**Problem Set 1**

**Total: 20 points**

Use the following scenarios to construct an Entity-Relationship Diagram for each question.

* Clearly show identifier attribute(s) and all other attributes of all the entities in the ERD. Show entity names, primary keys, attributes for each entity, relationships between the entities and cardinality.
* If a scenario doesn’t specify an identifier, make one for each entity.
* Clearly indicate the cardinality mappings.
* Please write down any assumptions you make.

**1. (5 points) Funding Allocation**

A company aims to allocate several research funds available to some scientists. One research fund may involve one to many scientists, and a scientist can be assigned to multiple research funds. In the meantime, scientists can also be allocated with equipment they need for their projects. Attributes of a Scientist include: Scientist\_ID (identifier), Name, Education, and Phone\_no. Attributes of Research Fund include Fund\_ID (identifier), Start\_Date and End\_Date. Attributes of Equipment include Serial\_no. and Cost. The company wants to record Assign\_Date – that is, the date when a scientist is assigned to a specified research fund. The company also wants to record which equipment a particular scientist is using for a specified assignment. An assignment requires one equipment. An equipment may be assigned to zero, one or many assignments.

**2. (3 points) Tesla**

Tesla aims to introduce new long-range Model Y in the fall of 2023 adding to their product portfolio. The following information is stored: model name, model ID and quantity on hand. These models are made up of many components (i.e. battery, tire). Each component can be supplied by one or more suppliers. The following component information is recorded: component ID, name, description, suppliers who supply them, and models in which they are used. A supplier can exist without providing components and a component does not have to be associated with a supplier. Similarly, a component does not have to be associated with a model. However, a model cannot exist without some components.

**3. (6 points) UW Co-Rec**

UW Cooperative Recreational Sports Center (Co-Rec) is a members owned co-op run by UW students. You have been called upon to do some conceptual data modeling for the organization.

*Co-Rec business scenario:*

For each student member we keep track of the unique Student\_ID, as well as Name, Zip, and the Date the membership was paid.

For each membership type we keep track of the unique Membership\_ID, as well as Membership\_Name and Price.

For each visit category we keep track of the unique VisitCat\_ID, as well as Category\_Name and Price.

For each visit we keep track of the unique Visit\_ID and Date.

For each merchandise item sold in Co-Rec we keep track of the unique Merchandise\_ID, as well as Merchandise\_Name, Student\_ID and Price.

For each sale transaction we keep track of the unique Transaction\_ID and Date.

Each student member pays for exactly one membership type; each membership type has at least one member but can have many members.

Each student member can visit Co-Rec as many times as they want but does not have to visit at all, each visit is corresponding with exactly one student member.

Each visit belongs to exactly one visit category; a visit category can have many individual visits issued for it but does not have to have any.

Each sale transaction involves exactly one student member; each student member can be involved in many sale transactions but does not have to be involved in any.

Each merchandise item is sold via at least one sale transaction, but it can be sold via many sale transactions; each sale transaction involves at least one merchandise item but can involve many merchandise items.

Every time a merchandise item is sold via a sale transaction, we keep track of the quantity (how many instances of that particular merchandise item were sold via that particular sale transaction) so that we can understand better which merchandise has larger demand.

**1). (4 points) Prepare an ERD based on the scenario.**

* Clearly show all other attributes of all the entities in the ERD. If a scenario doesn’t specify an identifier, make one for each entity.
* Show all the cardinalities.
* Please write down any assumptions you make.

**2). (2 points) Convert the ERD you have drawn in part 1) into Relational Schema. Indicate the primary key and foreign key in each table.**

**4. (6 points) UW Health**

UW Health needs a database to track their patients when they stay in the hospital.

UW Health business scenario:

The hospital stores information about each patient, including Patient ID, name, birth date, age, gender, and allergy history. A patient might have multiple allergies.

The hospital also stores information about each doctor, including Doctor ID, name, and department. Each patient gets diagnoses from one or many doctors, and each doctor can treat zero or many patients. The hospital wants to track the date and time length of each diagnose.

The hospital also stores information about each nurse, including Nurse ID, name, and specialization. Assume each nurse has only one specialization. Each patient can be taken care of by one or many nurses, and a nurse can take care of zero or many patients.

Patients also get visitors (zero or many) when they stay in hospital, and a visitor belongs to one and only one patient for each visit. The hospital also records information about each visitor, including name, gender, and relationship with the patient.

**1). (4 points) Prepare an ERD based on the scenario.**

* Clearly show all other attributes of all the entities in the ERD. If a scenario doesn’t specify an identifier, make one for each entity.
* Show all the cardinalities.
* Please write down any assumptions you make.

**2). (2 points) Convert the ERD you have drawn in part 1) into Relational Schema. Indicate the primary key and foreign key in each table.**