Name: _____

netID: _____

PROBLEMS (16 points each).

Answer the following problems, scan (take picture of) your solutions and upload them to Sakai. This exam is INDIVIDUAL you are NOT to work in groups. The exam is open book/open notes. There are several (wrong) solutions floating around on the internet. It is better to work on your own solution even if it is only partially right rather than risk using a solution found online and get a 0.

ALL OF YOUR SOLUTIONS MUST BE HANDWRITTEN (tablet OK). You can print the exam and answer directly on it, or you can use any paper (you can use also your ipad and stylus) to answer the questions as long as it is clear which question you are answering.

THE EXAM HAS 7 PAGES

1. You want to design a database for a restaurant. Customers have email, name, phone, and password. Each customer can have several credit cards registered in the system, each credit card has a 16 digit number, an expiration date, a 3 digit number (CVC code), and the name on the card. The menu items have a short description, a long descriptioin and a price. Customers can place orders that have the date/time that they were placed, one or several menu items (for each menu item it also keeps the quantity), and the total price (summation of the prices of the items mutiplied by the quatity of each item). There are two types of orders: dine-in, or pick-up. In the case of pick-up orders the system must have the car make, model, and color of the person picking up the order, as well as a parking spot number. Dine-in orders have a tip. In addition, the system needs to know if an order has been paid or not.

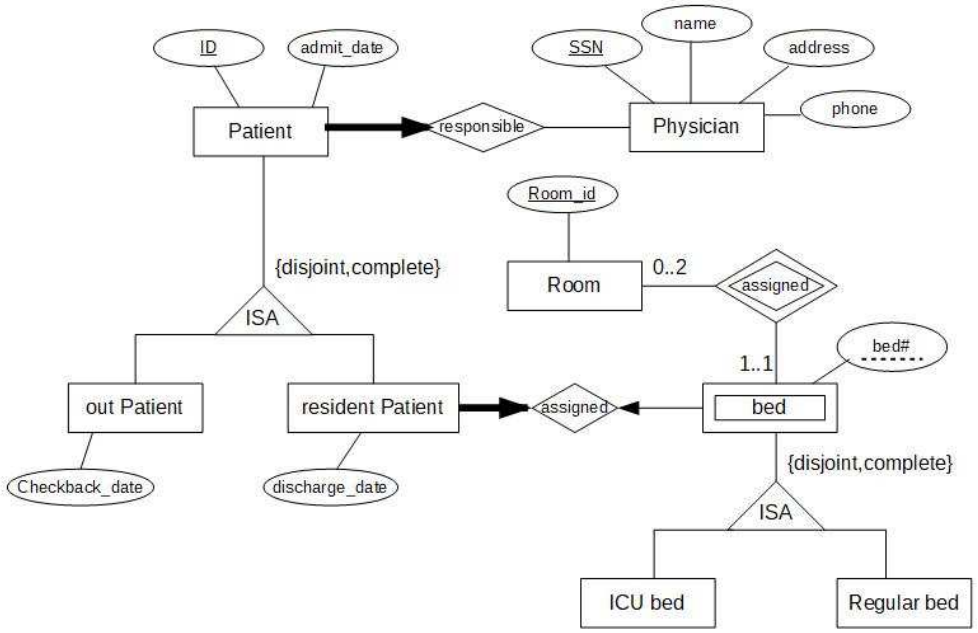
   Draw a complete ER diagram. Your diagram **must** include ISA relationships.

   If you need to make additional assumptions, please write them down.

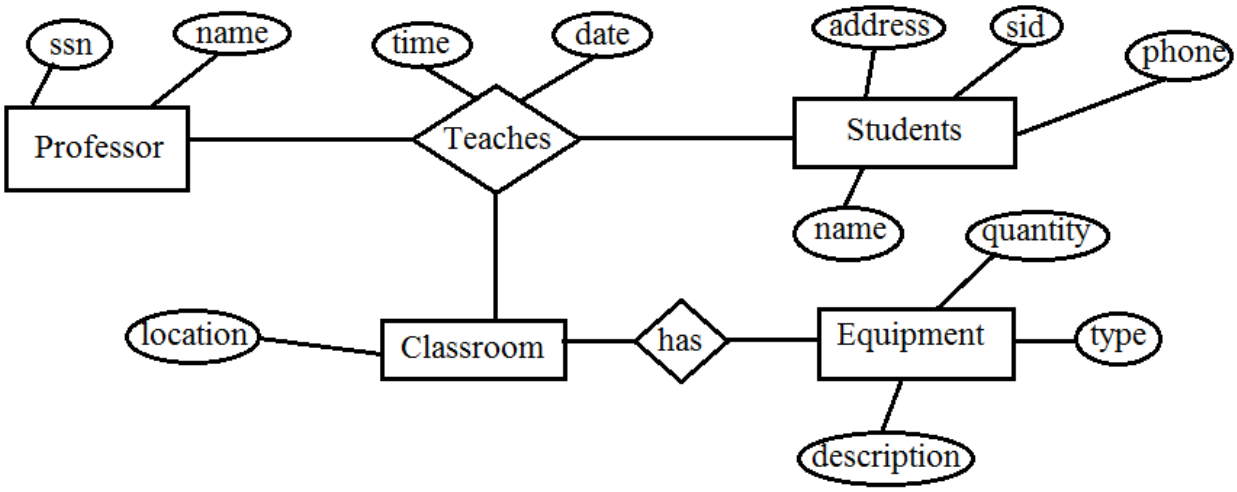
2. Suppose that we wish to keep a genealogy. The information we wish to record about each person includes their name, date of birth, phone number, and degrees obtained. We also need to keep track of the mother, father, and children of each person.

   Draw a complete Entity-Relationship diagram. You must include all the details, such as keys, weak entities (if any), cardinality constraints, etc. **Your diagram must avoid redundancy**.

3. Provide **a complete** Relational Schema of the database described by the following Entity Relationship diagram. You must use Merge Rule whenever possible.



4. Given the following E/R diagram,



Draw a new E/R diagram with no n-ary relationships (use reification). Your diagram must:

(a) Show the primary key

(b) Show cardinality and participation constraints

(c) Show weak entities

5. Given the following database instance:

Corporation:

id
15
17
20

Company:

cid	id
1	15
2	17
3	15
4	20
5	15

Department:

did	cid
1	1
2	2
3	2
4	3
5	5
6	1
7	3
8	3
9	1
10	2
11	4
12	5

Assumptions:

- `id` in `Company` references `id` in Corporation.
- `cid` in `Department` references `cid` in Company.

Each option starts from the original tables (given above) NOT from the tables modified by the previous option

You don't need to copy the entire table. Just explain the action of each operation.

(a) Suppose that all the foreign keys are declared using `on delete restrict`. What is the effect of the instruction `delete from Company where cid=2`?

(b) Suppose that all the foreign keys are declared using `on delete cascade`. What is the effect of the instruction `delete from Corporation where id=15`?

(c) Suppose that all the foreign keys are declared using `on update set NULL`. What is the effect of the instruction `update Company set cid=6 where cid=2`?