A. MULTIPLE CHOICE.

Circle the choice that **best** answers each question.

1. Customer(SSN Primary Key,Name,Phone) is an example of
   A) An ER diagram
   B) An SCHEMA function
   C) The schema of a relation
   D) A Hierarchical database

2. What is data?
   A) Information
   B) Facts
   C) Knowledge
   D) DBMS

3. The difference between data and information is:
   A) functional
   B) there is no difference
   C) hard to establish
   D) structural

4. Interity Constraints are enforced by
   A) The Data Base designer
   B) The DBMS
   C) The operating System
   D) The final user

   none

5. In a relational database a relation is:
   A) A set of pairs
   B) A list of tuples
   C) A set of tuples
   D) A list of pairs

6. The restricted domain from which data is gathered is called:
   A) Primary Key
   B) Constraint
   C) Functional domain
   D) Mini World

7. The following item does not have its own key
   A) an entity set
   B) a weak entity set
   C) a relation

8. A key is
   A) an attribute
   B) a tuple
   C) a set of attributes
   D) a binary relationship

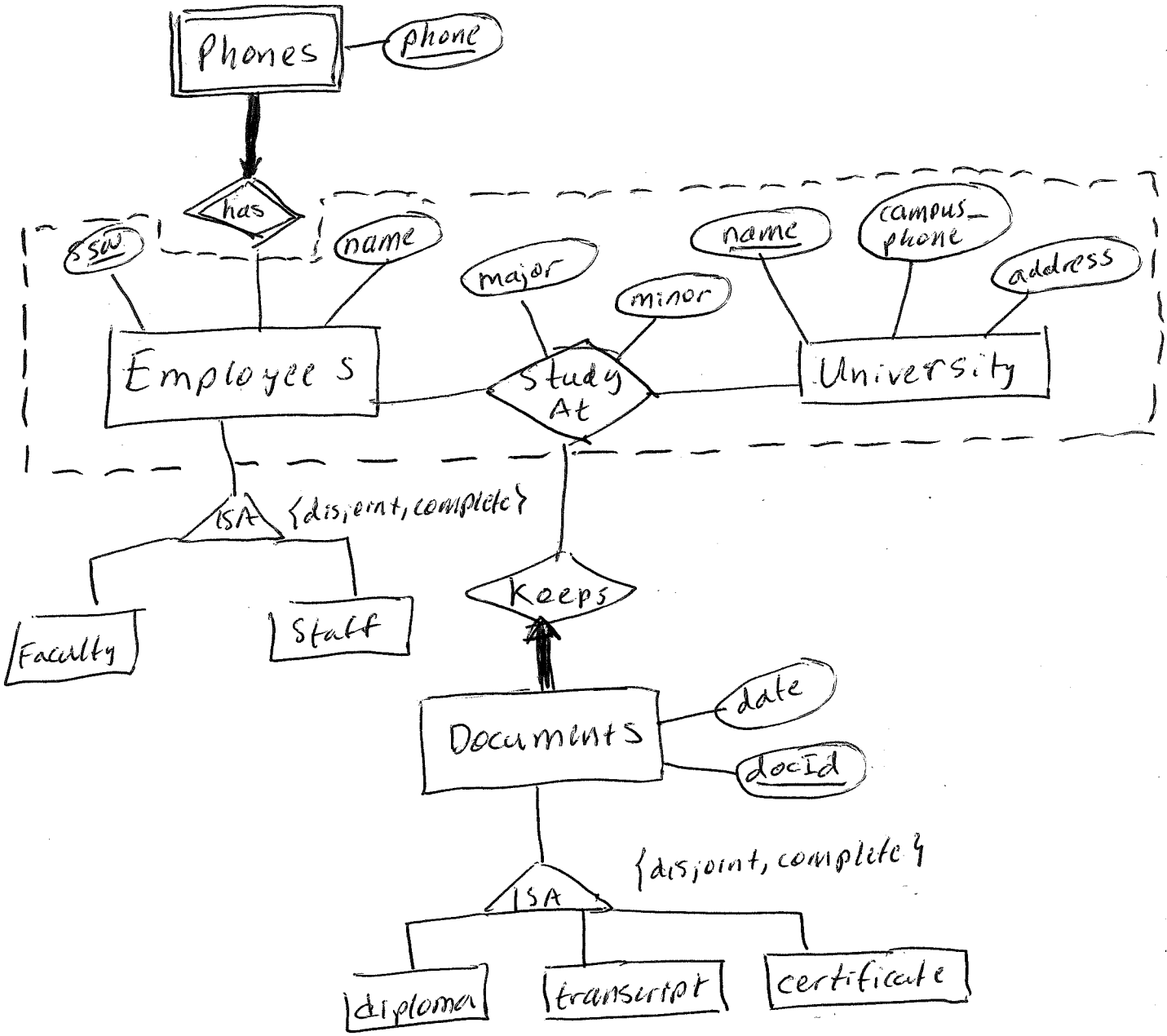
9. If $\{A, B\}$ is a candidate key of $R(A, B, C, D)$ then
   A) $\{A, B\}$ cannot be a primary key
   B) $\{A, B\}$ is a primary key
   C) In R every tuple has a distinct value of C
   D) $\{A\}$ is a partial key

10. The following is not an Integrity Constraint
    A) Primary Key
    B) Domain
    C) Indexing
    D) Foreign Key

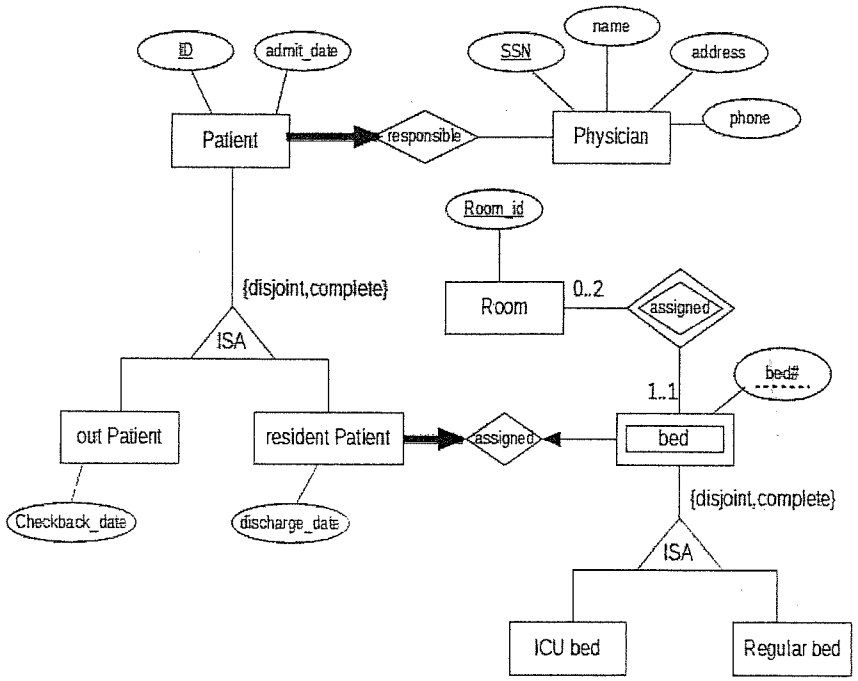
B. PROBLEMS.

1. Employees have SSN, name, several phone numbers, and one address. There are two types of employees: faculty and staff. Employees studied a major and/or minor in a field at a University that has a name, campus phone and address. The system keeps documents for each degree, the documents can be diplomas, transcripts, or certificates, each document has a date (issued).

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



2. Provide the Relational Schema of the database described by the following Entity Relationship diagram.



Patient (id : int , admit-date : date, physician_SSN : varchar (11),
primary key (id),
foreign key (physician_ssn) references Physician not null)

Physician (physicianSSN : varchar(11), name : varchar (50), address : varchar (50),
phone : varchar (10),
primary key (physicianSSN))

outPatient (id : int, checkout_date : date, primary key (id),
foreign key (id) references Patient)

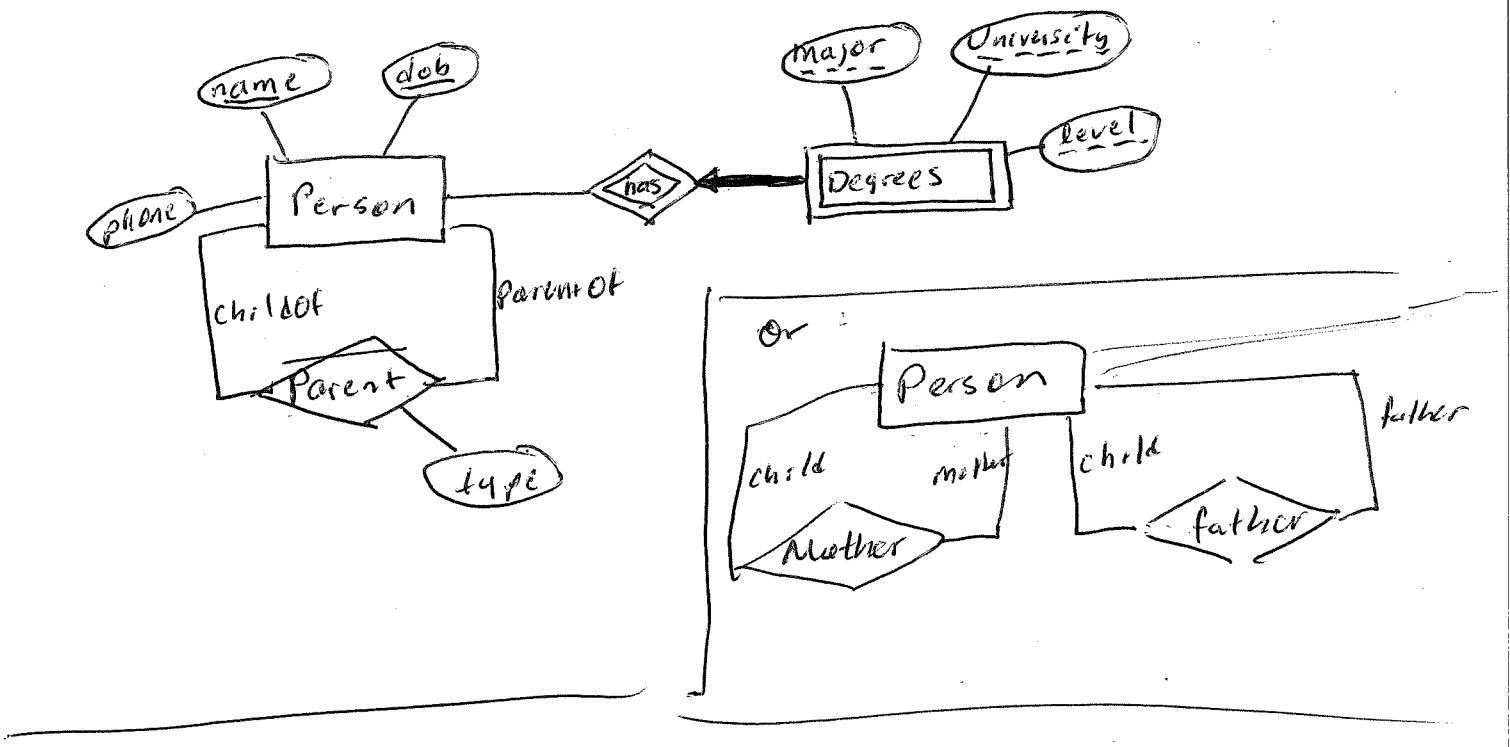
Room (RoomId : varchar (10), primary key (RoomId))

Bed (RoomId : varchar (10), bed# : int, isICU : boolean,
primary key (RoomId, bed#),
foreign key (RoomId) references Room)

residentPatient (id : int, Room_id : varchar (10), bed# : int, discharge_date : date,
primary key (id),
foreign key (id) references Patient,
foreign key (RoomId, bed#) references Bed not null)

3. 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.

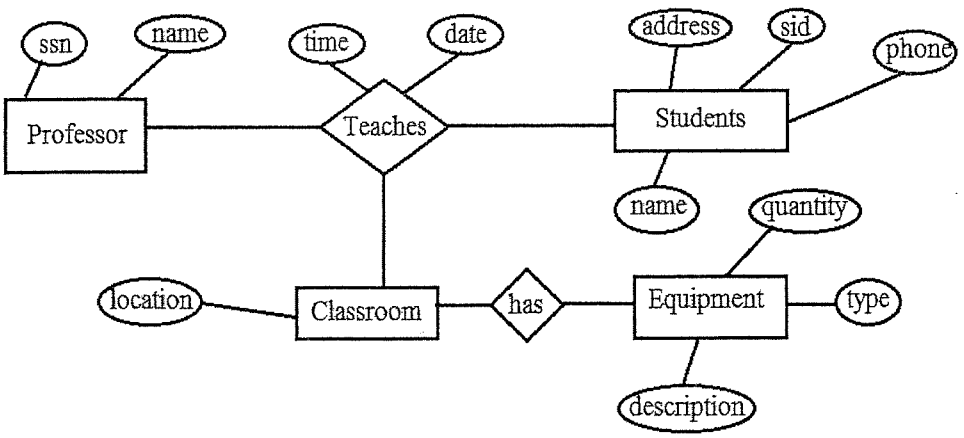
   (a) Draw a complete Entity-Relationship diagram. You must include all the details, such as keys, weak entities (if any), cardinality constraints, etc. **Your diagram must avoid redundancy.**



   (b) Do you need separate relationships for mother, father, and children? **Explain.**

- Children is just a role of the relationship, so it is not needed
- Adding type (mother or father) the father / Mother relationships can be collapsed into just one -

4. Given the following E/R diagram,

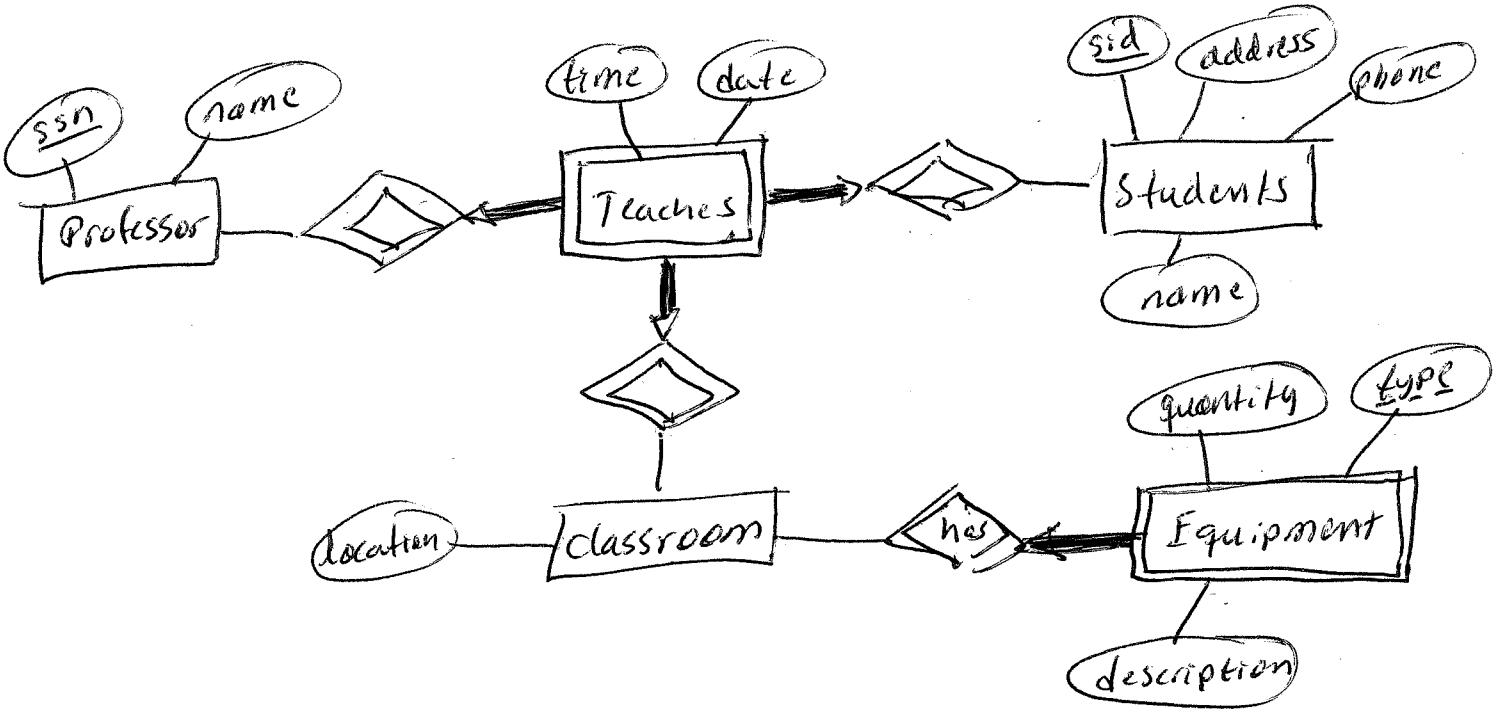


Draw a new E/R diagram with no n-ary relationships (use reification). Your diagram must:

(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`?

No effect, will give an error

(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`?

corporation

id
17
20

Company

cid	id
2	17
4	20

Department

did	cid
2	2
3	2
10	2
11	4

(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?

In Company cid = 2 will be changed to 6.

In Department

cid = 2 will be set to NULL