Database Management System – cs422 DE

Assignment 5 – Week 6

This assignment is based on lecture 6 (chapter 12).

- Submit your *own work* on time. No credit will be given if the assignment is submitted after the due date.
- Note that the completed assignment should be submitted in .doc, .docx, .rtf or .pdf format only.
- In MCQs, if you think that your answer needs more explanation to get credit then please write it down.
- You are encouraged to discuss these questions in the Sakai forum.

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(1) A student can take not more than 5 subjects in a semester. The number of students allowed in a subject in a semester is not more than 40. The student – subject relationship is:

(A) 5:40 (B) 40:5
(C) N:5 (D) 40:M
ANS: B

(2) Which of the following is NOT a basic element of all versions of the E-R model?

(A) Entities
(B) Attributes
(C) Relationships
(D) Primary keys
ANS: D

(3) The attribute *name* could be structured as a attribute consisting of first name, middle initial, and last name. This type of attribute is called

(A) Simple attribute
(B) Composite attribute
(C) Multivalued attribute
(D) Derived attribute
ANS: B

(4) Which of the following indicates the minimum number of entities that must be involved in a relationship?

(A) Maximum cardinality
(B) Minimum cardinality
(C) ERD
(D) Keys
ANS: C

(5) Which of the following is a single valued attribute

(A) Register_number
(B) Address
(C) SUBJECT_TAKEN
(D) Reference
ANS: A

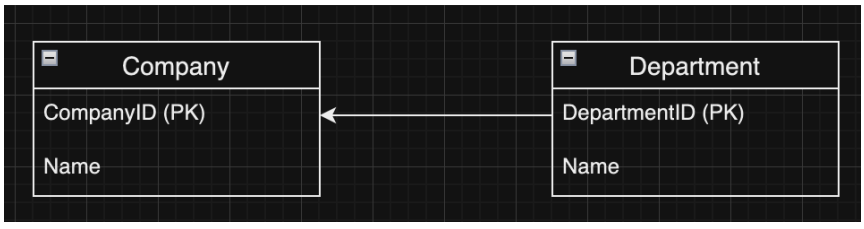
(6) In a one-to-many relationship, the entity that is on the many side of the relationship is called as
(A) Strong entity
(B) Weak entity
(C) Entity that has optional participation in the relationship
(D) Entity that has mandatory participation in the relationship
ANS: B

(7) Describe what attributes represent in an ER model and provide examples of simple, composite, single-valued, multi-valued, and derived attributes.
(Review Question 12.3 in 5th edition/ 11.3 in 4th edition)
ANS: The attributes hold values that describe each entity occurrence and represent the main part of the data stored in the database.
Example:
- Simple: position and salary of the Staff entity
- Composite: address attribute composes of street, city, and postcode attributes
- Single-valued: branchId of Branch
- Multi-valued: branchType of Branch
- Derived attributes: rentStart and rentFinish of the Lease entity type.

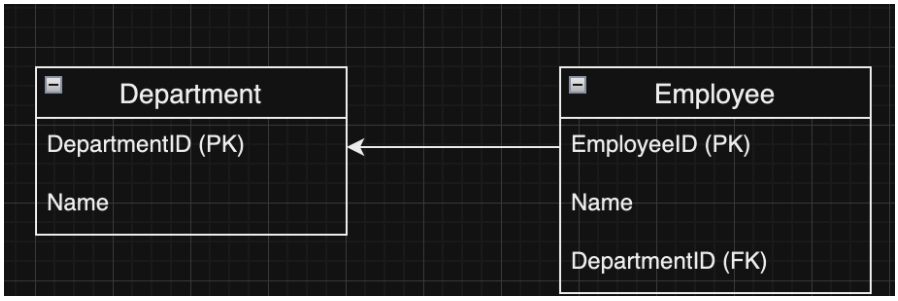
(8) Describe how strong and weak entity types differ and provide an example of each.
(Review Question 12.8 in 5th edition/ 11.8 in 4th edition)
ANS: A strong entity type is an entity type that exists independently, not relying on any other entity for its existence. Strong entity types are characterized by having a key attribute, which uniquely identifies each entity within the type. For instance, the entity type "BRANCH" is a strong entity type as it can exist autonomously without any dependencies on other entities. It is identified uniquely by its key attribute, "branchID."
Conversely, a weak entity type is an entity type whose existence is dependent on another entity type. For example, in a scenario where a company provides insurance coverage to its employees and their dependents, the entity type "Dependent" is weak as it cannot exist independently without being associated with an "Employee" entity.

(9) Create an ER diagram for each of the following descriptions:
(Exercise 12.10 in 5th edition/ 11.10 in 4th edition)

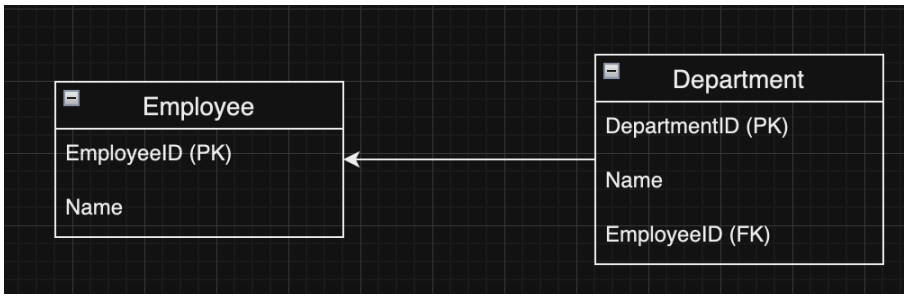
a. Each company operates four departments, and each department belongs to one company.
ANS:



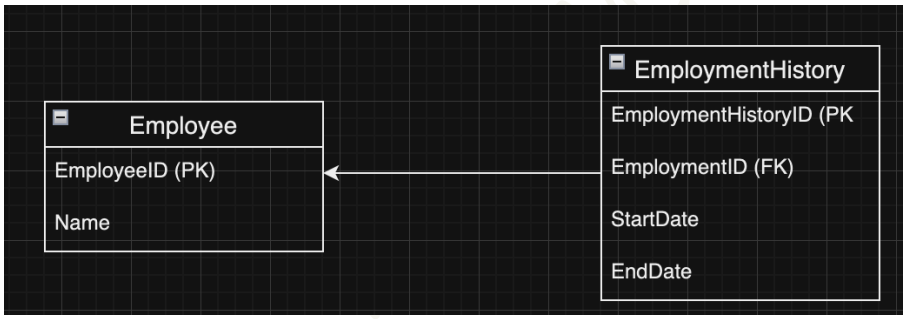
b. Each department in part (a) employs one or more employees, and each employee works for one department.
ANS:



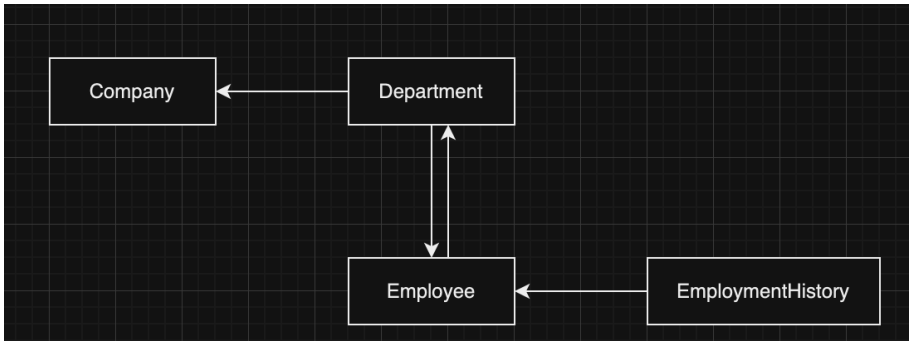
c. Each of the employees in part (b) may or may not have one or more dependants, and each dependant belongs to one employee.
ANS:



d. Each employee in part (c) may or may not have an employment history.
ANS:



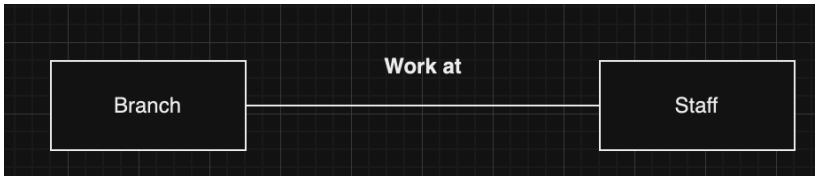
e. Represent all the ER diagrams described in (a), (b), (c), and (d) as a single ER diagram.
ANS:



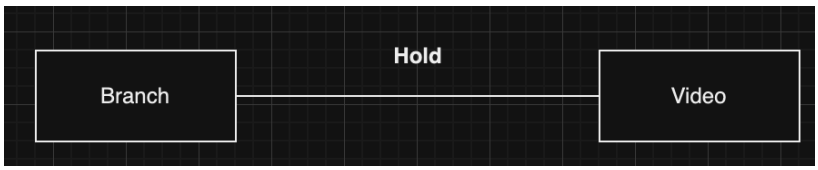
(10) Solve exercise 12.12 from the 5th edition (11.12 from the 4th edition). If time permits, solve from *a-f*. Otherwise, it's ok if you just solve *f*.
ANS:

a. Entities: Branch, Staff, Video, Member, Rental
b. Relationship:

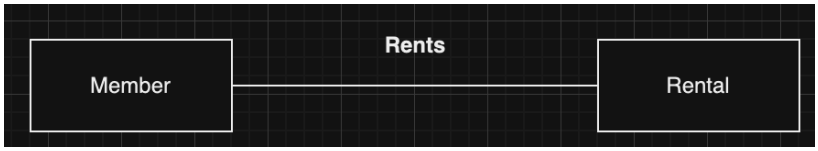
Branch - Staff



Branch - Video

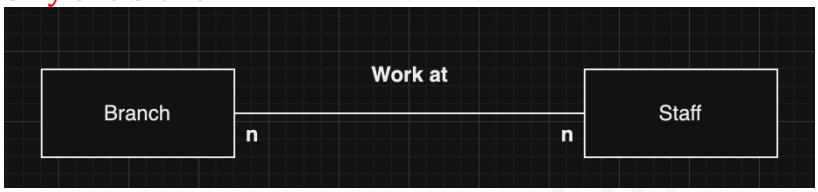


Member - Rental

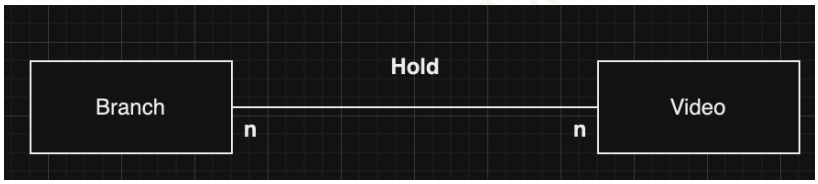


c. Determine the multiplicity constraints for each relationship

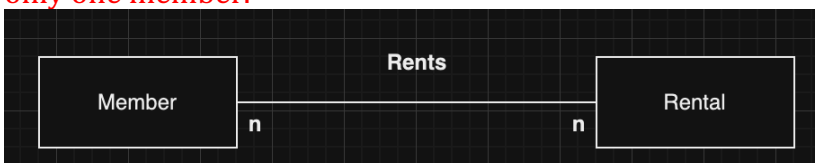
- Branch - Staff: One branch can have many staff members, but each staff member works at only one branch



- Branch - Video: One branch can hold many videos, and each video can be held by only one branch



- Member - Rental: One member can rent multiple videos, and each rental is associated with only one member.



d. Identify attributes and associate them with entity or relationship types.

- Branch Entity: Attributes: Branch Number (PK), Address (Street, City, State, Zip Code), Telephone Number
- Staff Entity: Attributes: Staff Number (PK), Name, Position, Salary
- Video Entity: Attributes: Catalog Number (PK), Video Number, Title, Category, Daily Rental, Cost, Status, Main Actors, Director
- Member Entity: Attributes: Member Number (PK), First Name, Last Name, Address, Registration Date
- Rental Entity: Attributes: Rental Number (PK), Member Name, Member Number, Video Number, Title, Daily Rental, Rental Date, Return Date

e. Determine candidate and primary key attributes

- Branch Entity:

    - Candidate Key Attributes: Branch Number
    - Primary Key Attribute: Branch Number
- Staff Entity:
    - Candidate Key Attributes: Staff Number
    - Primary Key Attribute: Staff Number
- Video Entity:
    - Candidate Key Attributes: Catalog Number
    - Primary Key Attribute: Catalog Number
- Member Entity:
    - Candidate Key Attributes: Member Number
    - Primary Key Attribute: Member Number
- Rental Entity:
    - Candidate Key Attributes: Rental Number
    - Primary Key Attribute: Rental Number

f. ER Diagram