CSE 480: Database Systems
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EER Model and Relation Schemas

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Superclass/Subclass and EER Model

1. ER model described earlier is extended to include superclass and subclass and their relationship. This model is called Enhanced ER (EER) model.

2. Entities of an entity type A (entity set) can be grouped based on some common properties. Entity type for each group is called a subclass of the entity type A and the entity type is called the superclass of the entity types representing the groups.

   - Entity type Employees defined in terms of entity types Secretaries, System Analysts and Programmers.
   - Each one of the three entity types is a subclass (relationship) of the Employees entity type
   - Employees entity type is a superclass (relationship) of the three subclasses. Note both relationships occur together.

3. Relationships between a superclass and any of its subclasses is called superclass/subclass or simply class/subclass relationship type.
4. This relationship type is indicated by the subset symbol, \( \subset \), in the ER diagram because a subclass entity set is a subset of the superclass entity set.

5. How does this \textbf{class/subclass} relationship differ from the relationship type like workFor?

\textbf{class/subclass} relationship is usually defined between similar entity types. Most of the attributes are common among the entity types. 

\textbf{class/subclass} relationship can be defined between Employees and Programmers entity types because they have many common attributes such as Emp-Name, EmpSSno, EmpAddress, etc.

6. Often the \textbf{class/subclass} relationship type is also called a \textbf{IS-A} relationship type.

Programmers \textbf{IS-A} Employees meaning Employees entity type has \textbf{class/subclass} relationship with Programmers entity type.

7. \textbf{Type Inheritance:}

A subclass inherits all the attributes of the superclass as well as all the relationships in which the superclass participates. Thus, in ER diagram the attributes of the superclass are not repeated in the subclass entity types.
8. When should a \textbf{class/subclass} relationship be defined between entity types?

(a) Most of the attributes are common.
(b) Certain attributes apply to only some and not all of the entities of the superclass entity type.
(c) Some relationship may apply to a subset of the entities in an entity set.

9. \textbf{Specialization/Generalization:}

\textbf{Specialization} and \textbf{Generalization} are two \textbf{processes} by which subclasses and superclasses, respectively are defined.

(a) \textbf{Specialization} is a process of defining a set of subclasses for an entity type.

From the Employees entity type define the subclasses Secretaries, System Analysts and Programmers. Employees entity type is the superclass

(b) \textbf{Generalization} is a process of defining (abstracting the similar properties) a superclass from a set of entity types.

Secretaries, System Analysts and Programmers entity types are abstracted to define Employees (entity type).
(c) Specialization/Generalization Hierarchies and Lattices:

Figure 4.6 on page 83 gives an example.
How does it relate to the question of midterm exam?
Mapping EER to Relational Model

1. One Table Options:
   
   One table for both super class and subclasses by including all the attributes of the superclass and adding other attributes that are specific to the subclasses. The key of the table is the key of the superclass entity type. This approach is good if a few specific subclass attributes are present. An entity that does not belong to some of the subclasses will have null values for the specific attributes of these subclasses. These option may not be right if there are many specific attributes defined for the subclasses.

2. Multiple Tables Options:
   
   (a) One table for the superclass entity type. One table for each of the subclasses with attributes specific to the subclass and the key of the superclass. The key of the superclass is also the key of the subclass. Key in the subclass is a foreign key referencing the table corresponding to superclass.

   (b) One table for each of the subclasses with attributes specific to the subclasses and all the attributes of the super class.