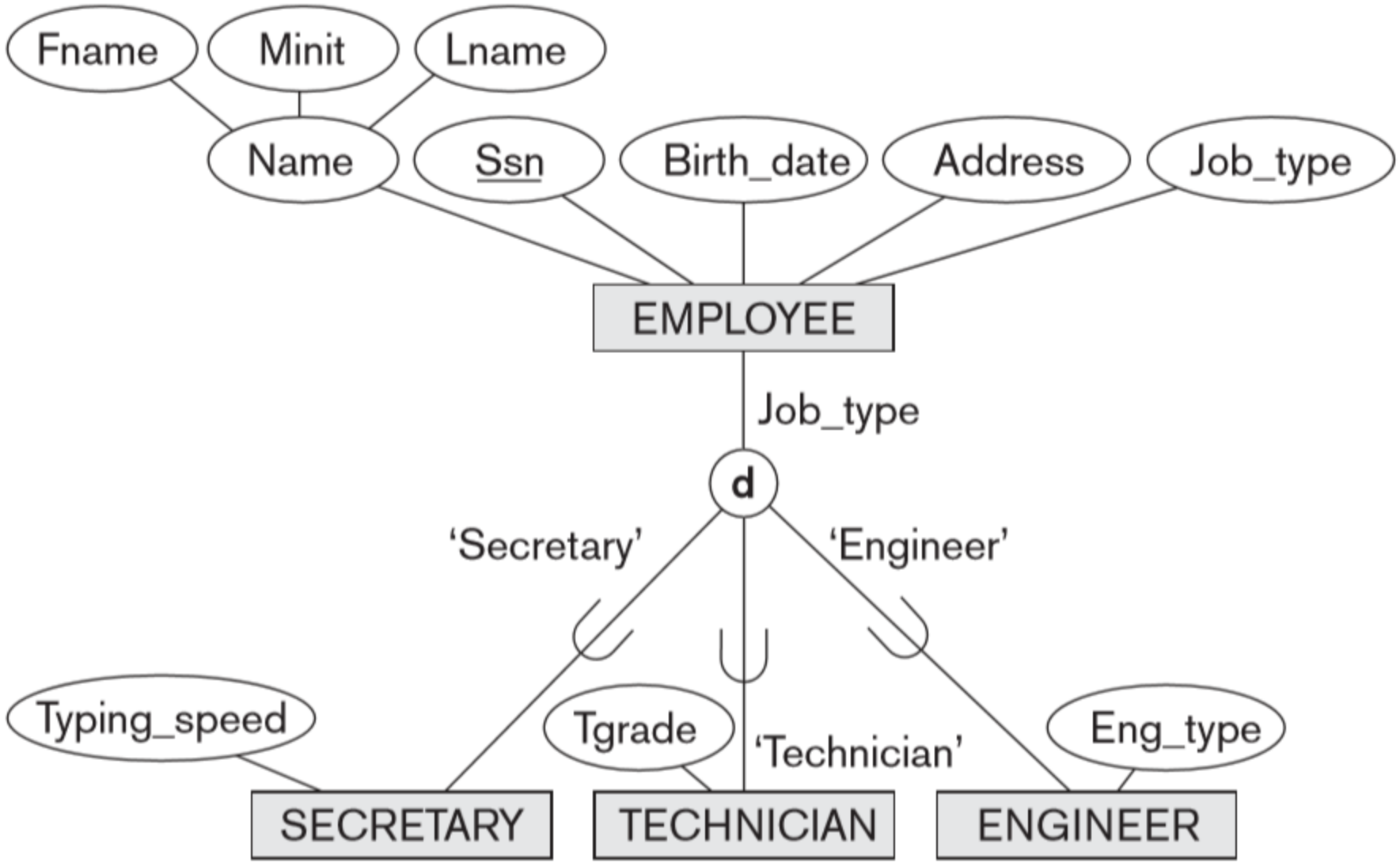
Part 2

Mapping EER Model Constructs to Relations

Mapping of Specialization or Generalization

- **Step 8: Options for Mapping Specialization or Generalization.** Convert each specialization with m subclasses $\{S_1, S_2, ..., S_m\}$ and (generalized) superclass C, where the attributes of C are $\{k, a_1, ..., a_n\}$ and k is the (primary) key, into relation schemas.

- **Option 8A: Multiple relations—superclass and subclasses.** Create a relation L for C with attributes Attrs(L) = {k, a_1, ..., a_n} and PK(L) = k. Create a relation L_i for each subclass S_i, $1 \leq i \leq m$, with the attributes Attrs(L_i) = {k} ∪ {attributes of S_i} and PK(L_i) = k. This option works for any specialization (total or partial, disjoint or overlapping).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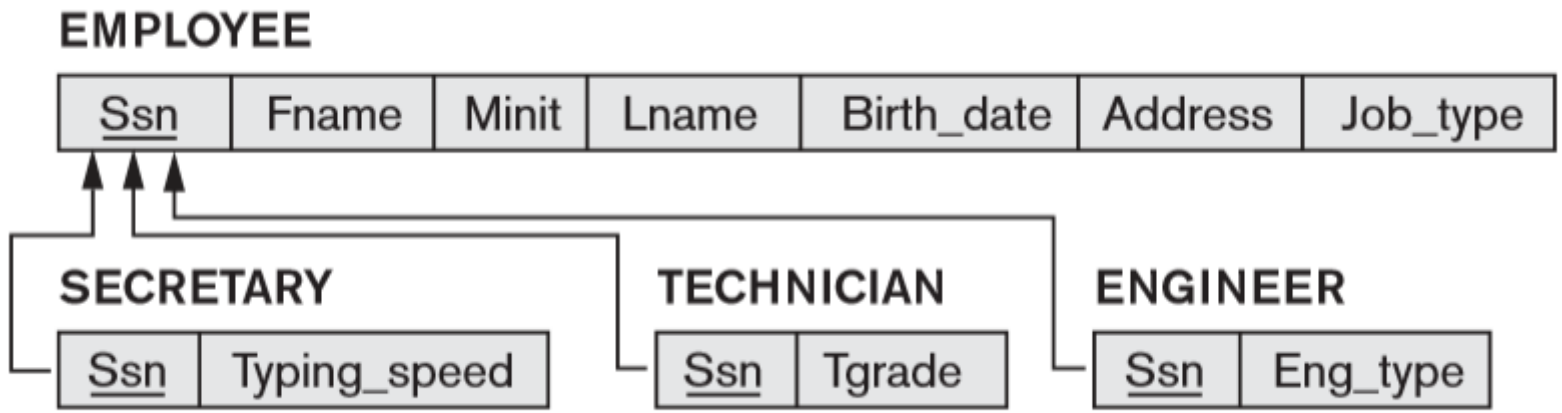
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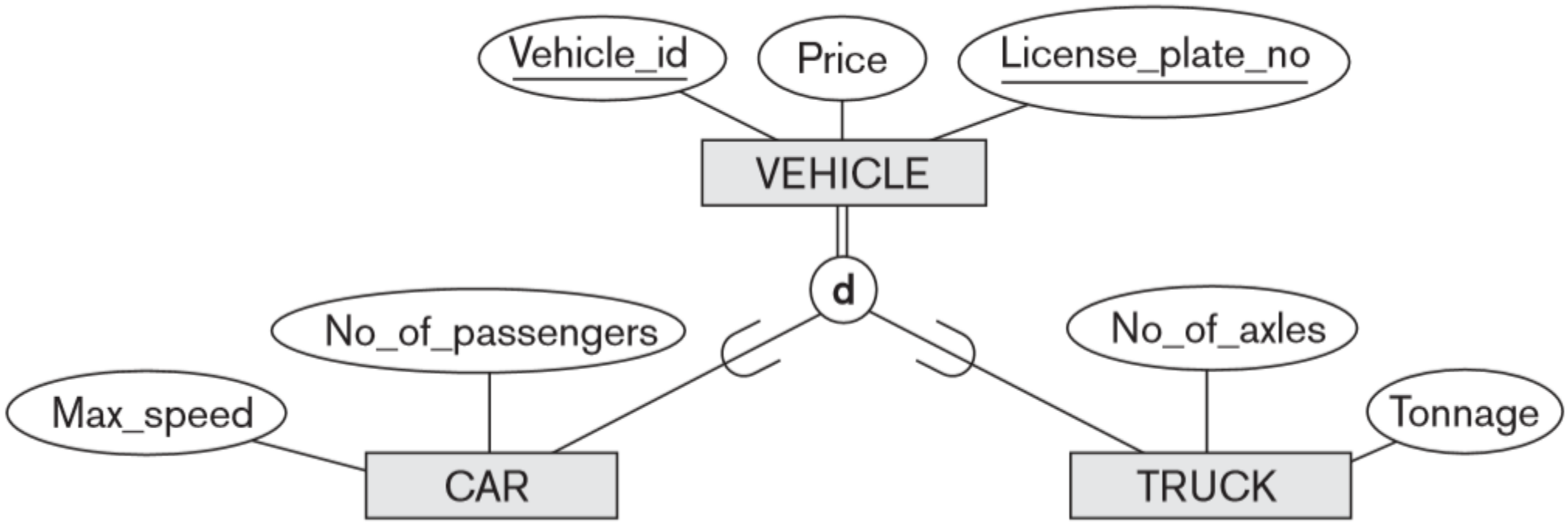
- **Option 8B: Multiple relations—subclass relations only.** Create a relation L_i for each subclass S_i, $1 \leq i \leq m$, with the attributes Attrs(L_i) = {attributes of S_i} ∪ {k, a_1, ..., a_n} and PK(L_i) = k. This option only works for a specialization whose subclasses are *total* (every entity in the superclass must belong to (at least) one of the subclasses). Additionally, it is only recommended if the specialization has the *disjointedness constraint*. If the specialization is *overlapping*, the same entity may be duplicated in several relations.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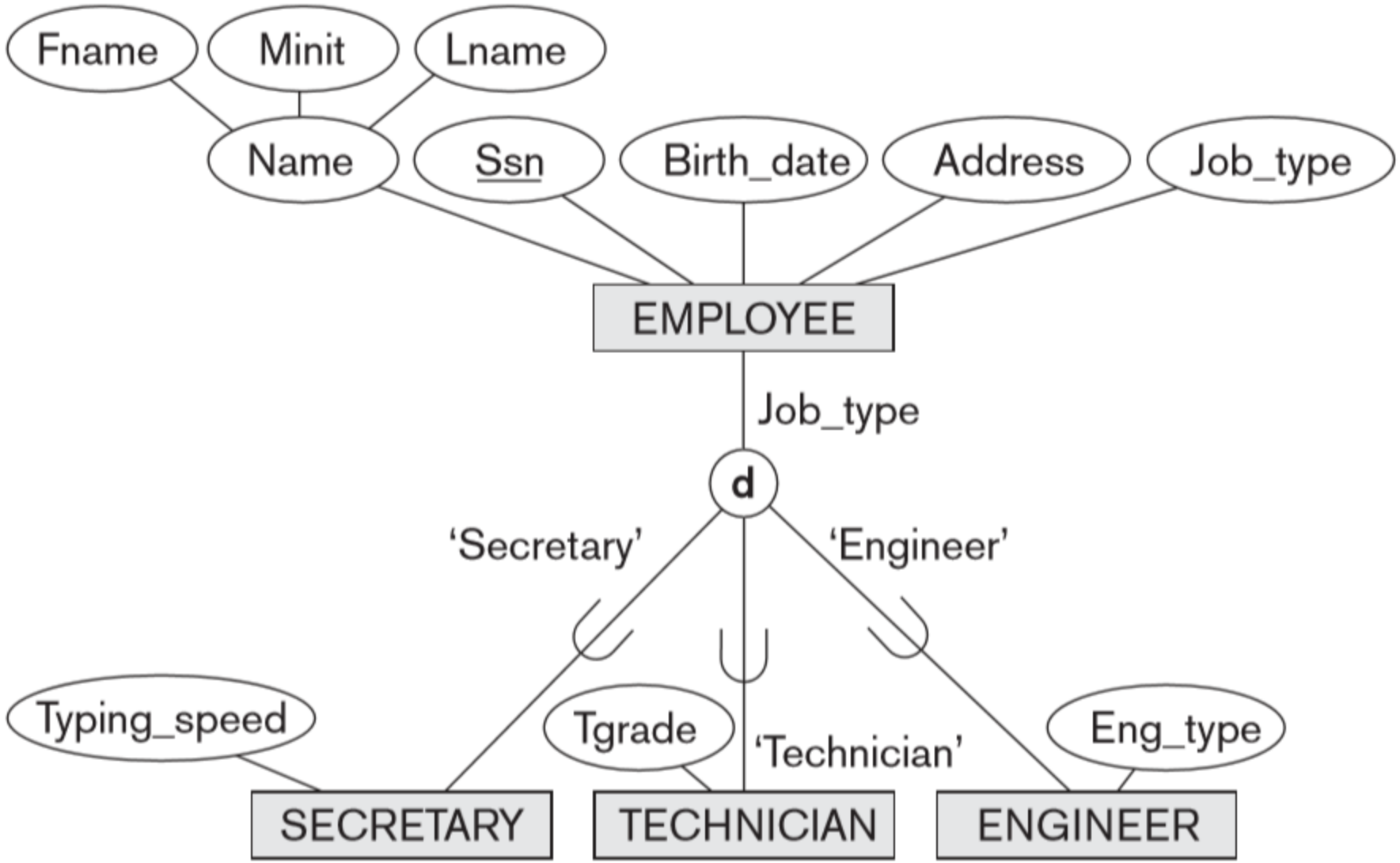
- **Option 8C:Single relation with one type attribute.** Create a single relation L with attributes Attrs(L) = {k, a_1, ..., a_n} ∪ {attributes of S_1} ∪ ... ∪ {attributes of S_m} ∪ {t} and PK(L) = k. The attribute t is called a **type** (or **discriminating**) attribute whose value indicates the subclass to which each tuple belongs, if any. This option works only for a specialization whose subclasses are *disjoint*, and has the potential for generating many NULL values if many specific attributes exist in the subclasses.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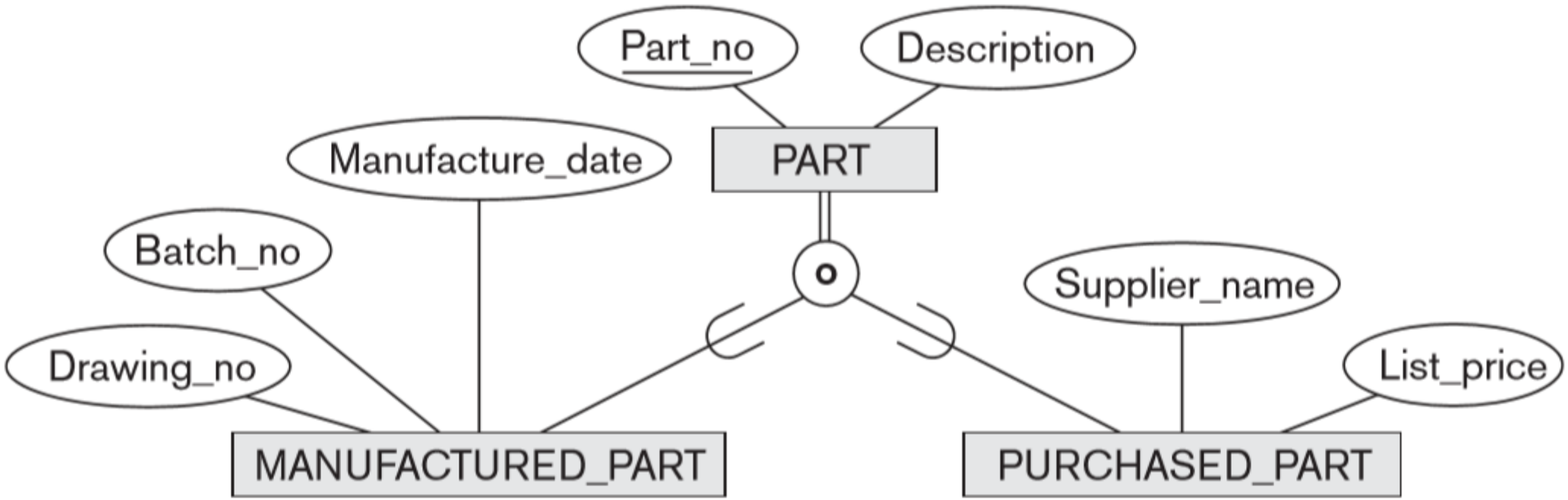
- **Option 8D: Single relation with multiple type attributes.** Create a single relation schema L with attributes Attrs(L) = {k, a_1, ..., a_n} ∪ {attributes of S_1} ∪ ...∪ {attributes of S_m} ∪ {t_1, t_2, ..., t_m} and PK(L) = k. Each t_i, $1 \leq i \leq m$, is a **Boolean type attribute** indicating whether a tuple belongs to subclass S_i. This option is used for a specialization whose subclasses are *overlapping* (but will also work for a disjoint specialization).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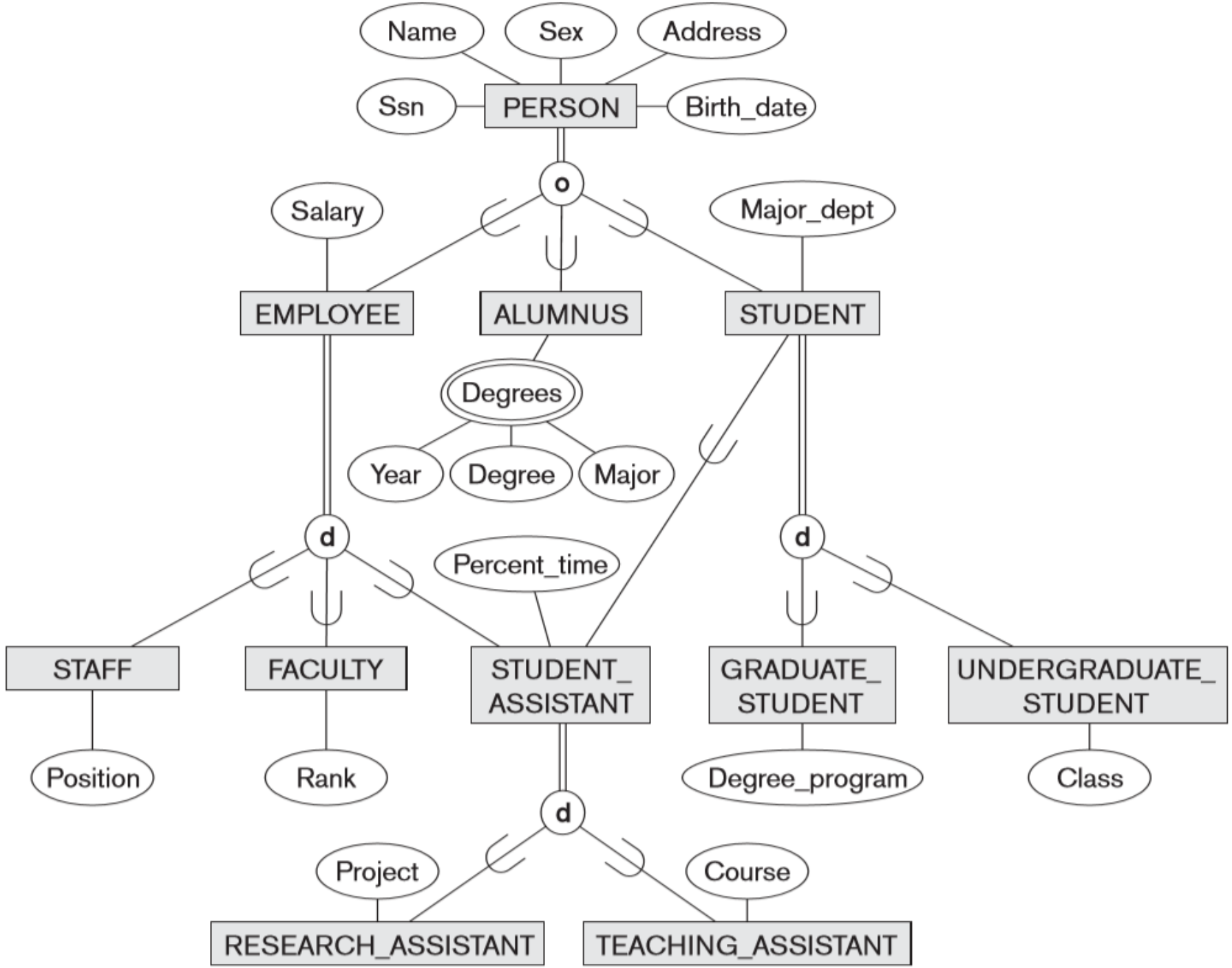
- When we have a multilevel specialization (or generalization) hierarchy or lattice, we do not have to follow the same mapping option for all the specializations. Instead, we can use one mapping option for part of the hierarchy or lattice and other options for other parts.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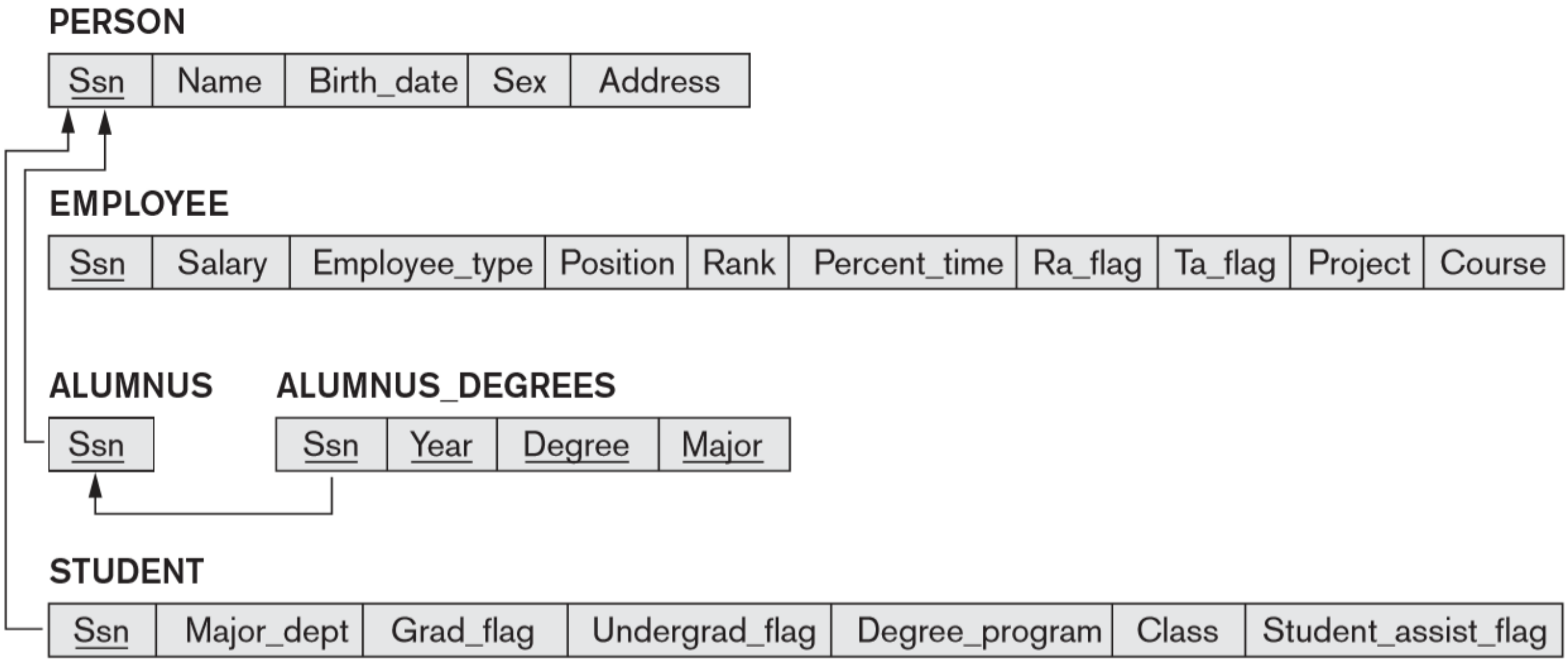
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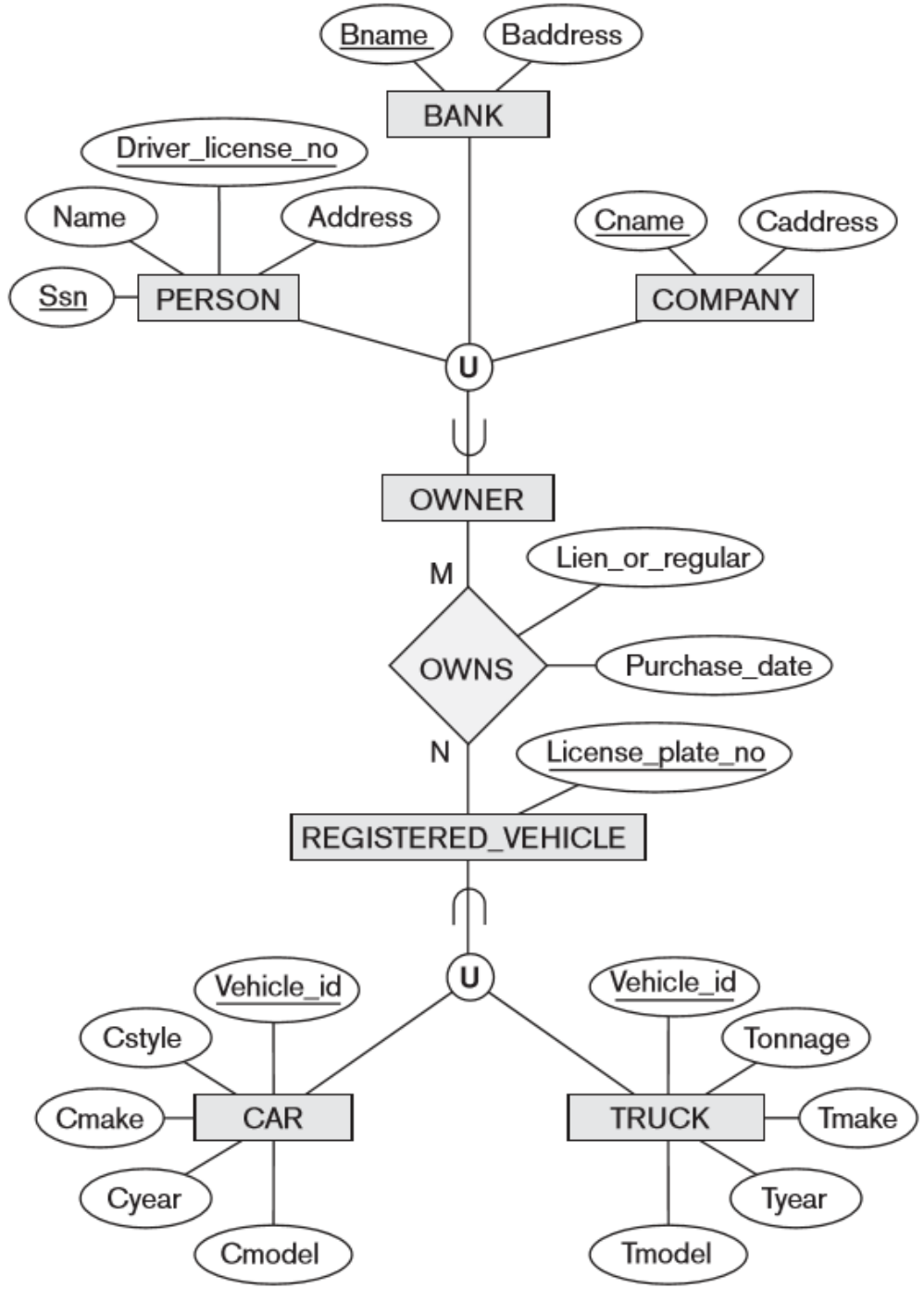
Mapping of Shared Subclasses (Multiple Inheritance)

- We can apply any of the options discussed in step 8 to a shared subclass, subject to the restrictions discussed in step 8 of the mapping algorithm.

Mapping of Categories (Union Types)

- **Step 9: Mapping of Union Types (Categories).** For mapping a category whose defining superclasses have different keys, it is customary to specify a new key attribute, called a **surrogate key**, when creating a relation to correspond to the category.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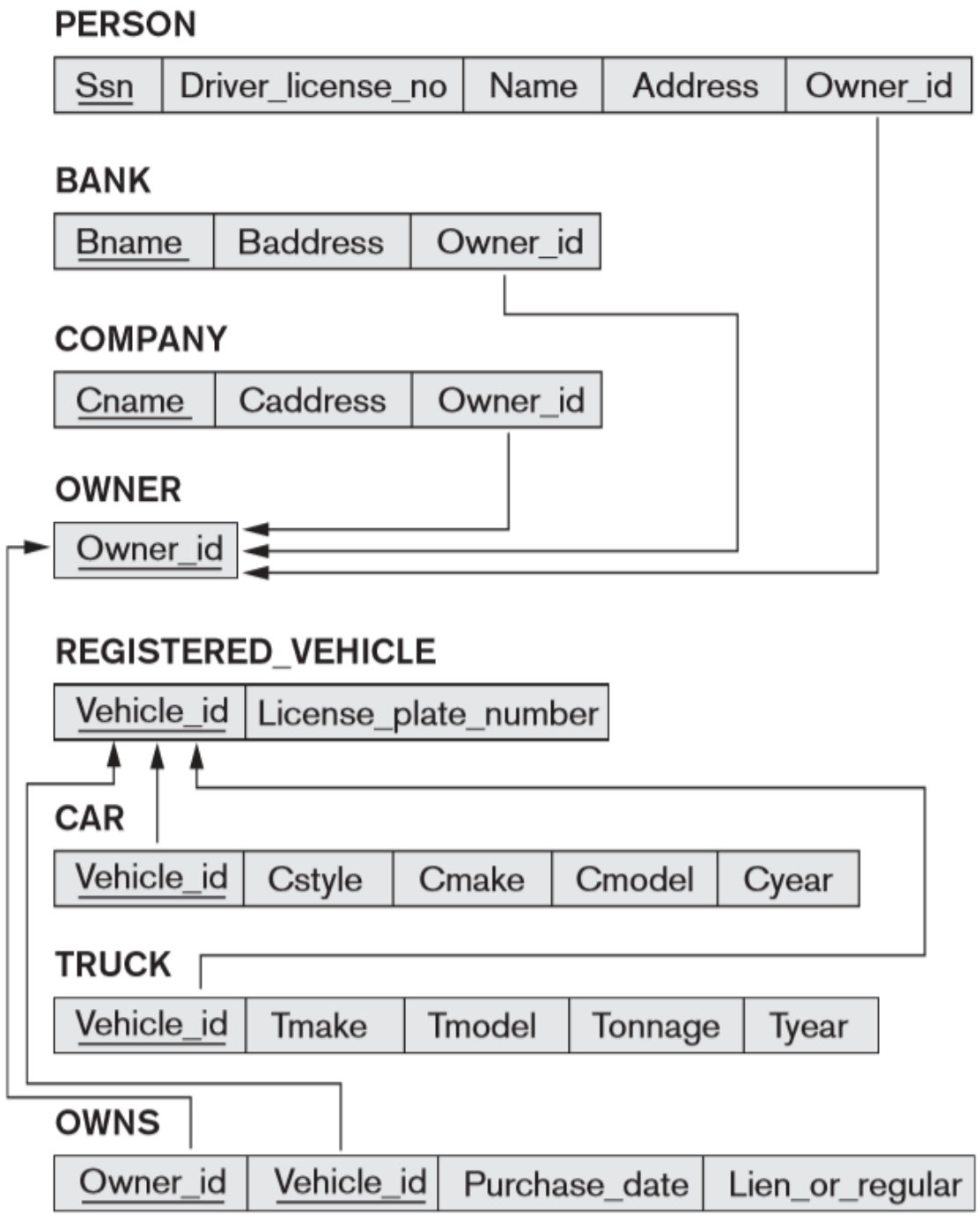
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