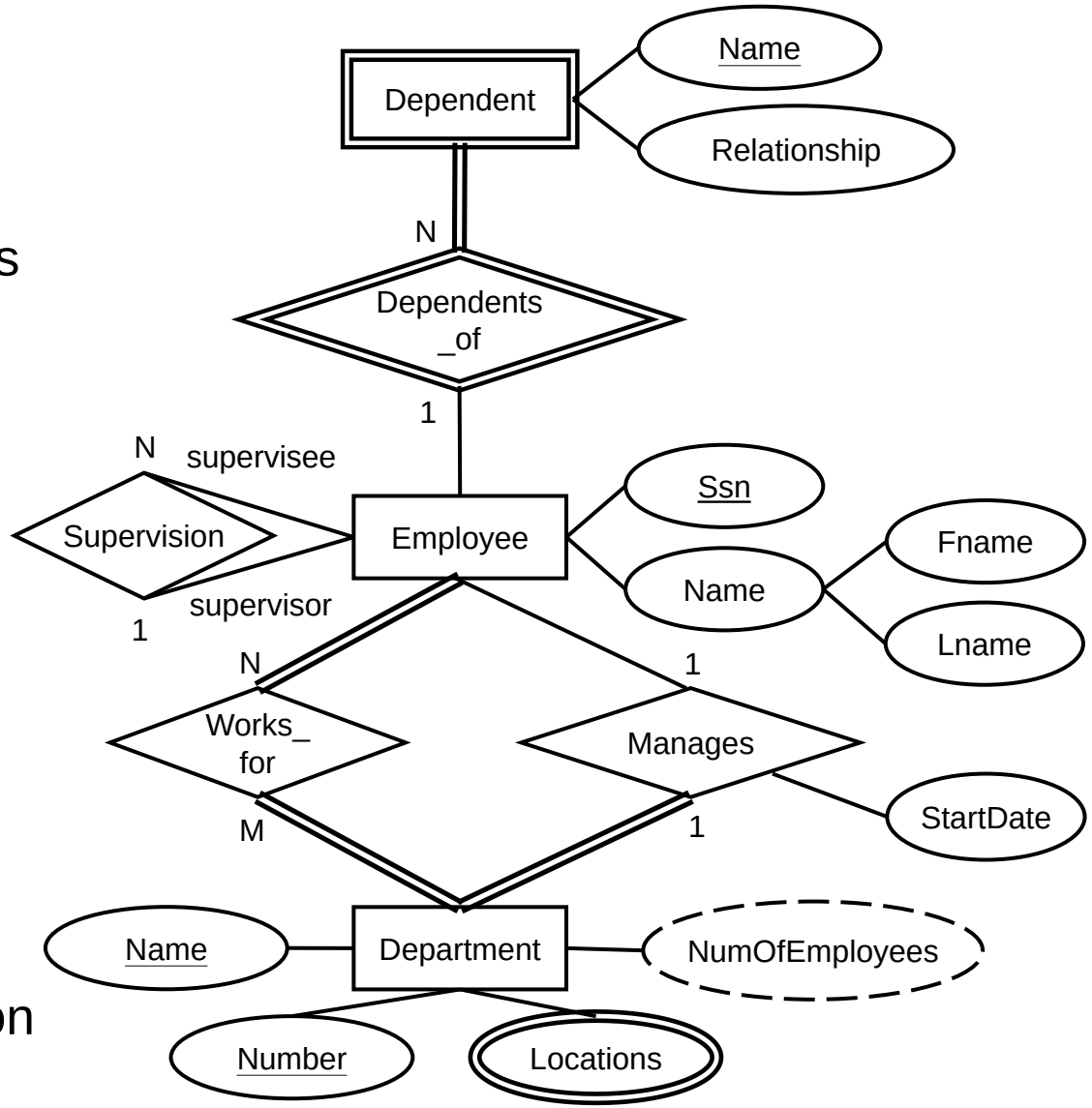
Tutorial 2: Relational Model (Solutions)

CS3402 Database Systems

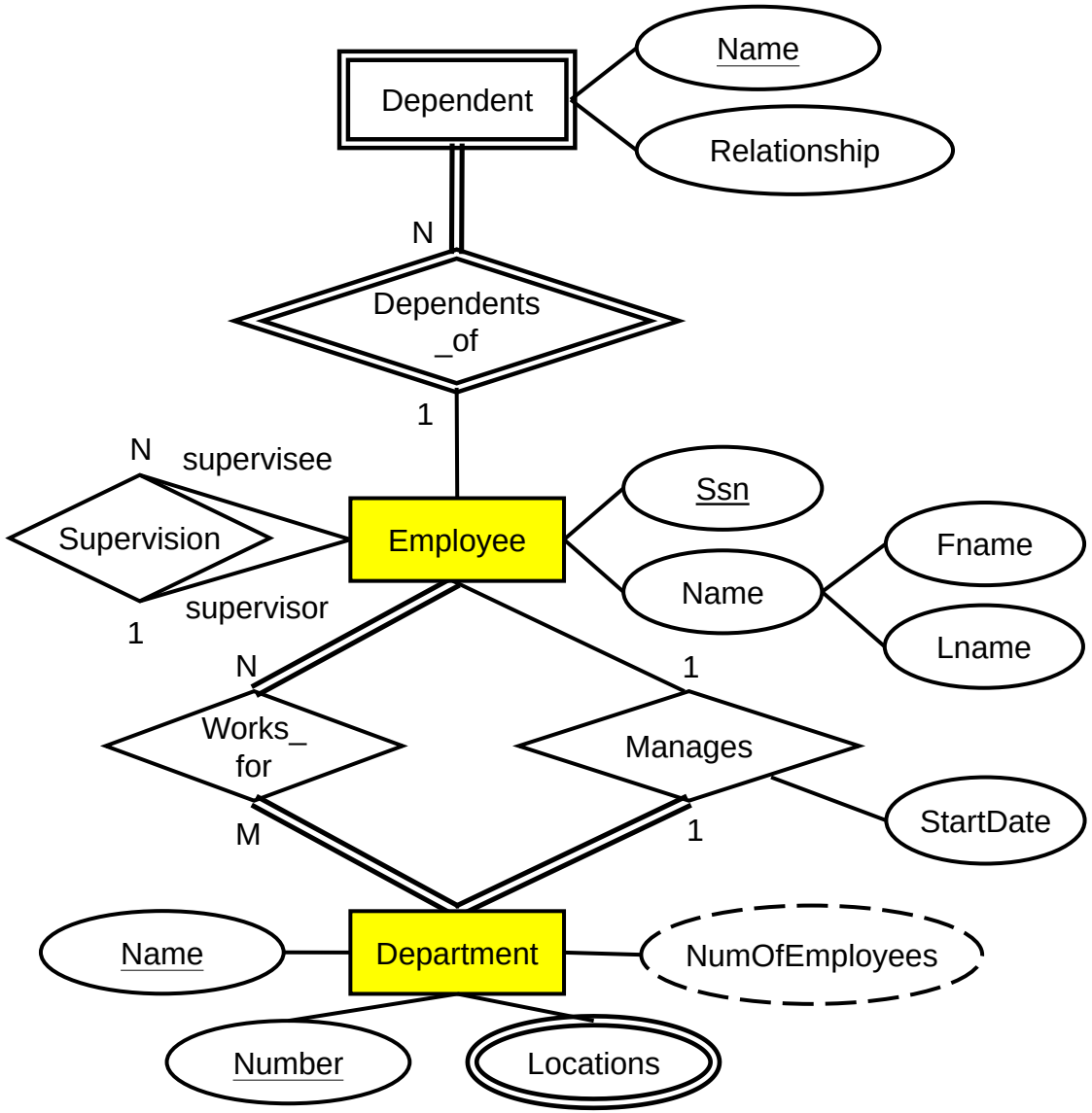
Question 1

- Translate the given ER diagram to relational models based on the following steps.
  a) Map each strong entity type into a relation
  b) Map each weak entity type with its identifying relationship type into a relation
  c) Map each binary 1:1 relationship type into attributes
  d) Map each binary 1:N Relationship types into attributes
  e) Map each binary M:N relationship type into a relation
  f) Map each N-ary relationship type into a relation
  g) Map each multi-valued attribute into a relation



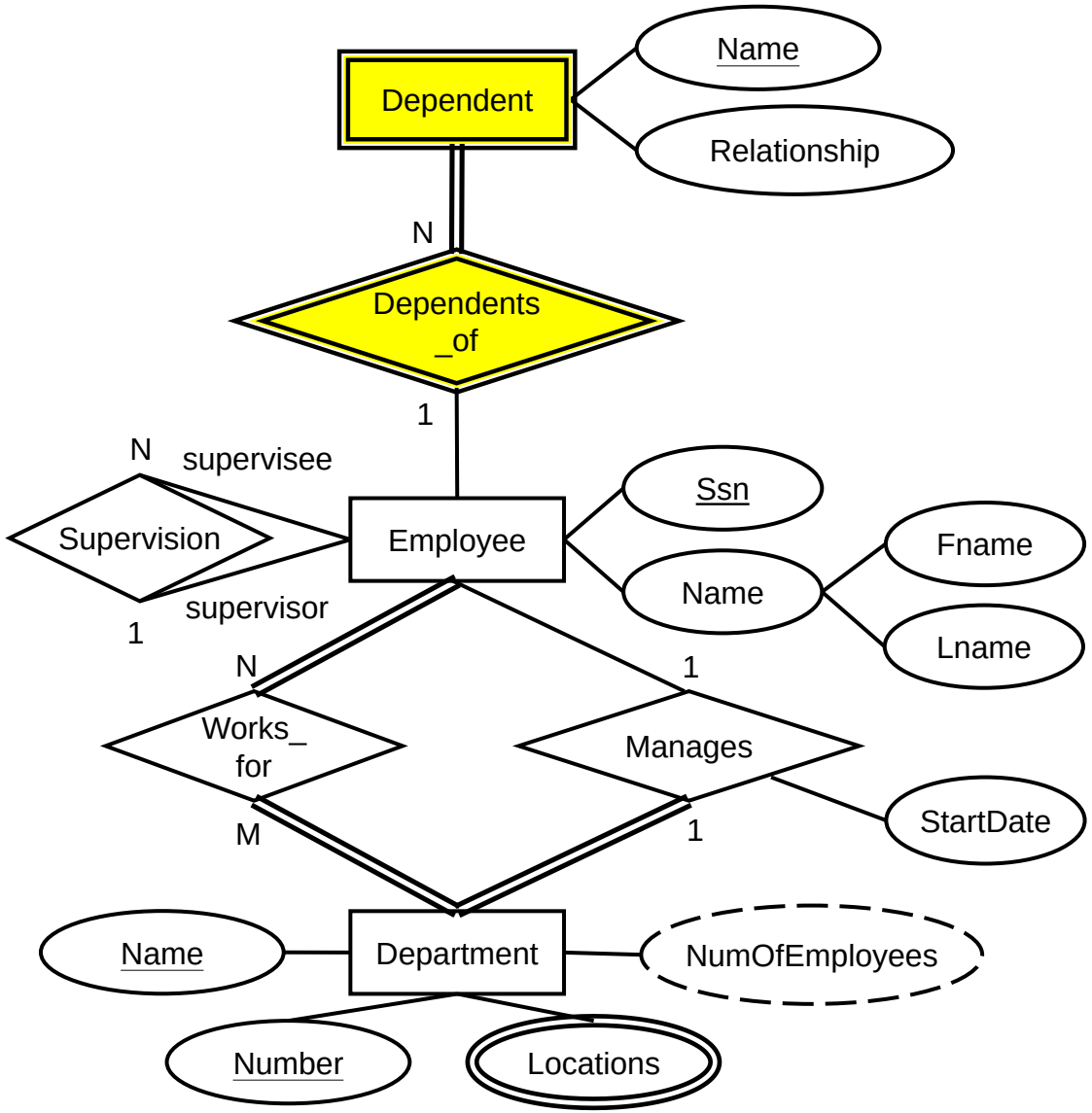
Question 1(a)

- For each strong entity type,
  - Include simple attributes of the entity
  - Include simple components of composite attributes
  - Identify the primary key from the key attributes
- **Employee (SSN, Fname, Lname)**
- **Department (Number, Name)**



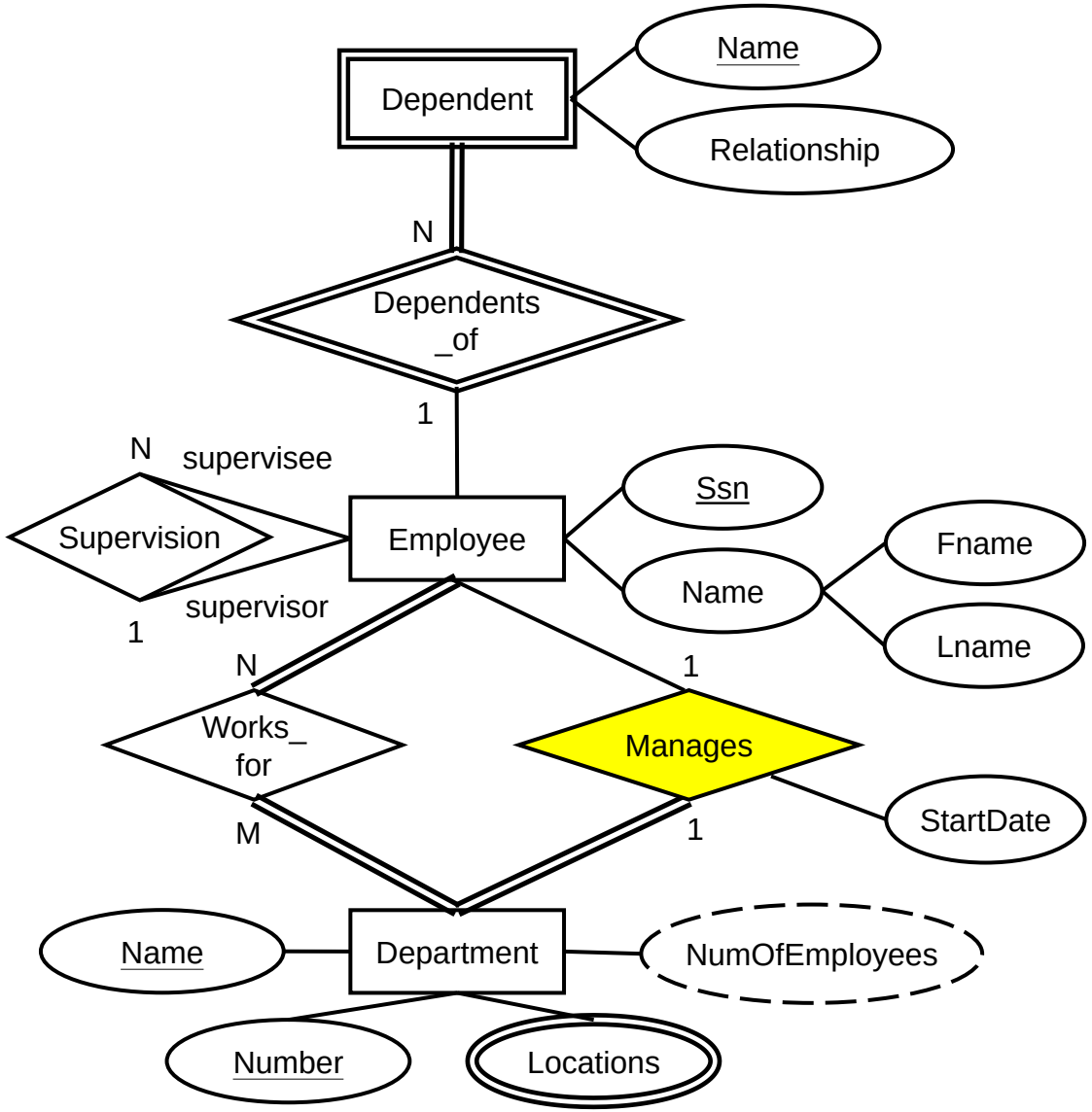
Question 1(b)

- For each weak entity type with its identifying relationship type
  - Include simple attributes
  - Add the owner's key attribute as attributes (also known as foreign key because it refers to another relation's primary key)
  - Set the primary key as the combination of (1) the key attribute of the associated strong entity and (2) the partial key of the weak entity
- **Dependent (<u>Name,</u> <u>EmployeeSSN</u>, Relationship)**



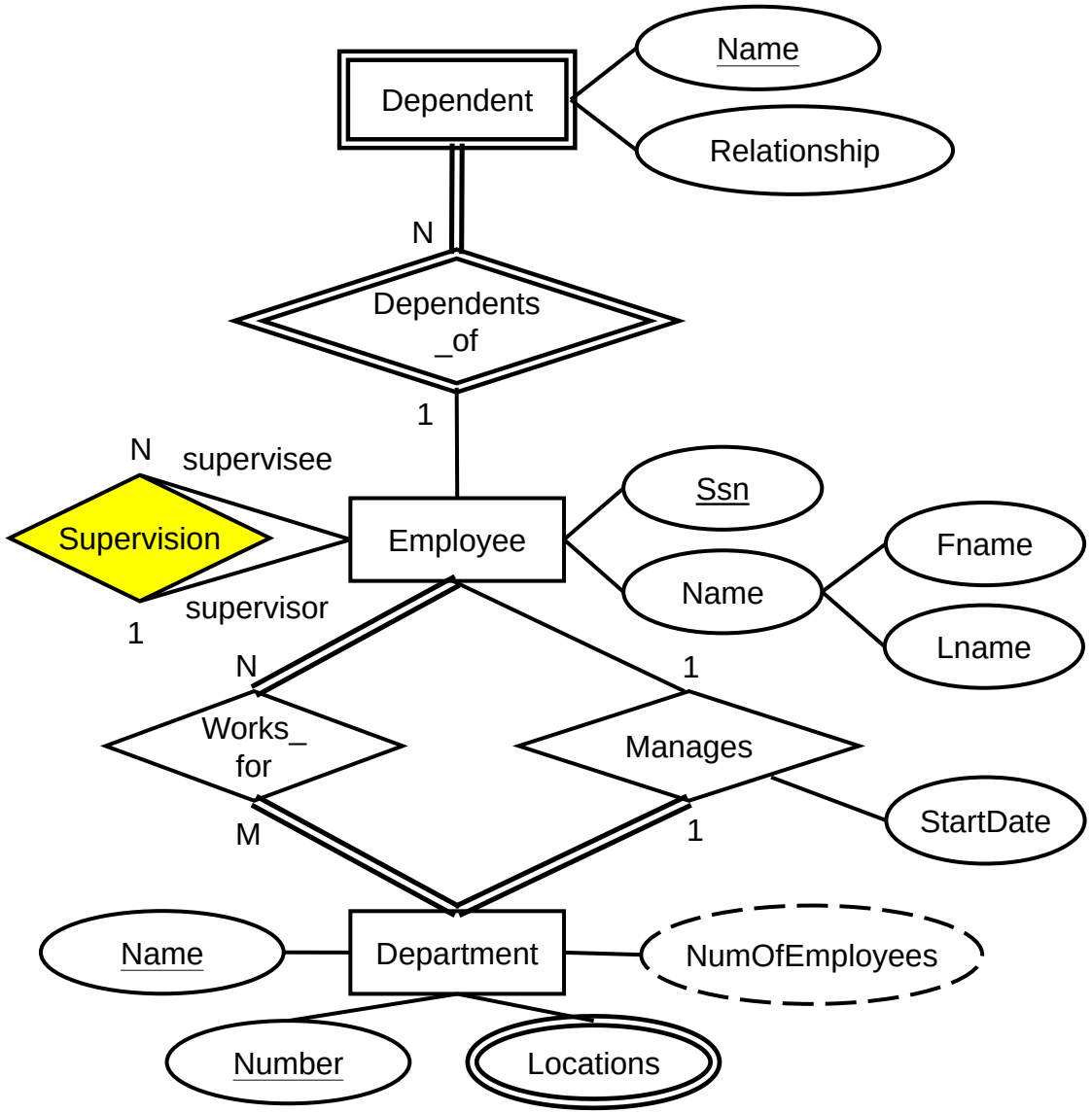
Question 1(c)

- For each binary 1:1 relationship type,
  - Include the primary key of one entity type as attributes (foreign keys) of the other entity type (note: it is better to choose the entity in total participation to include the other entity's primary key as attributes)
  - Include the simple attributes of the relationship type
- **Department** (Number, Name, **ManagerSSN, StartDate**)



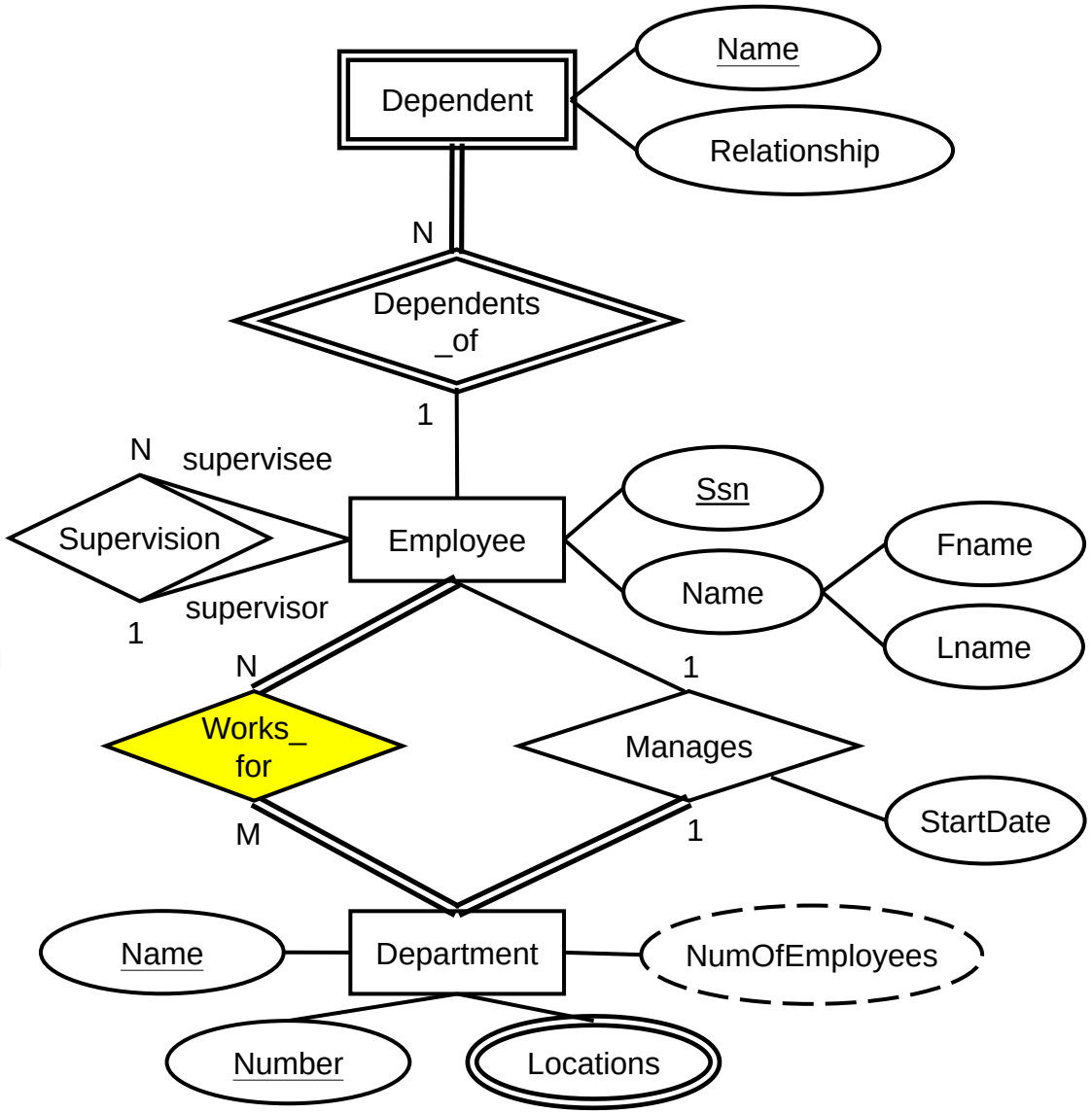
Question 1(d)

- For each binary 1:N Relationship type,
  - In the relation representing the N-side entity type, add the primary key of the 1-side entity type as attributes (foreign key)
  - Include the simple attributes of the relationship type
- **Employee (SSN, Fname, Lname, SupervisorSSN)**



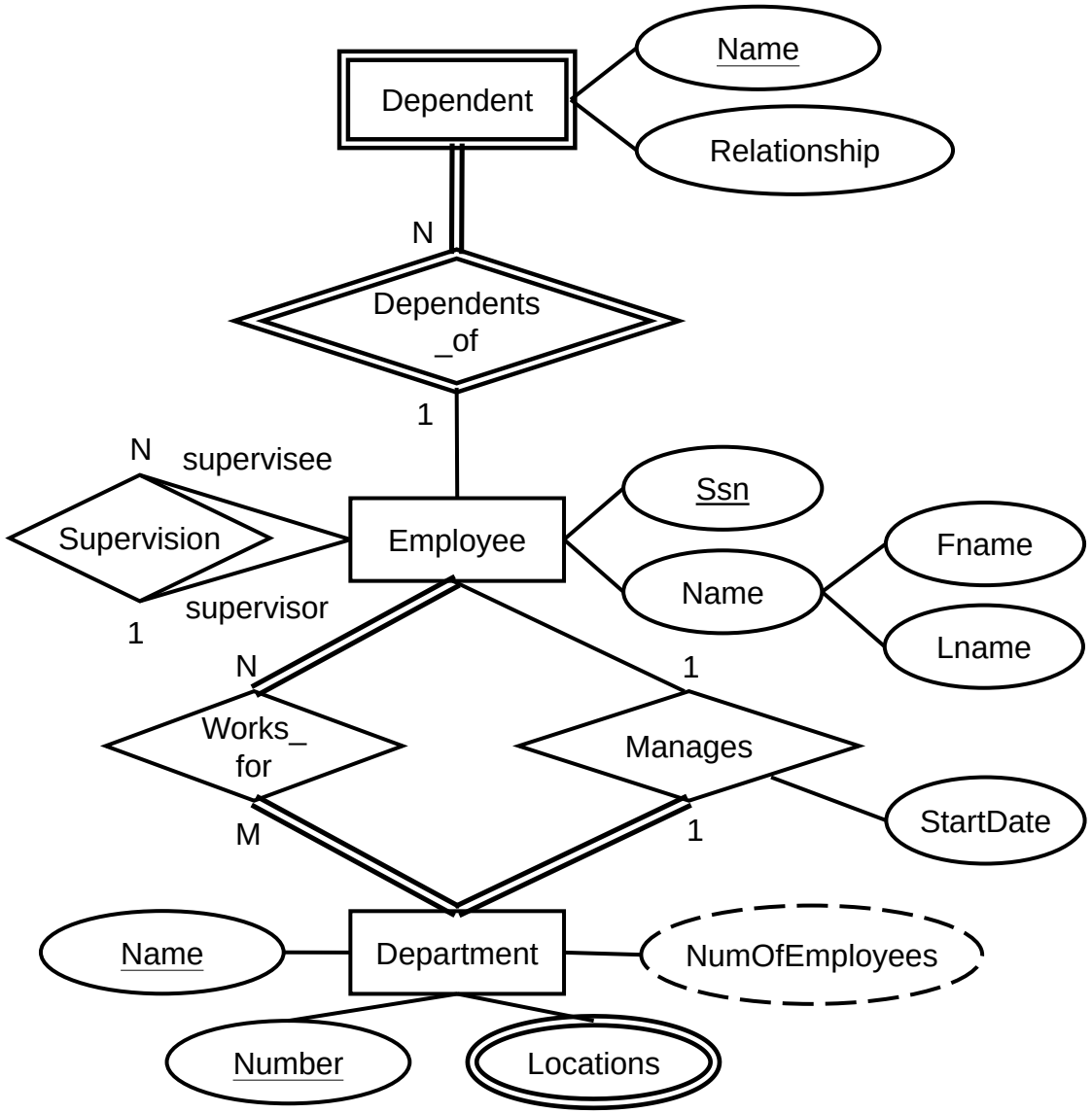
Question 1(e)

- For each binary M:N relationship type,
  - Create a relation
  - Include the primary keys of the participating entity types as attributes (foreign keys)
  - Identify the primary key as the combination of the above foreign keys
  - Include the simple attributes of the relationship type
- **Work_for (EmployeeSSN, DeptNum)**



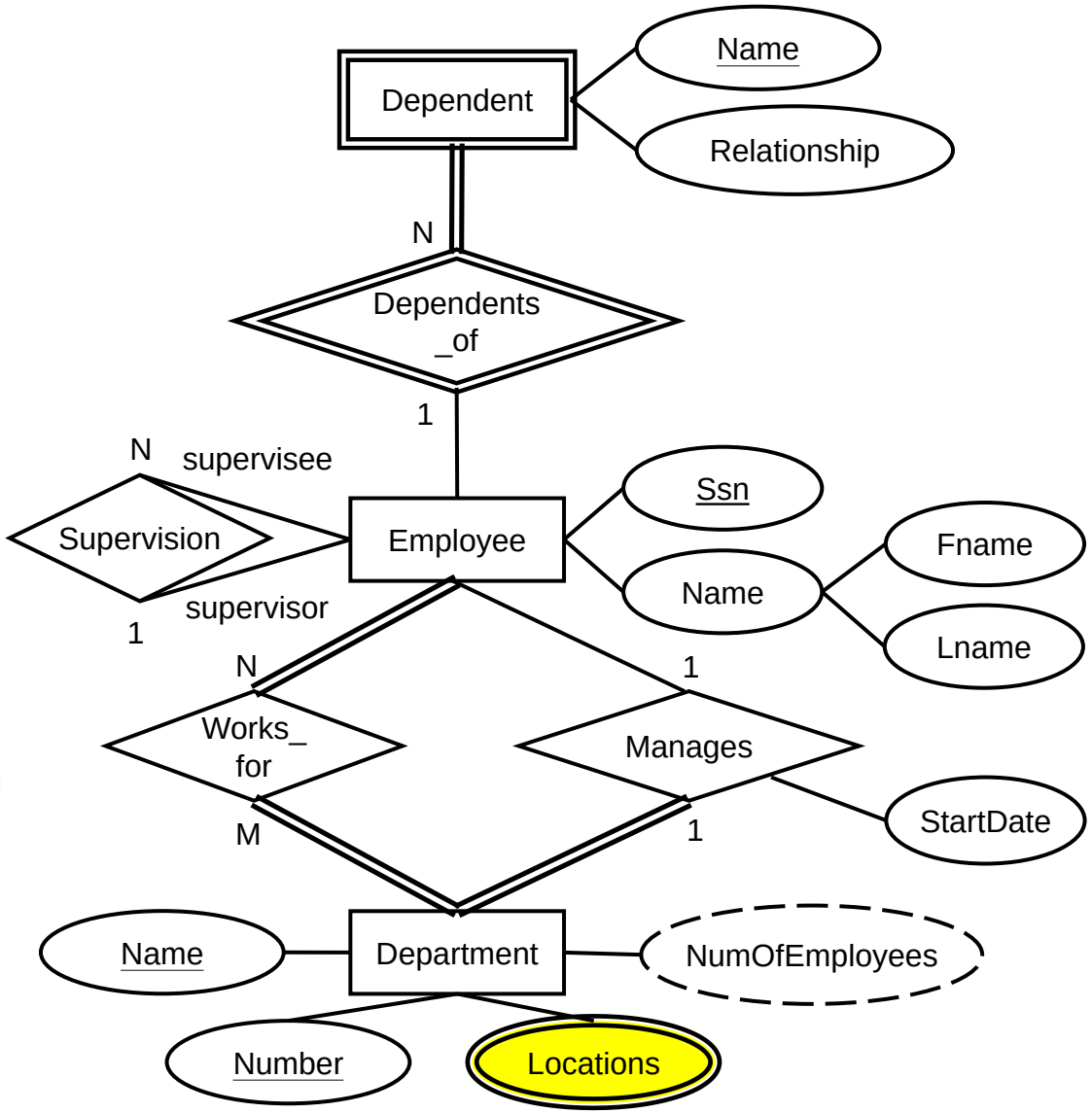
Question 1(f)

- For each N-ary relationship type,
  - Perform the same steps as in binary M:N relationship type



Question 1(g)

- For each multi-valued attribute,
  - Create a relation
  - Include the given multi-valued attribute
  - Include the primary key of the entity/relationship type owning the multivalued attribute
  - Identify the primary key as the combination of (1) the above primary key and (2) the given multi-valued attribute
- **Dept_Location (DeptNum, Location)**



Question 1: Answer

- Department (Number, Name, ManagerSSN, StartDate)
- Dept_Location (DeptNum, Location)
- Employee (SSN, Fname, Lname, SupervisorSSN)
- Dependent (Name, EmployeeSSN, Relationship)
- Work_for (EmployeeSSN, DeptNum)