Test 1

09/21/2017

*****You have 80 minutes to complete the exam in class.*****

Name _____

UBIT _____

Person # _____

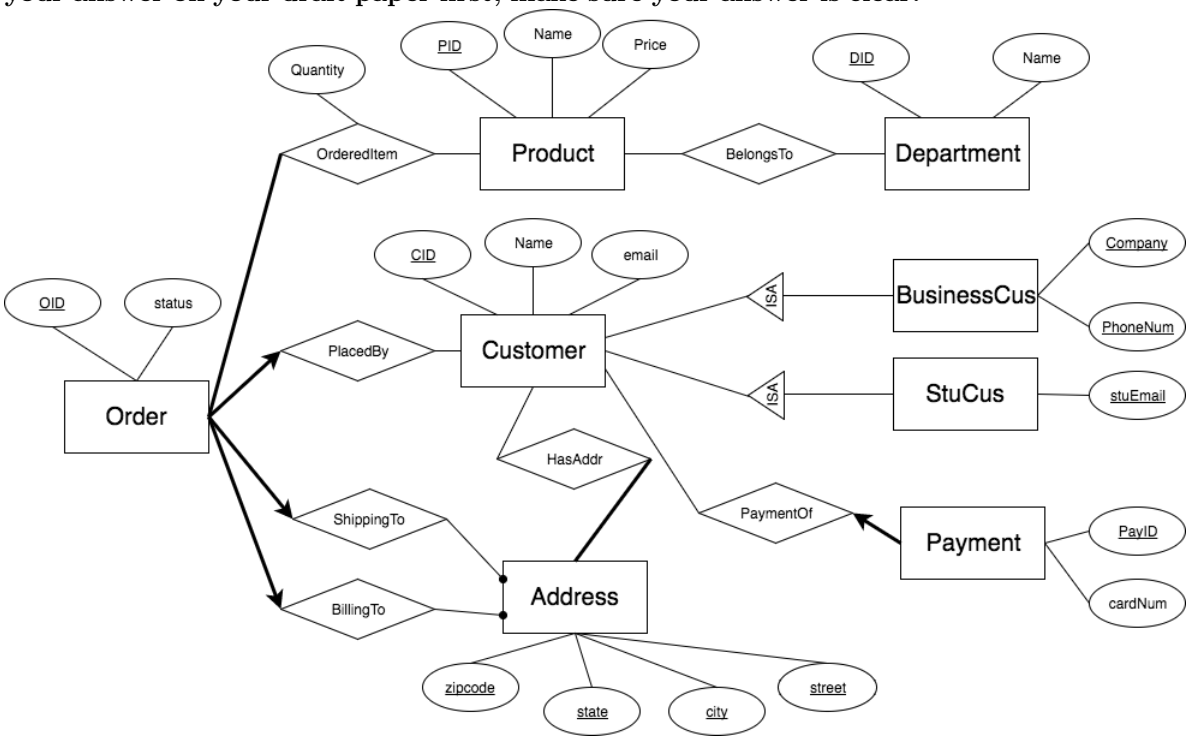
Directions. Read and understand each problem before you start to answer. Provide complete answers, show your work, and do not forget to explain and/or justify an answer when needed. Strive for brevity, clarity, and completeness in your answers. Answer on the spaces provided. You can attach additional sheets if you need extra space.

Problem 1 (45 Points) Consider the information management system for a simple online shopping website described below:

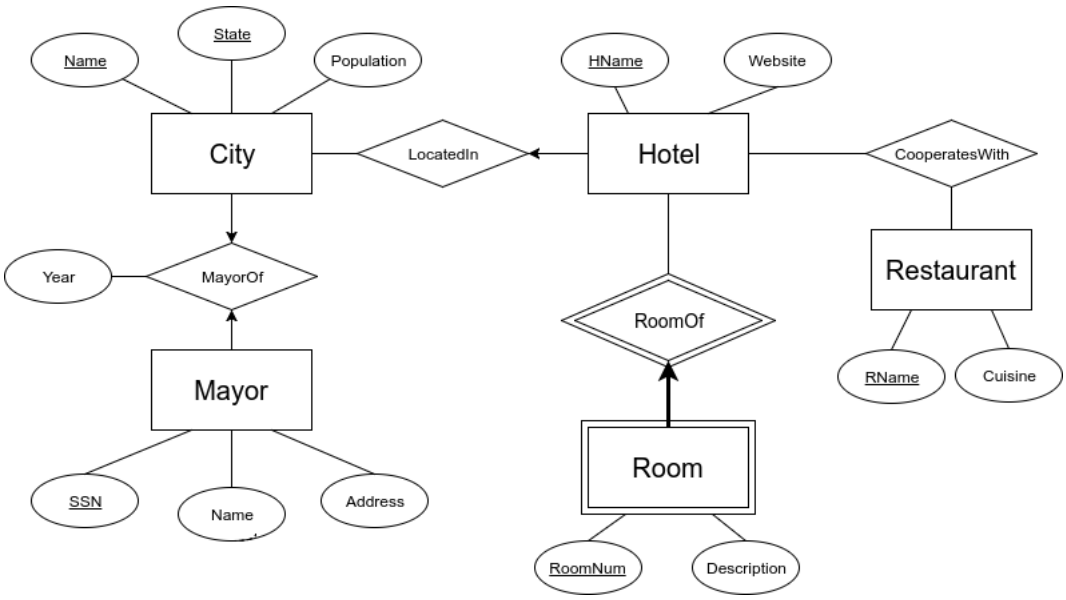
- Each department has a name and a system-assigned identifier.
- Each product has a name, a price, and a system-assigned identifier, each product belongs to some department(s).
- Each customer has a name, an email, a system-assigned identifier, zero or more U.S. addresses, and zero or more payment methods. We have two special types of customers:
  - Student customer: customers that are student, each student customer has an extra student email, a student email associate with only one student customer.
  - Business customer: customers that are purchasing for a company, each business customer has a company, and a company phone number.
- Each U.S. address consists of the street, city, state, and zip code, each address associates with at least one customer.
- Each payment method has a system-assigned identifier, a card number,each payment method associates with one and only one customer.

- Each order has an order number, which is a system-assigned identifier and an order status, each order is shipped to a valid address, and also is billed to a valid address (a valid address is an address that exists in the database), each order contains a list of ordered products together with the ordered quantity of them, and each order is placed by one and only one customer.

Create an ER model for the application, note that the domains of all attributes are primitive data types ONLY, provide your modeling in the form of an ER diagram, for every relationship in the diagram, make sure you define the necessary constraints (e.g. multiplicity constraint) correctly. *You can make any other additional assumptions that make sense in the real world.* **Note: draw your answer on your draft paper first, make sure your answer is clear.**



Problem 2 (45 points) Given below E/R diagram, map it to a relational schema use CREATE TABLE statement, the domain of *RoomNum*, *Population* and *SSN* is integer, the domain or *Year* is date, and the domains of all other attributes are strings.




```
CREATE TABLE City(
    Name VARCHAR(20),
    State VARCHAR(20),
    Population INT,
    PRIMARY KEY (Name, State)
);
CREATE TABLE Mayor(
    SSN INT PRIMARY KEY,
    Name VARCHAR(20),
    Address VARCHAR(100)
);
CREATE TABLE Hotel (
    HName VARCHAR(20) PRIMARY KEY,
    Website VARCHAR(200),
    CName VARCHAR(20),
    CState VARCHAR(20),
    FOREIGN KEY (CName, Cstate) REFERENCES City(Name, State)
);
CREATE TABLE Restaurant(
    RName VARCHAR(20) PRIMARY KEY,
    Cuisine VARCHAR(200)
```

```
);

CREATE TABLE MayorOf(
    CityName VARCHAR(20),
    CityState VARCHAR(20),
    Mayor VARCHAR(20) UNIQUE REFERENCES Mayor(SSN),
    Year DATE,
    PRIMARY KEY (CityName, CityState),
    FOREIGN KEY (CityName, CityState) REFERENCES City(Name, State)
);

CREATE TABLE CoopertatesWith(
    HotelName VARCHAR(20) REFERENCES Hotel(HName),
    ResName VARCHAR(20) REFERENCES Restaurant(RName),
    PRIMARY KEY(HotelName, ResName)
);

CREATE TABLE Room(
    RoomNum INT,
    Description VARCHAR(200),
    HName VARCHAR(20) REFERENCES Hotel(HName),
    PRIMARY KEY(RoomNum, HName)
);
```

Problem 3 (10 points)
3.1 (5 points) Explain what are primary key, candidate key and superkey.

- A superkey a super set of a key.
- A candidate key is a minimal key that uniquely identifies an entity/record.
- A primary key is the designated key (designated by the database designer).

3.2 (5 points) Explain what are domain constraints and foreign key constraints in relational data model.

Domain constraints: limitations on valid values of an attribute.
Foreign key constraints: A set of attributes referencing a key of another relation.