Database Systems
Assignment #2
Due Date: Tuesday, Oct. 03, 2023, Midnight

For this assignment you must use a software tool to draw ERMs or EERM of the following problems. The following links provide some ER drawing tools; you may investigate them and pick one that works for you. http://dia-installer.de/shapes/ER/index.html.en https://products.office.com/en-us/Visio/visio-professional-2013-free-trialflowchart-software https://www.omnigroup.com/omnigraffle https://www.gliffy.com/
Or any software that you may find and suitable for drawing ERM

Submission Instructions:
- Hand drawing ERMs are not accepted.
- All answers should be your own • Handwritten answers are not accepted.
- Images are not accepted.
- All answers should be collected in only one PDF file.
- Submit this file via eLearning.

Question 1: [20 points]

Draw an Enhanced Entity Relationship (EER) Diagram for the following specifications. •

Each campus has a unique ID, name, address, city, state, country, and URL. A campus can have many colleges.

- Each college has a unique id, name, phone, email, and URL.
- A campus can have many units. Each unit has a unique id within the campus, name, phone, and type (academic or non-academic). An academic unit is associated to a college. A non-academic unit has a job description.
- A college may offer courses. Each course has code, number, credit, and title. Each course is uniquely identified by the code and number together.
- Each user of the system has a unique id, first name, last name, email, phone. A user may have several phones.
- A user is a faculty, student, or a combination. Faculty has a rank. Student can be undergraduate or graduate.
- A tutor is a user hired by a college and has a pay rate (dollars per hour) and a list of courses he/she can be responsible for. A tutor can tutor in more than one college. A college can have many tutors.
- A supervisor is a faculty member assigned to supervise tutors. A supervisor has office hours for supervising. Each tutor is supervised by one supervisor. A supervisor can supervise many tutors.
- An on-call is initiated by a faculty to ask a tutor to help in one specific course. The oncall has a unique id, location, date, start time, end time, task type (classroom assistance, lab assistance, or exam monitoring), and status (assigned, missed, or attended).

- An appointment between a tutor and a student could be scheduled outside of the classroom and lab. An appointment has a unique id, location, date, start time, end time, list of courses, and status (scheduled, canceled, or attended).

Identify the entities, attributes, and relationships for the above set of requirements.
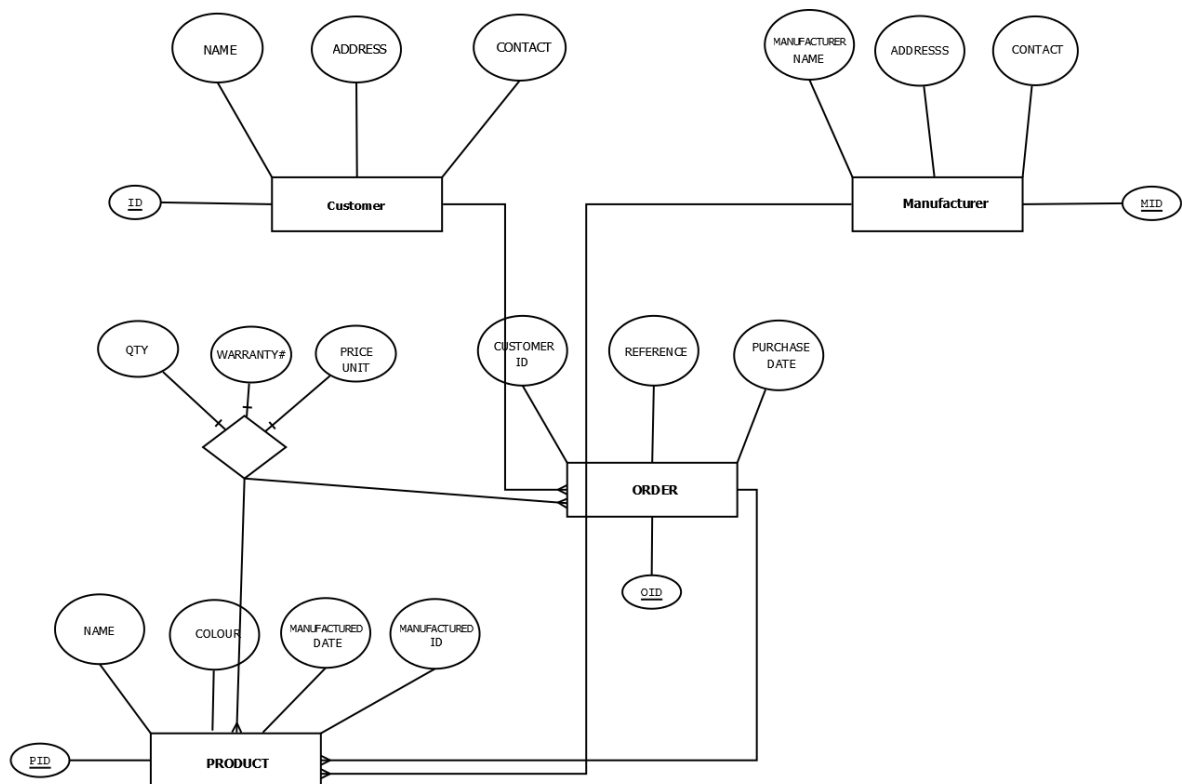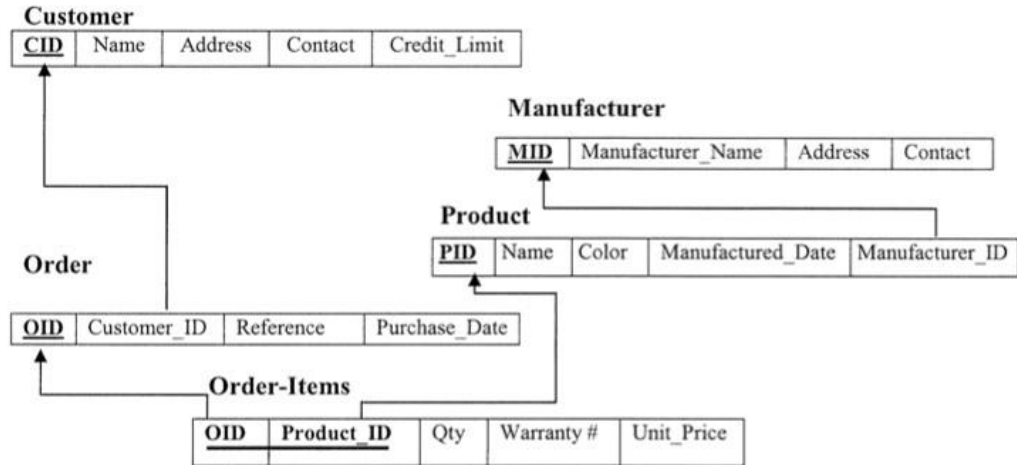- For entities: identify the strong and weak entities.
- For attributes: identify key, multi-valued, composite, and derived attributes.
- For relationships: use (min, max) constraints

List any assumptions you make.
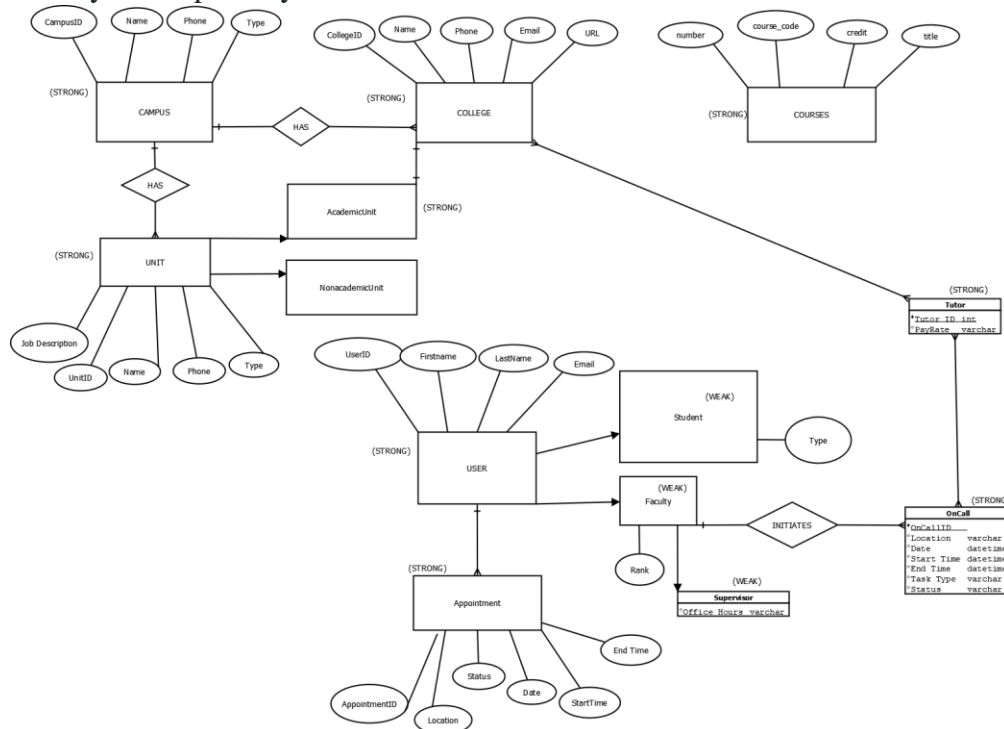
Question 2: [10 points]
Draw an ER diagram that would be mapped into the following relational database schema:

Customer

CID	Name	Address	Contact	Credit_Limit

Manufacturer

MID	Manufacturer_Name	Address	Contact

Product

PID	Name	Color	Manufactured_Date	Manufacturer_ID

Order

OID	Customer_ID	Reference	Purchase_Date

Order-Items

| OID	Product_ID	Qty	Warranty #	Unit_Price

Question 3: [10 points]

Consider the following ER diagram. Assume that an employee may work in up to two departments or may not be assigned to any department. Assume that each department must have one and may have up to three phone numbers.

Assume the following additional system requirements:
- Each department can have anywhere between 1 and 30 employees.
- Each phone is used by one, and only one, department.
- Each phone is assigned to at least one and may be assigned to up to 30 employees.
- Each employee is assigned at least one, but no more than 5 phones.

a) Supply (min, max) constraints on this diagram. State clearly any additional assumptions you make.

b) Under what conditions would the relationship HAS PHONE been redundant in this example?
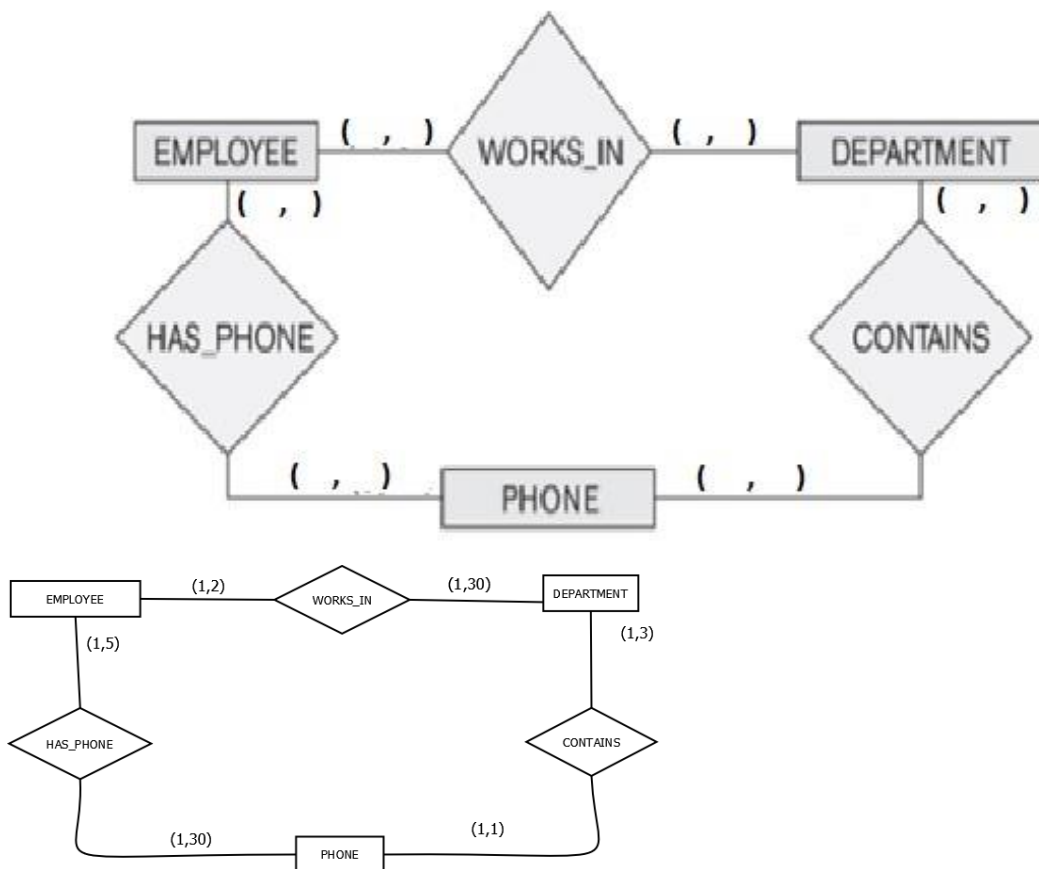
The relationship "HAS PHONE" would become redundant under the following conditions:

1- If there is no requirement to track which phones belong to a department, and each phone is solely assigned to employees without any association with a specific department. In this case, the "Belongs_To" relationship between Department and Phone would be sufficient.

2- If there is no requirement to track which employees use each phone, and each phone is exclusively associated with a department but not assigned to any employees. In this case, the "Assigned_To" relationship between Phone and Employee would be unnecessary.