

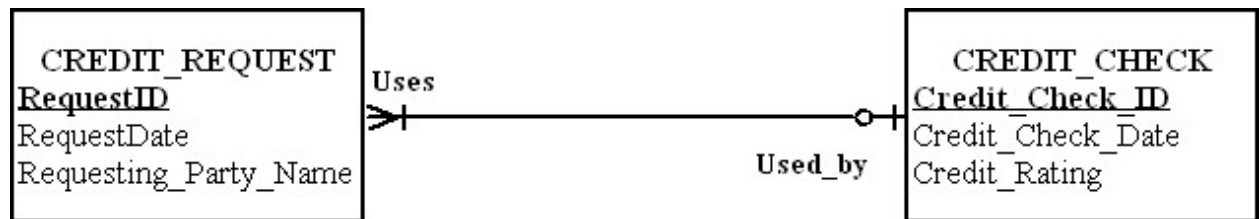
Due: **In class Thursday May 29th** . NO LATE ASSIGNMENTS ACCEPTED

Answer each of the following questions completely. Make sure that your answers are neatly written and very readable. Points will be deducted if your assignment is not presented in a neat format. For example, don't turn it in on notebook paper torn out of a spiral notebook.

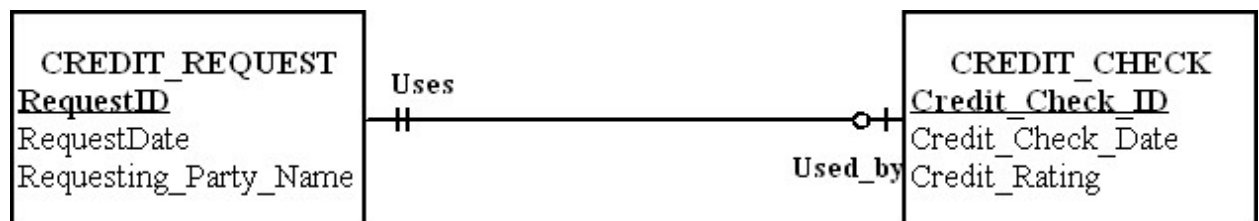
1. (15 points – 5 pts each)

The loan office in a bank receives from various parties requests to investigate the credit status of a customer. Each credit request is identified by Request_ID and is described by a Request_Date and Requesting_Party_Name. The loan office also receives the results of credit checks. A credit check is identified by a Credit_check_ID and is described by the Credit_Check_Date and the Credit_Rating. The loan office matches credit requests with credit check results. A credit request may be recorded before its result arrives; a particular credit result may be used in support of several credit requests.

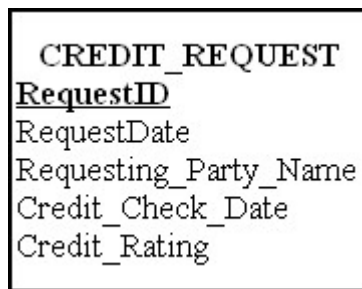
(a) Draw an ERD for this situation.



(b) Now assume that credit results may not be reused for multiple credit requests and redraw the ERD using two entity types (similar to that in part (a)).



(c) Redraw the ERD of part (b) using only one entity type. Which of the versions (b) or (c) seems better, and why?

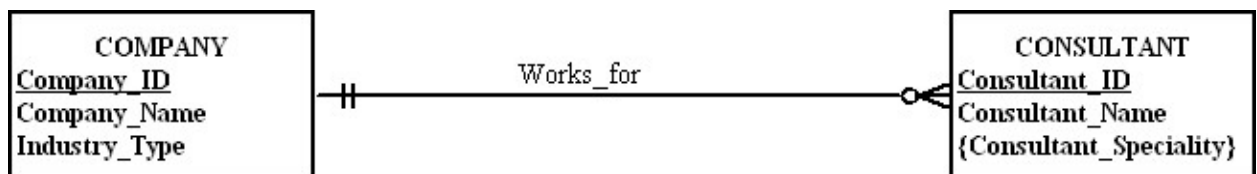


Using 1 entity type seems much simpler since the credit check and rating only apply to this credit request. However, Credit_Check_Date and Credit_Rating will be blank (null) until the credit check is received.

2. (20 points – 5 pts each)

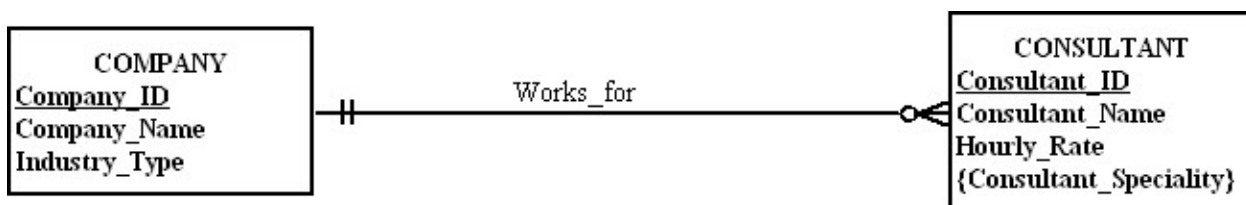
Companies, identified by a Company_ID and described by Company_Name and Industry_Type, hire consultants, identified by Consultant_ID and described by Consultant_Name, Consultant_Speciality, which is multivalued. Assume that a consultant can work for only one company at a time, and we need to track only current consulting engagements.

(a) Draw an ERD for this situation.



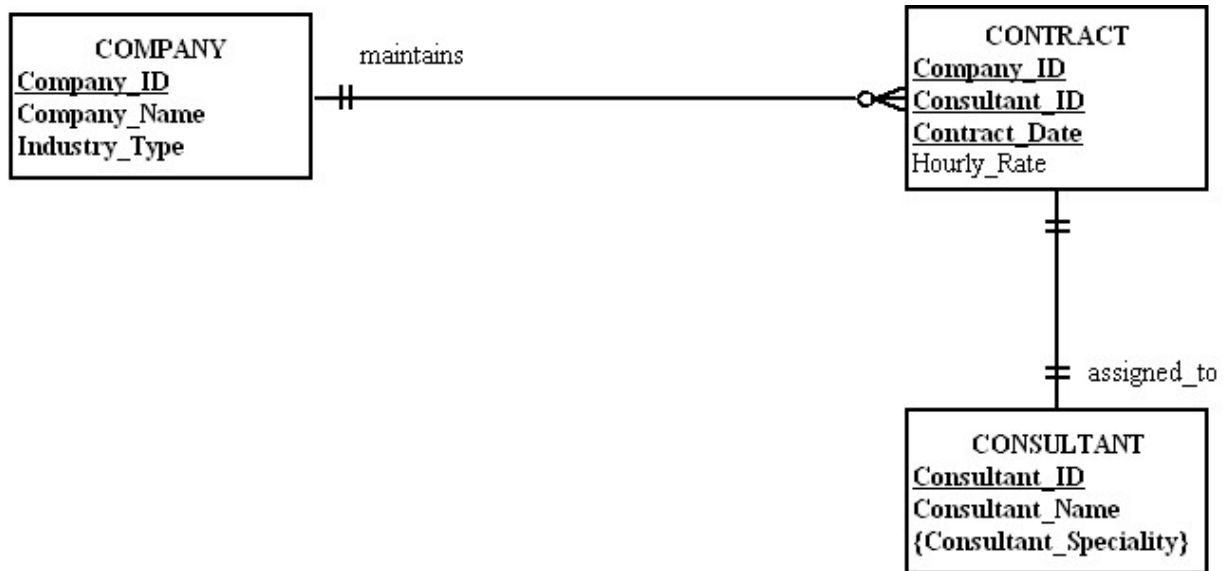
(b) Now, consider a new attribute, which is the Hourly_Rate a consultant charges a company for their services. Redraw the ERD of part (a) to include this new attribute.

Adding Hourly_Rate: this could be added to either the consultant entity or the Works_for relationship.



(c) Now, consider that each time a consultant works for a company a contract is written describing the terms for this consulting engagement. A contract is identified by a composite identifier consisting of Company_ID, Consultant_ID, and Contract_Date. Assuming that a consultant can still work for only one company at a time, redraw the ERD of part (b) for this new situation. Did you move any attributes to different entity types in the new ERD?

Note that this is added as another entity and participates in a ternary relationship. We have moved hourly_rate to the contract entity.



- (d) As a final situation, now consider that although a consultant can still work for only one company at a time, we need to keep the complete history of all consulting engagements for each consultant and company. Draw an ERD for this final situation.

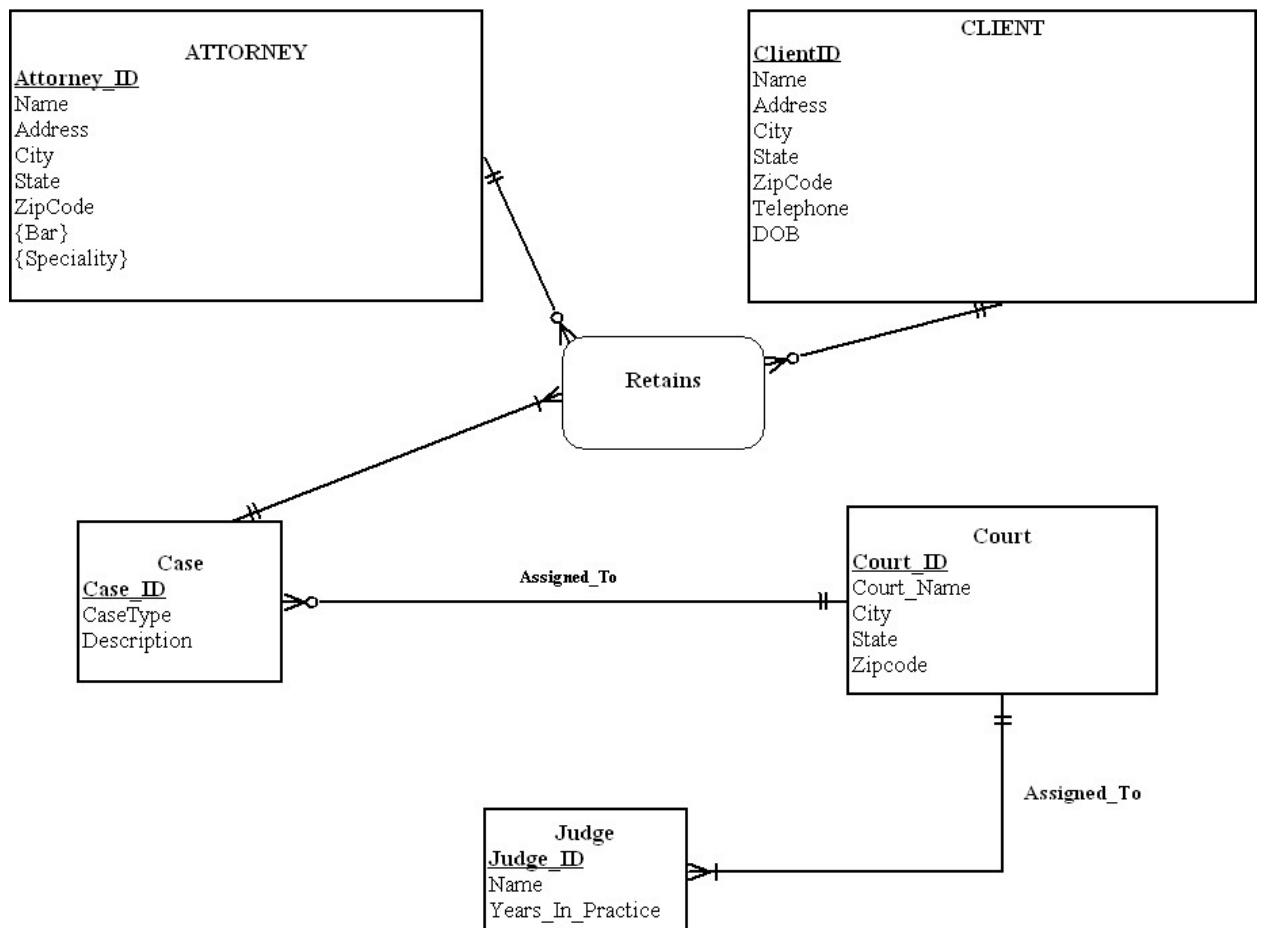
We can create an associative entity for CONTRACT. I've also added Contract_ID as a surrogate primary key.



3. (25 points)

You've been hired by a law firm to construct a database based upon the following business rules. Create an ERD that accurately depicts this situation. Clearly state any assumptions you made.

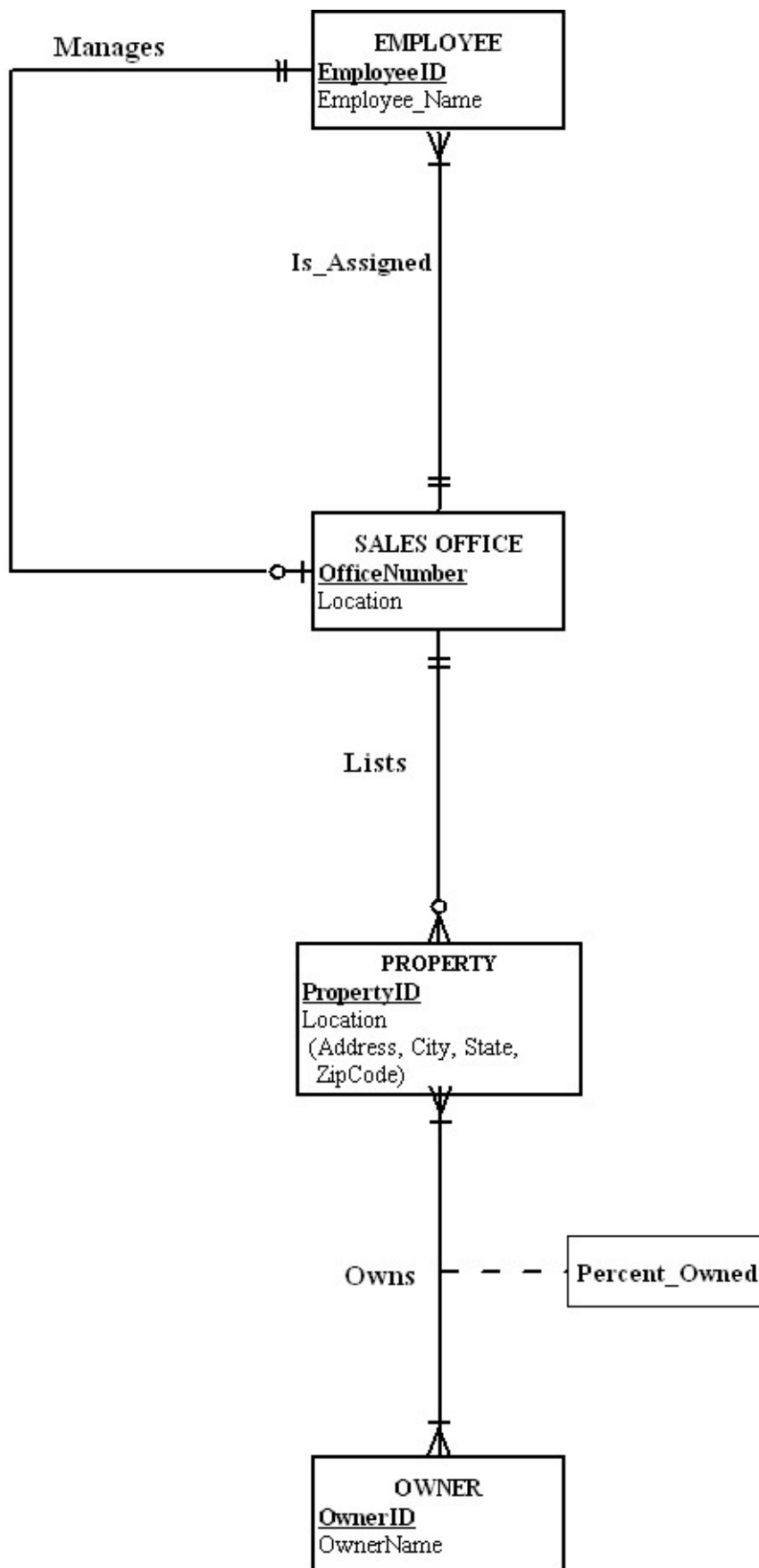
- An ATTORNEY is retained by one or more CLIENTS for each CASE.
- Attributes of ATTORNEY are: Attorney_ID, Name, Address, City, State, Zip_Code, Speciality (may be more than one), Bar (may be more than one).
- A CLIENT may have more than one ATTORNEY for each CASE.
- Attributes of CLIENT are Client_ID, Name, Address, City, State, Zip_Code, Telephone, Date_of_Birth.
- A CLIENT may have more than one CASE.
- Attributes of CASE are Case_ID, Case_Description, and Case_Type.
- An ATTORNEY may have more than one CASE.
- Each CASE is assigned to one and only one COURT.
- Attributes of COURT are Court_ID, Court_Name, City, State, and Zip_Code.
- Each COURT has one or more JUDGES.
- Attributes of JUDGE are Judge_ID, Name and Years_In_Practice.
- Each JUDGE is assigned to exactly one court.



4. (25 points)

Prepare an ERD for a real estate firm that lists property for sale. Also prepare a definition for each entity type, attribute, and relationship in your ERD. The situation to model is:

- The firm has a number of sales offices in several states. Attributes of sales offices include Office_Number (identifier) and Location.
- Each sales office is assigned one or more employees. Attributes of employees include Employee_ID (identifier) and Employee_Name. An employee must be assigned to only one sales office.
- For each sales office, there is always one employee assigned to manage that office. An employee may manage only the sales office to which they are assigned.
- The firm lists property for sale. Attributes of property include Property_ID (identifier) and Location. Components of Location include Address, City, State, and Zipcode.
- Each unit of property must be listed with one (and only one) of the sales offices. A sales office may have any number of properties listed or may have no properties listed.
- Each unit of property has one or more owners. Attributes of owners include Owner_ID (identifier) and Owner_Name. An owner may own one or more units of property. An attribute of the relationship between property and owner is Percent_Owned.



The description of the ERD components.

Entities:

Employee: An employee of the firm. An employee works for one sales office and may manage one sales office. It is not explicitly indicated that the employee can only manage the office that he/she works for. This would require a business rule.

Sales_Office: The office where real estate is sold.

Property: Buildings for sale, such as houses, condos and apartment buildings.

Owner: The individual who owns one or more properties.

Attributes on Employee:

Employee_ID: A unique identifier for an employee. This attribute must be unique.

Employee_Name: The name of the employee.

Attributes on Sales_Office:

Office_Number: A unique identifier for the office.

Location: The physical location of the sales office. This data may be made up of the city and state.

Attributes on Property:

Property_ID: The unique identifier for the property.

Location: A composite attribute that consists of the street address, city, state, and Zip Code.

Attributes on Owner:

Owner_ID: The unique identifier for the owner.

Owner_Name: The name of the owner.

Relationship:

Is_assigned: An employee is assigned to one sales office. A sales office may have many employees assigned but must have at least one employee.

Manages: An employee may manage one sales office or no sales office. Each sales office is managed by one employee. A business rule is needed here in order to indicate that an employee can only manage the sales office in which he or she works.

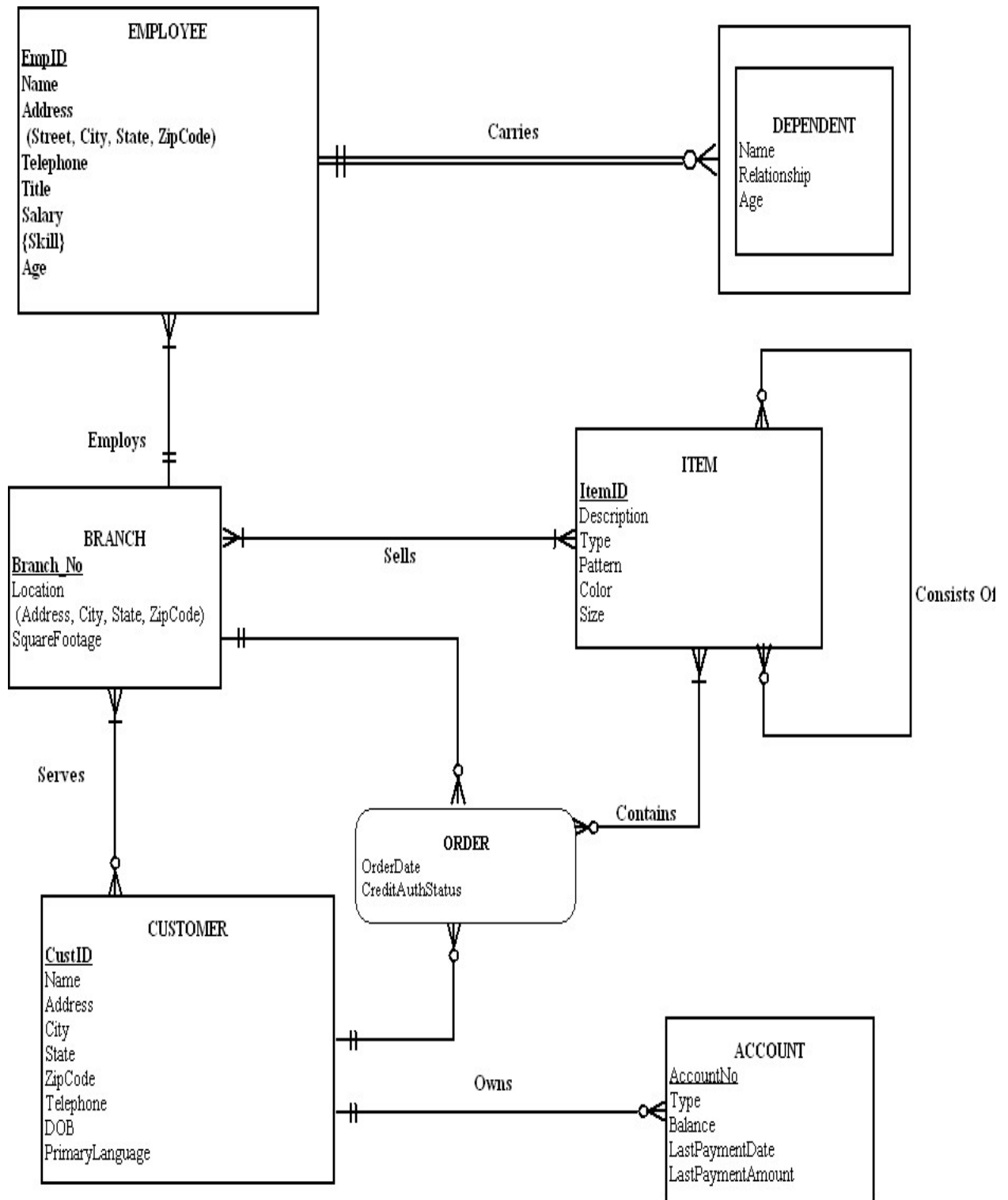
Lists: Each property is listed by only one sales office. Each sales office can list one, none, or many properties.

Owns: Each property has one or more owners. Each owner can own one or more properties. Percent_owned is an attribute on Owns; it tracks the percent of property that the owner owns.

5. (30 points)

You have been hired by Kristi's Wonderful World of Wallcoverings to design a database for her chain of three stores that sell wallpaper and accessories. Kristi would like to keep track of her sales, employees, and customers. After meeting with Kristi you have developed the following set of business rules. Develop an ERD based upon these rules.

- Customers place orders through a branch.
- Kristi would like to track the following about customers: Name, Address, City, State, Zipcode, Telephone, Date of Birth, Primary Language.
- A customer may place many orders.
- A customer does not always have to order through the same branch every time.
- Customers may have one or more accounts, although they may also have no accounts.
- The following information needs to be recorded about accounts: Balance, Last payment date, Last payment amount, Type.
- A branch may have many customers.
- The following information about each branch needs to be recorded: Branch number, Location (consisting of Address, City, State, Zipcode), Square footage.
- A branch may sell all items or only certain items.
- Orders are composed of one or more items.
- The following information needs to be maintained about each order: Order date, credit authorization status.
- Items may be sold by one or more branches.
- Kristi wants to record the following information about each item: Description, Color, Size, Pattern, Type.
- An item can be composed of multiple items: for example, a dining room wall covering set (item 20) may consist of wallpaper (item 22) and borders (item 23).
- Kristi employs 56 employees.
- Kristi would like to record the following information about her employees: Name, Address (Street, City, State, Zipcode), Telephone, Date of Hire, Title, Salary, Skill, Age.
- Each employee works in one and only one branch.
- Each employee may have one or more dependents. Kristi would like to record the name of each dependent as well as their age and relationship to the employee.
- Employees may have more than one skill.



Note: The question does not indicate that there is a quantity for the Contains or Consists_of relationships.