CpSc 4620/6620 Quiz #5

**Name:_____**   **Date:_____**

Question #1 (20 points):

Are the following statements **true** or **false**?

1. In database design, the requirement analysis is always conducted concurrently with ER diagramming.   (T   )
2. Data model focuses on what data should be stored in the database, while function model deals with how the data is processed.   (T   )
3. Entity X has partial participation in Relationship Z, meaning only a part of an instance of X participates in relationship Z.   (F   )
4. A subclass only inherits the attributes, not the relationships, from its superclass. (F   )
5. Total Specialization means every member of the super-class must belong to at least one subclass.   (T   )
6. The overlapping specialization means a member of the super-class can belong to more than one subclass.   (T   )
7. Deleting a subclass entity will result in the deletion of its super-class entity.   (F   )
8. If a sub-class contains instances from more than one super-class, it is called multiple inheritance   (F   )
9. Primary key is a single attribute uniquely identifying an instance of an entity.   (F   )
10. In a generalization/specialization hierarchy, all attributes in the parent entity must be migrated to the child entity.   (F   )

Question #2 (30 points): Given the following ER diagram, please list all the entities and relationships. 1) For each entity, list their attributes and specify the key attribute. 2) For each relationship, please indicate their constraints and cardinalities. 3) There is one many-to-many relationship in this ER diagram, explain how you can redesign the ER diagram to avoid this many-to-many relationship.
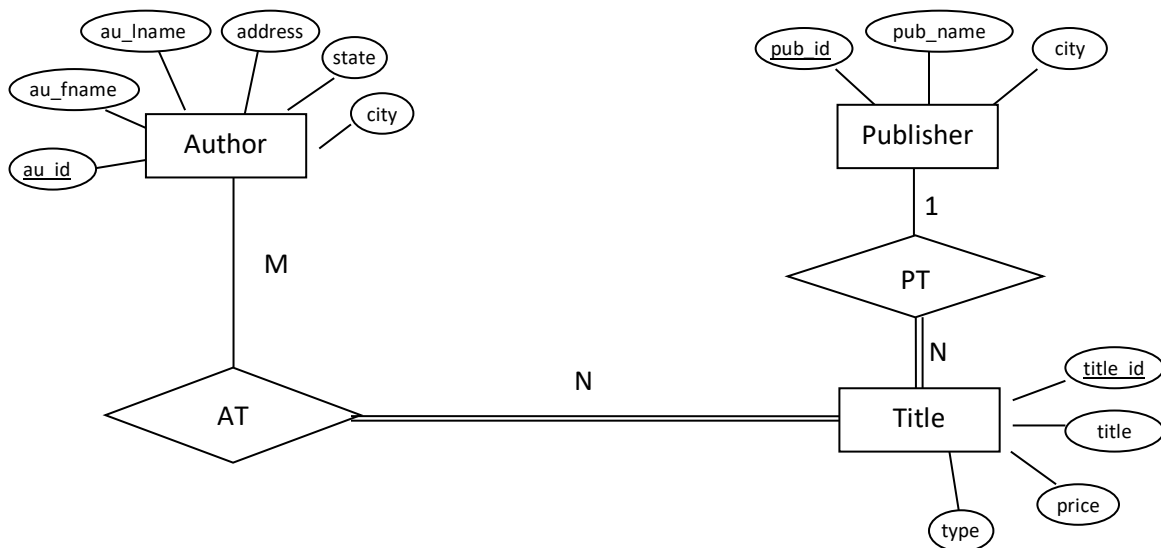

1. Entity Author has six attributes. They are au_id, au_fname, au_lname, address, state, city. The key attribute is au_id. Entity Publisher has three attributes. They are pub_id, pub_name, city. The key attribute is pub_id. Entity Title has four attributes. They are title_id, title, price, type. The key attribute is title_id.

2. There are two relationships. Relationship AT is a many-to-many relationship between Author and Title. Author is partially participating in this relationship while Title is totally participating in this relationship. Relationship PT is a one-to-many relationship between Publisher and Title. Publisher is partially participating in the relationship and Title is totally participating in this relationship.

3. The relationship AT can be converted into a relationship entity Author-Title. We migrate au_id from entity Author to Author-Title, and migrate title_id to from Title to Author-Title to form a composite key (au_id, title_id). The entities Author and Author-Title have a 1-to-many relationship and the entities Title and Author-Title has a 1-to-many relationship.

After the conversion, the ER diagram is as follows:
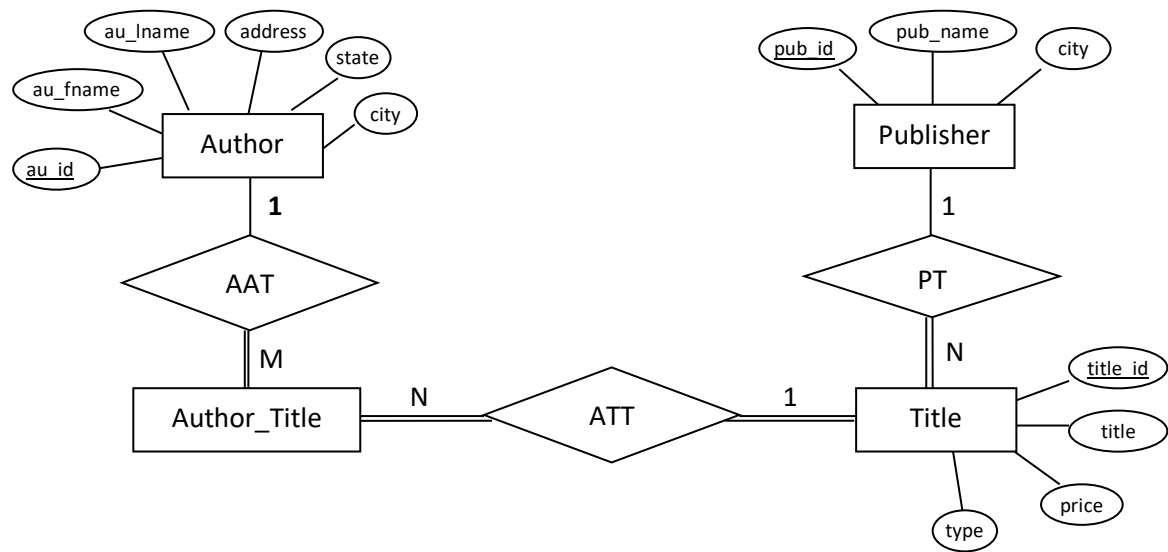
Question #3 (20 points): Given the EER diagrams in Fig. 3.1, Fig. 3.2, Fig. 3.3, Fig. 3.4, and Fig. 3.5, please explain the relationships between the entities and specify the constraints of those relationships.
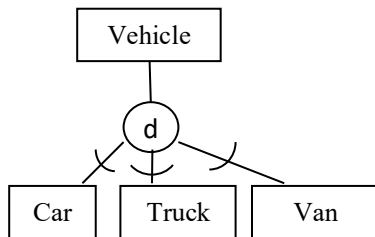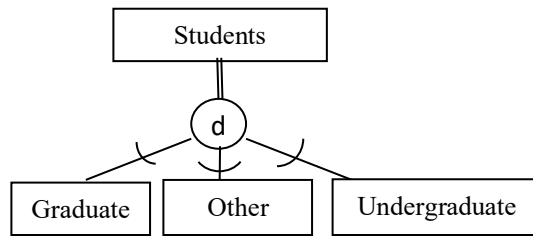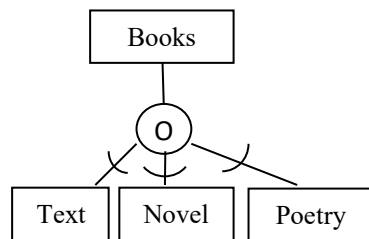

Fig. 3.1: Vehicle

Fig. 3.2: Students
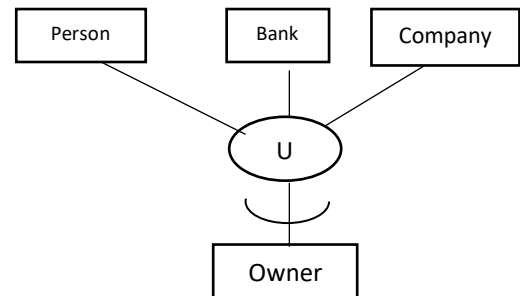

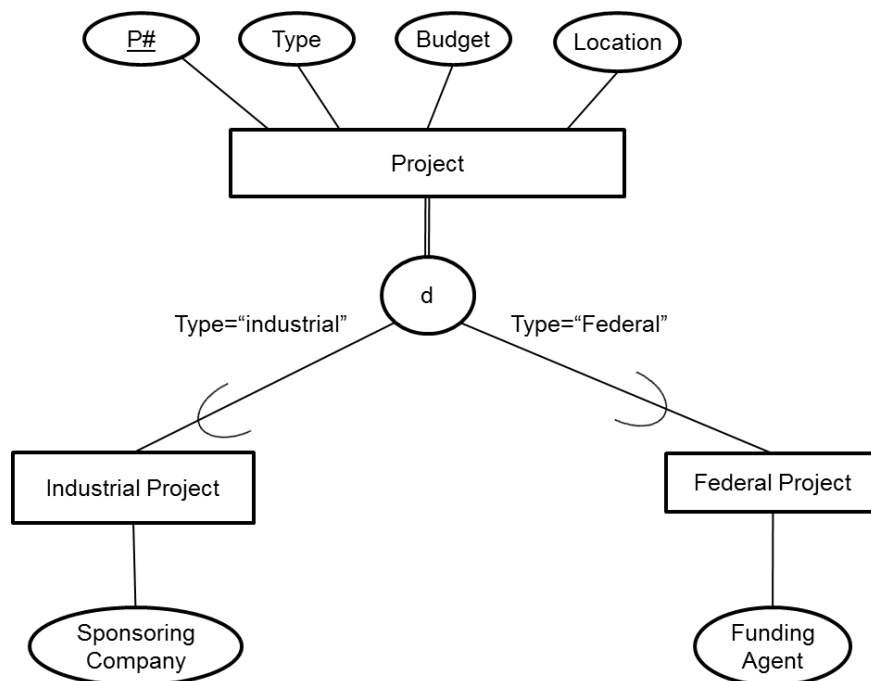**Fig. 3.3: Books**

Fig. 3.4: Owner

Fig. 3.5: Project

Fig. 3.1:

Vehicle has a partial generalization/specialization relationship with Car, Truck and Van. Vehicle is superclass while Car, Truck and Van are subclasses. The relationship is disjoint.

Fig. 3.2:

Students has a total generalization/specialization relationship with graduate, other, and undergraduate. Students is superclass and graduate, other, and undergraduate are subclasses. The relationship is disjoint.

Fig. 3.3:

Books has a partial generalization/specialization relationship with Text, Novel, and Poetry. Books a superclass while Text, Novel, and Poetry are subclasses. The relationship is overlap.

Fig. 3.4:

Owner is a union of person, bank, and company. Person, bank and company are superclasses and Owner is a subclass.

Fig 3.5

Project has an attribute specified total generalization/specialization relationship with Industrial Project and Federal Project. Project is a Superclass with attributes "P#", "Type", "Budget", "Location". Industrial Project is a subclass with an attribute "Sponsoring Company" and defined by Type = "Industrial". Federal Project is a subclass with an attribute "Federal Agent" and defined by Type = "Federal"

Question #4 (30 points): You are asked to design an enrollment database for a college which has two kinds of students, graduate and undergraduate. This database contains the information about the instructors, the courses, the students, and enrollment. The instructor information includes the employee ID, name, office, email, and rank. The student information includes the student ID, grade (for undergraduate only), major, graduate student type (MS or PhD), GPA. The course information includes the course ID, title, and description. The enrollment information includes the instructor ID, the course offering type (online or in-person), classroom location (if in-person), student IDs who enrolled in the course. For the online courses, it must include teaching method (asynchronous or synchronous). Please draw an ER diagram for this database.