Course: *Databases and Data Warehousing*
Instructor: *Prof. Divyakant Agrawal*
TAs: *Saideep, Sriharshitha, Tanu Goyal*

Homework Assignment I

Assigned : *5:45PM, 30th August* **Deadline** : *11:55 PM, 5th September*

1. Explain the following terms briefly along with an **example**: attribute, domain, entity, relationship, entity set, relationship set, one-to-many relationship, many-to-many relationship, participation constraint, and weak entity set. (**5 Points**)

2. Consider two entity sets A and B that both have the attribute X (among others whose names are not relevant to this question).(**5 Points**)

    1. If the two Xs are completely unrelated, how should the design be improved?
    2. If the two Xs represent the same property and it is one that applies both to A and to B, how should the design be improved? Consider three subcases:
        - X is the primary key for A but not B
        - X is the primary key for both A and B
        - X is not the primary key for A nor for B

3. Answer the following questions (**5 Points**)

    - Does it make sense for a weak entity to participate in one to one relationship with a strong entity? If not answer why it doesn't make sense.
    - We can convert any weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity sets?

4. JIO institute AIDS frequent travelers have been complaining to the state's transport authority about the poor organization at the bus station in Vashi. As a result, the officials have decided that all information related to the station should be organized using a DBMS, and you've been hired to design the database. Your first task is to organize the information about all the buses that are stationed and maintained at the station. The relevant information is as follows: (**10 Points**)

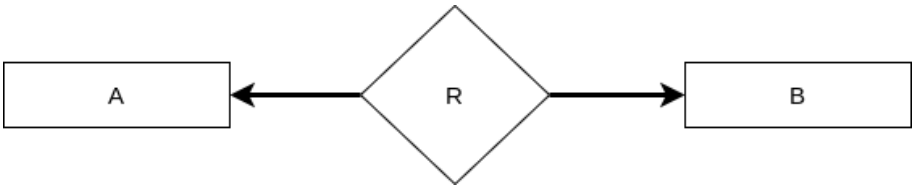
   - Every bus has a registration number, and each bus is of a specific model. The station accommodates a number of bus models, and each model is identified by a model number and has a capacity.
   - A number of technicians work at the bus station. You need to store the name, aadhar number, address, phone number, and salary of each technician.
   - Each technician is an expert on one or more bus model(s), and his or her expertise may overlap with that of other technicians. This information about technicians must also be recorded.
   - All the station employees (including technicians) belong to a union. You must store the union membership number of each employee. You can assume that each employee is uniquely identified by the aadhar number.
   - The bus station has a number of tests that are used periodically to ensure that the buses are in a good condition. Each test has a test number, a name, and a maximum possible score.
   - The Road Transport Authority (RTA) requires the station to keep track of each time that a given bus is tested with a given test by a given technician. For each testing event, the information needed is the date, the number of hours the technician spent doing the test, and the score that the bus received on the test.

   1. Draw an ER diagram for the above database. Be sure to indicate the various attributes of each entity and relationship set; also specify the key and participation constraints for each relationship set.

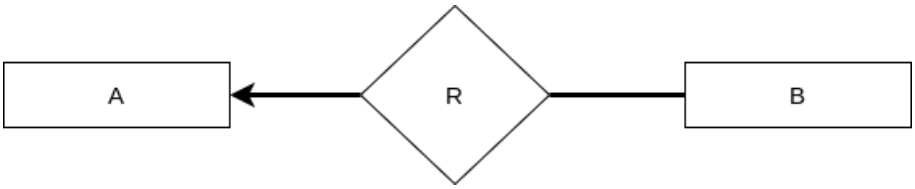
   2. A regulation is passed by RTA that only a technician who is an expert in a bus's model is eligible to conduct the test on it. How can this constraint be expressed in the ER diagram? Explain.

5. Translate the given E-R diagrams (thick lines indicating total participation) to an ideal relational schema (with minimal tables and without redundancy) **(7 Points)**

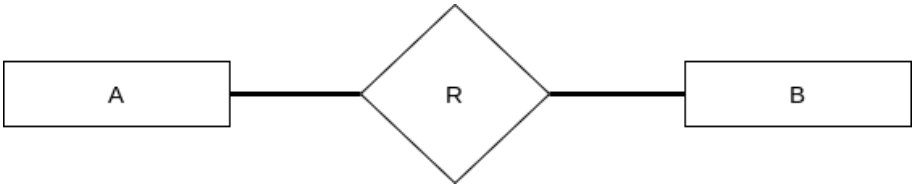
   - Case 1:



   - Case 2:



   - Case 3:



   - Also comment on what has to be done when there is partial participation from any one of the sides or both and why?