

Section 1: True/False (2 pts each)

1. T / F An attribute of a $N : M$ relation can be migrated to either entity.
2. T / F All superkeys are keys.
3. T / F NULL always means the value exists but we just don't know the value yet.
4. T / F For multiple consecutive σ operations, order doesn't matter.
5. T / F For multiple consecutive π operation, order doesn't matter.
6. T / F For multiple consecutive \cup operations, order doesn't matter.
7. For multiple consecutive \cap operations, order doesn't matter.
8. For any sets R and S , $R - S = S - R$
9. Primary keys must always be a single column.
10. All constraints and attributes must be specified when we create a table.

Section 2: Short answer (5 pts each)

1. What is the main difference between an atomic and a composite attribute?
2. What is a derived attribute and how is it shown on the ER diagram?
3. What is the term for the relationship between a weak entity and its owner entity?

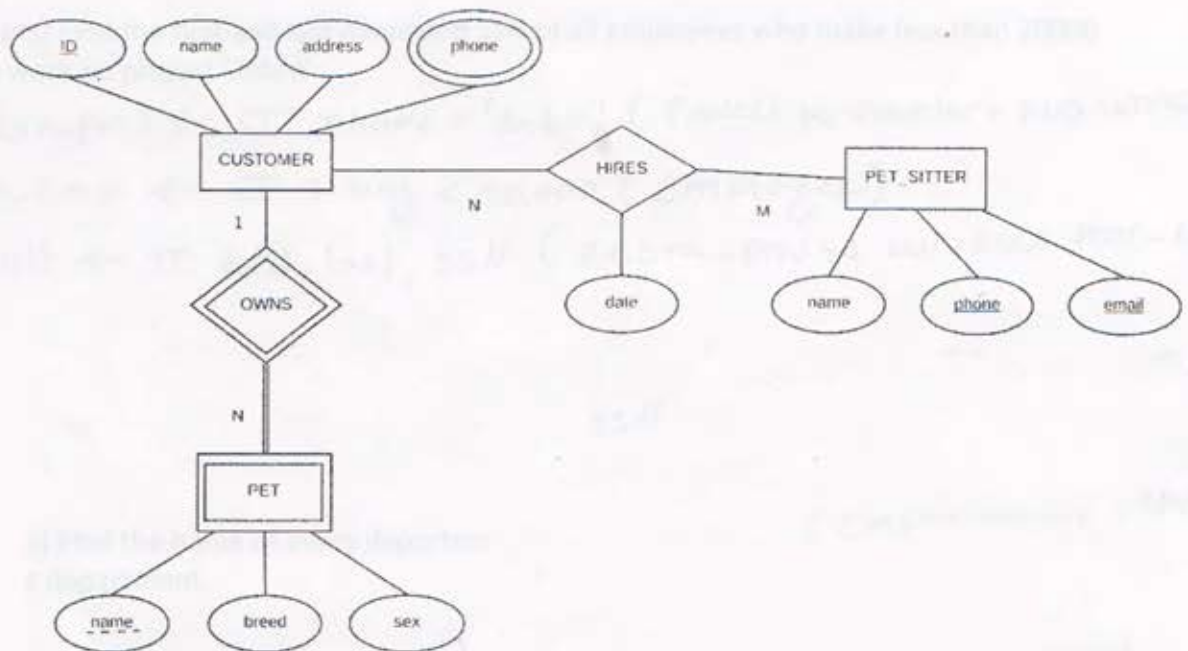
4. What is the term for the relationship between two instances of the same entity type?
5. What two properties must two relations possess before they are union compatible?
6. If we say a relation is of degree 5, what does that tell us about the relation?
7. How do we indicate a foreign key on the relational diagram?
8. A _____ is used to give users of a database privileges (permissions).
9. What is the difference between a table and a view?
10. Give an example of an initial constraint that can be specified when creating a table in SQL.

Section 3: Diagram problems

- 1) (50 pts) Draw the ER diagram of the following spec for part of a mail order database. Use proper notation.

- Each customer has a unique customer number, a first and last name, a delivery address and may have several phone numbers.
- Each item sold has a unique part number, a unique item name, a price, and a quantity on hand.
- A customer may order several items on an order. The order has an order number. The same item can be ordered by more than one customer.

2) (50 pts) Map the following ER diagram to a relational diagram. Use proper notation.



Section 4: Relational Algebra. Use the attached Company relational model to write relational algebra expressions that answer the following questions.

1. (20 pts) Find the first and last name and SSN of all employees who make less than 20000 and work on project 'Zebra'.
2. (10 pts) Find the name of every department and the first and last name of the manager of that department.
3. (20 pts) Find the name of every department that has a project location in the same location as that department. Make sure the project and department locations only match when it's the same department.

- 4) (30 pts) Find the SSN and salary of all employees who work for the department named 'sales' but who do not have a dependent with a relationship type of 'spouse'.