Chapter 2

Data Modeling

Practical Learning using ER Diagram

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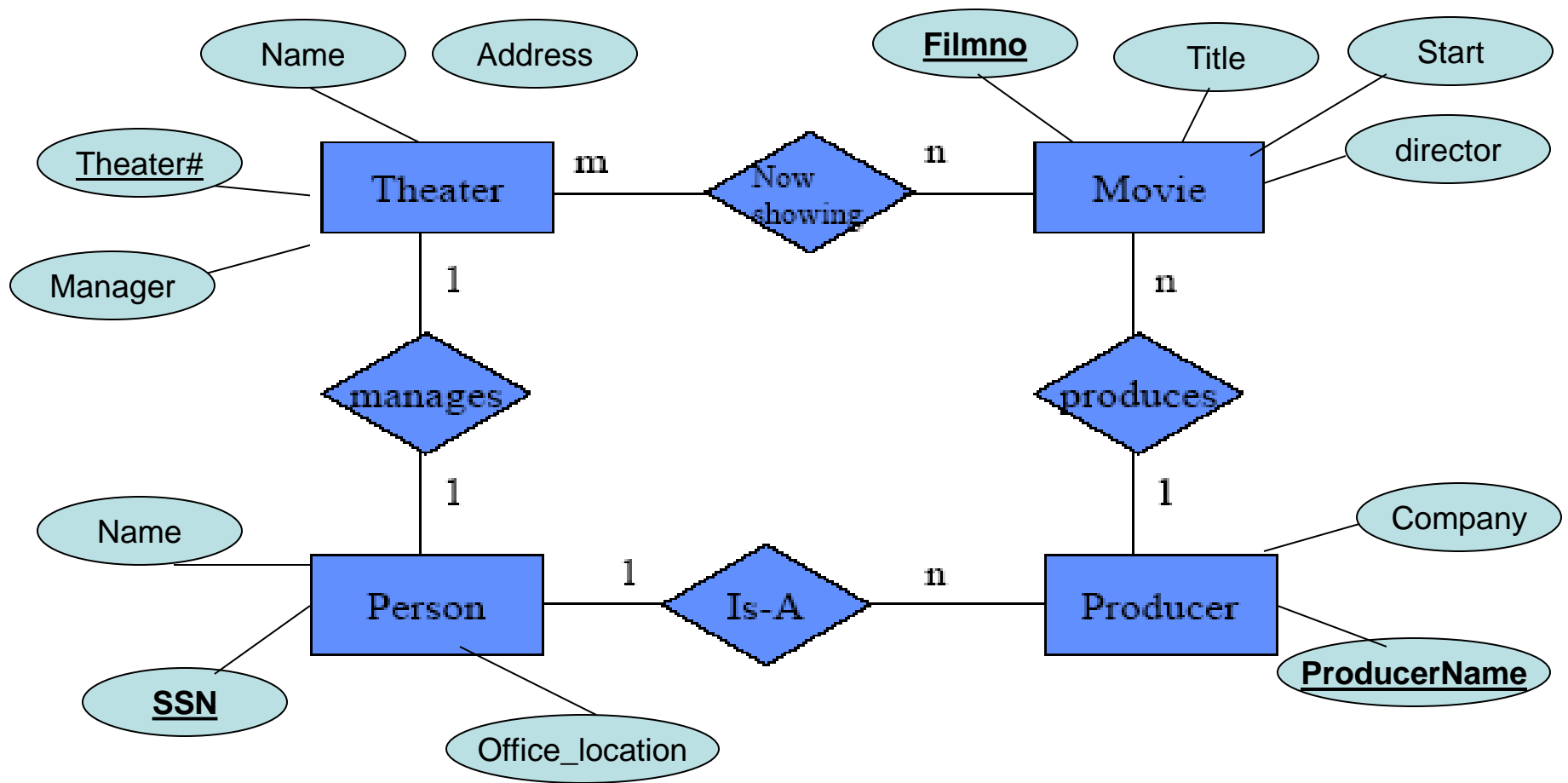E-mail : chan_samedy@yahoo.com

Exercise 1

You are hired to implement an object-relational database schema for a movie distribution center. The database schema consists of the following
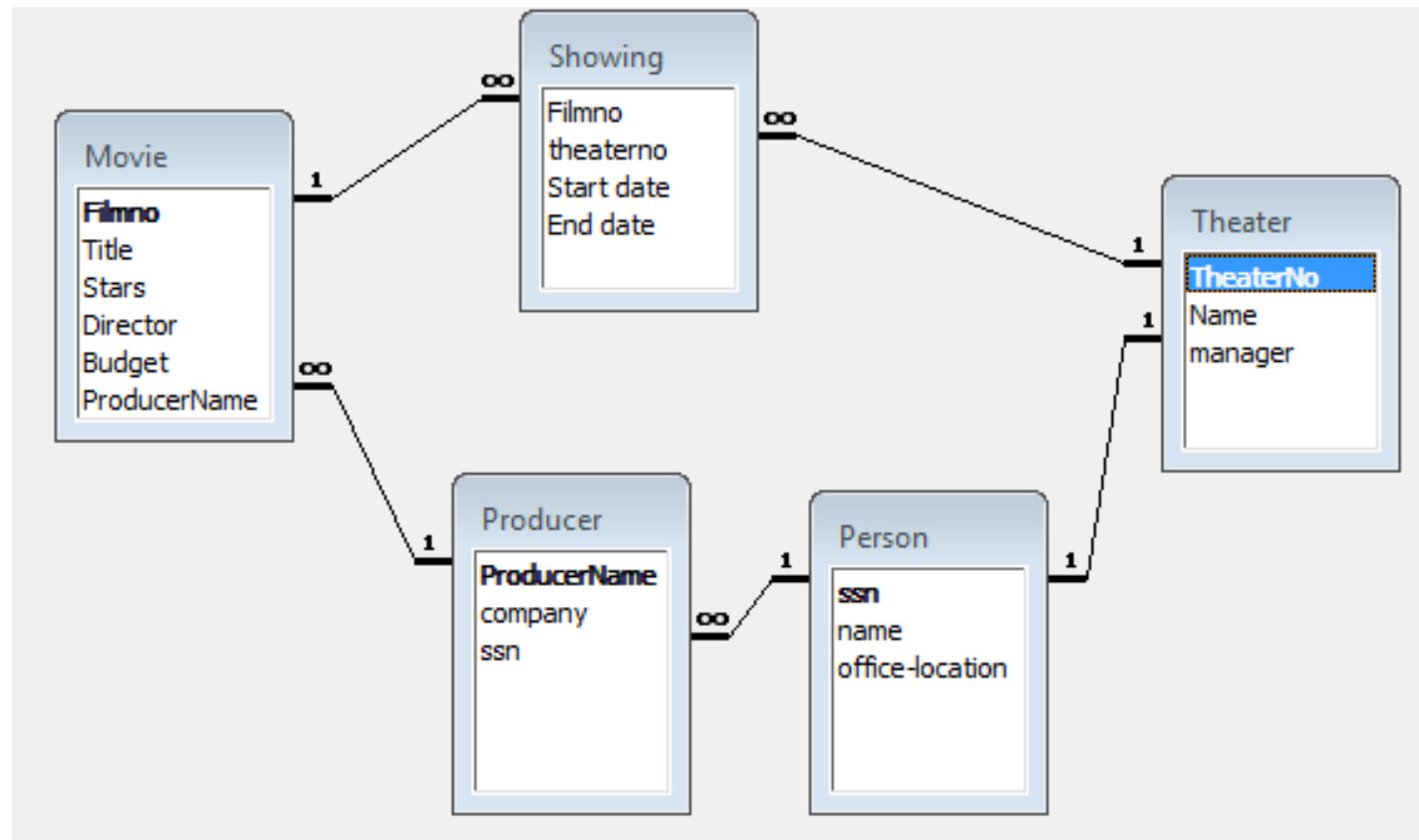
1. theaters that specifies the Theaterno (integer) is unique , Name(text), and Address (text) of all theaters.
2. Movie that specifies the Movie-no (integer) is unique, Title (text), the set of stars (text), Director (text), and Budget (number) of each movie.
     Each film is now showing in several theaters. Each theater may show different films. The **nowshowing** relationship specifies, for each movie showing, the Movie-no (integer), a set of theaters that show the movie, Start (date), and End (date) dates.
3. Person: Each theater is managed by one person and a person can only manage one theater at a time.
4. Producer: Each movie is made by one movie producer and one movie producer can make multiple moives.

Question:

    A. Present the ER diagram for this application.
    B. Mapping it to a relational schema with primary key and foreign keys specified.

Name   Address

Theater#

Manager

Theater   m   Now showing   n   Movie

Filmno   Title   Start   director

1

manages

1

Name

SSN

Office_location

Person   1   Is-A   n   Producer

n

produces

1

Company

ProducerName

3

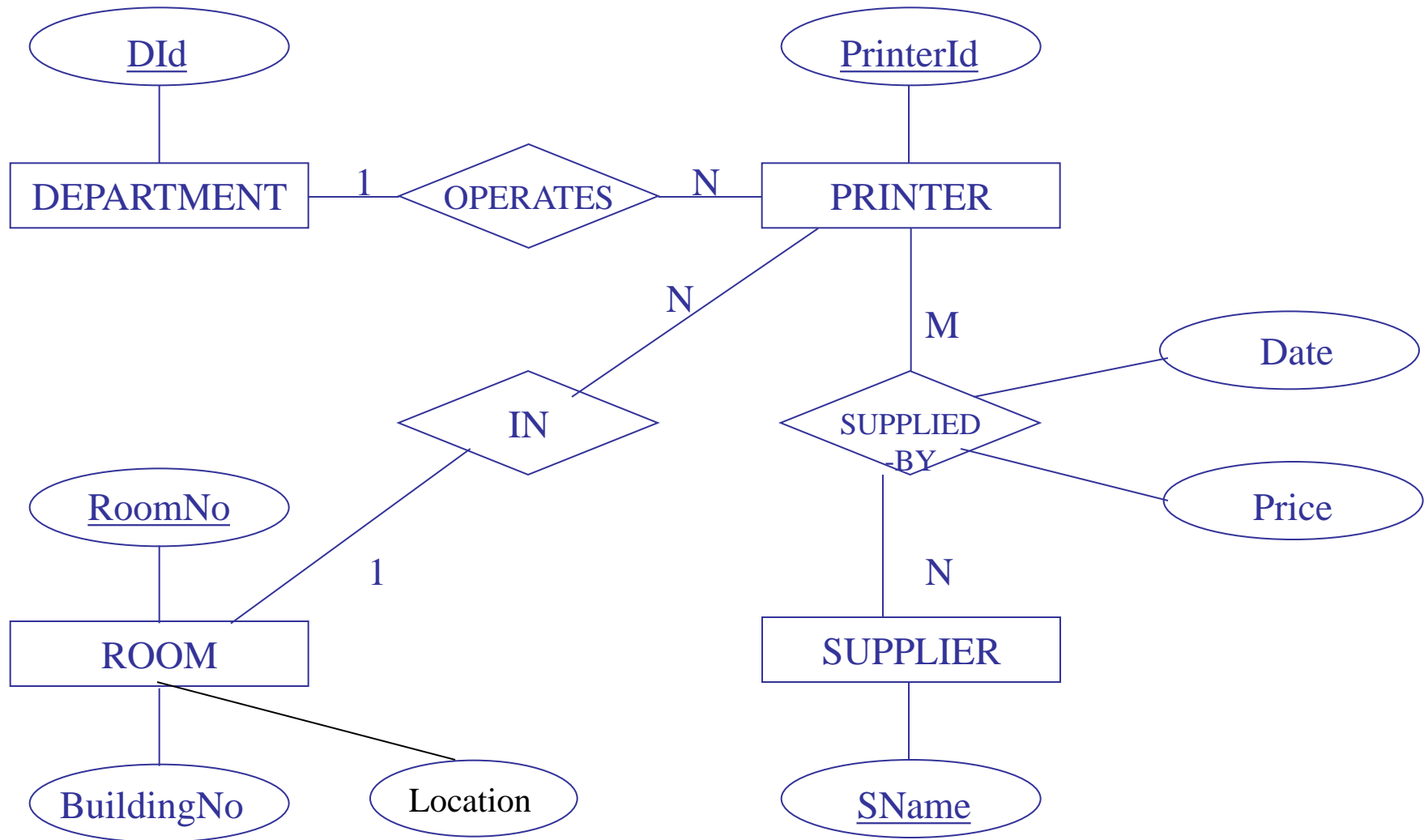Mapping it to a relational schema with primary key and foreign keys specified.
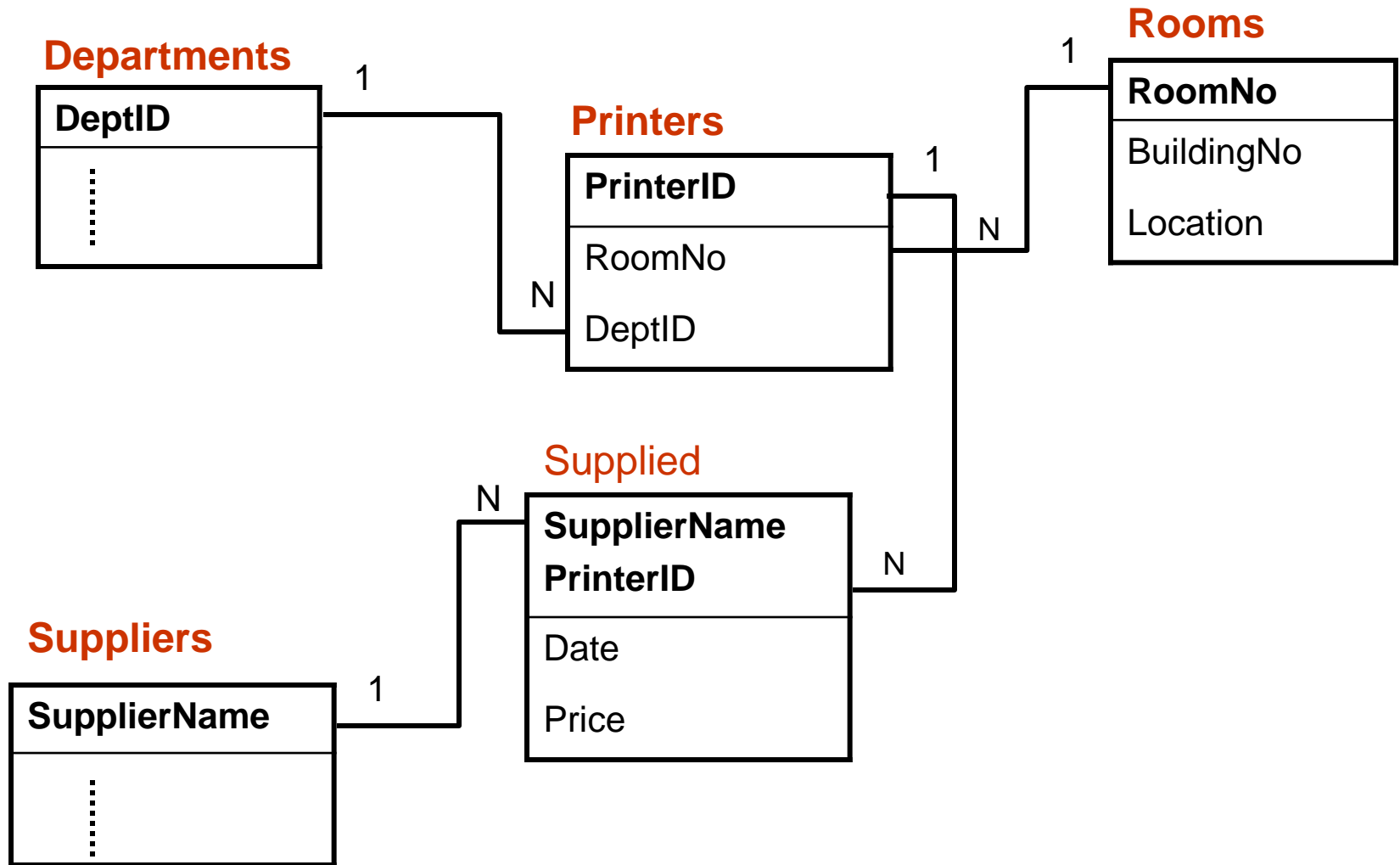
Exercise 2

Identify the entities and relationships for the following description and draw an ER diagram.

Departments, identified by ID, operate a variety of printers, each printer located in a particular room. We need to keep all rooms information, each room is identified by a roomNo and buildingNo, location. Printers are supplied by a number of suppliers, identified by name, with each supplier charging a different price for a given printer, but also providing different date. A room can have many printers. Each supplier can supply many printers.

Exercise 1 (solution)

DId

PrinterId

DEPARTMENT — 1 — OPERATES — N — PRINTER

N

M

Date

IN

SUPPLIED BY

Price

RoomNo

1

N

ROOM

SUPPLIER

BuildingNo

Location

SName

Exercise 1 (solution)

Departments

DeptID
⋮

1

Rooms

RoomNo
BuildingNo
Location

1

Printers

PrinterID
RoomNo
DeptID

1

N

N

Supplied

SupplierName PrinterID
Date
Price

N

N

Suppliers

SupplierName
⋮

1

Exercise 2

Consider the following information about a university database:

- Professors have a SSN, a name, an age, a rank, and a research specialty.
- Projects have a project number, a sponsor name (e.g. UNDP), a starting date, an ending date, and a budget.
- Graduate students have a SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
- Each project is managed by one professor (known as the project's principal investigator).
- Each project is worked on by one or more professors (known as the project's co-investigators).
- Professors can manage and/or work on multiple projects.

Exercise 2 (cont,…)

- Each project is worked on by one or more graduate students (known as the project's research assistants).
- When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number(unique) , a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.

Exercise 2 (Cont,…)

- Graduate students have one major department in which they are working on their degree.
- Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Draw an ER diagram that captures the information about the university.

Exercise 2 (solution)

Chapter 3 Practice Exercises
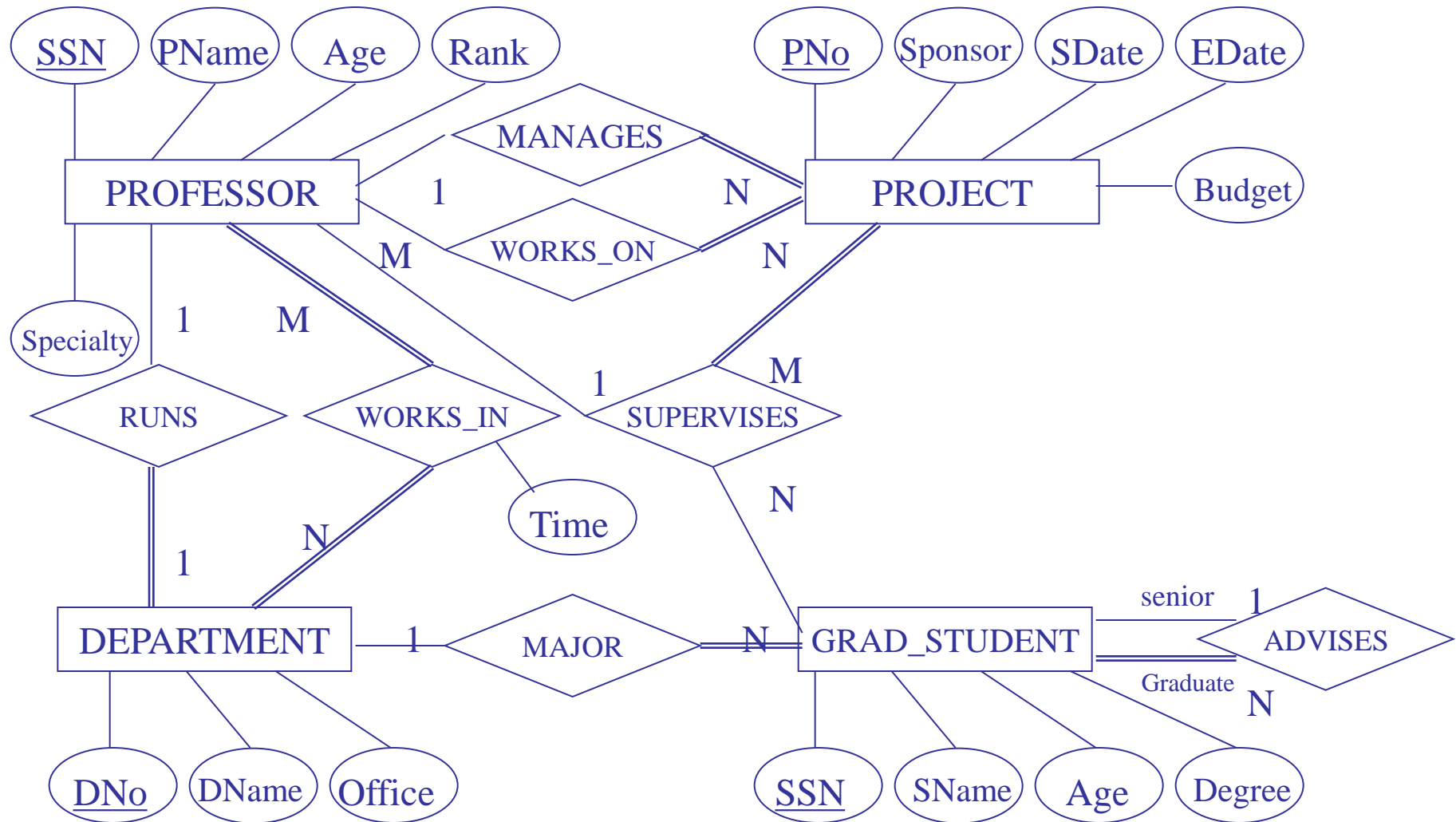
Exercise 3

Draw an ER diagram for the following situation.
State any assumptions you believe you have to make in order to develop a complete diagram.

Projects, Inc., is an engineering firm with approximately 500 employees. A database is required to keep track of all employees, projects assigned, and departments worked in. every employee has a unique number assigned by the firm, required to store his or her name and date of birth. If an employee is currently married to another employee of projects, Inc., the date of marriage and who is married to whom must be stored; however, no record of marriage is required if an employee's spouse is not also an employee. Each employee is given a job title (for example, engineer, secretary, and so on).

Exercise 3 (cont…)

An employee does only one type of job at any given time, and it is only needed to retain information for an employee's current job .

There are 11 different departments, each with a unique name. An employee can report to only one department. Each department has a phone number.

To procure various kinds of equipments, each department deals with many vendors. A vendor typically supplies equipment to many departments. It is required to store the name and address of each vendor and the date of offering between a department and a vendor.

An employee can work on many projects. each projects can have many employees work. Projects are distinguished by project number, and the estimated cost of each project must be stored.

Exercise 3 (Solution)
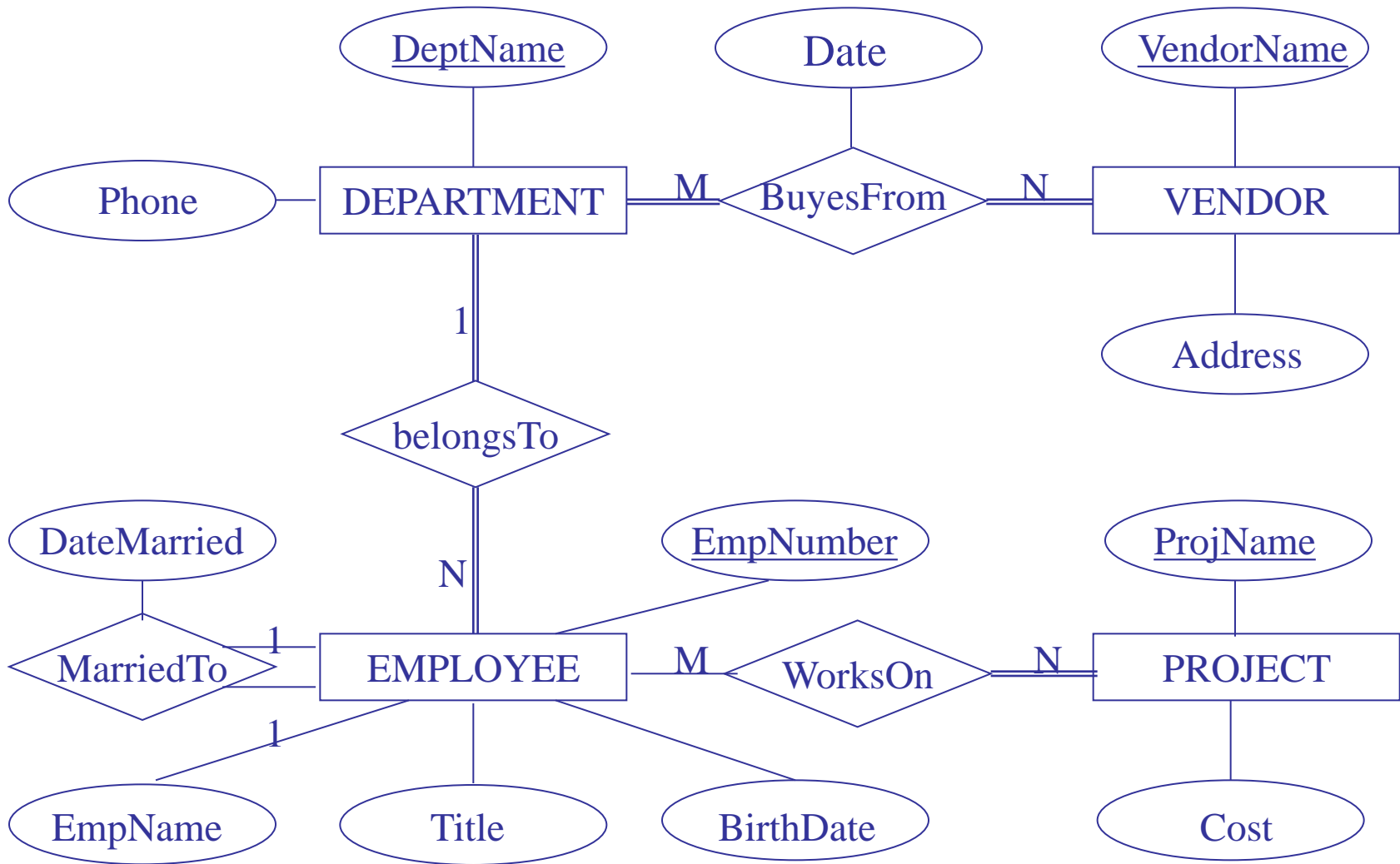
Exercise 4

A hospital wishes to maintain the following information about its structure, staff and patients.

The hospital consists of several departments. Each department is identified by a code and has a name, head and staff (doctors, nurses, others) working in the department. The members of the staff are identified by their social security numbers, have names, salaries, addresses, telephone numbers, and functions. A member of the staff works for a specific department.

The hospital contains patients that are assigned to a room and each room may contain many patients.

we need to store patient information, each patient is unique identified by a number and has name, address, next of kin, age, sex, blood type, and reference to his/her doctor.

Exercise 4 (cont,…)

Each room has a unique number and information about its location and telephone number. Each room contains information about its availability.
A patient may have a number of operations. The information to be recorded about an operation includes a unique operation number, the type of operation, the patient, the members of the staff involved in the operation, date, time, and the operating theatre.

An operation is performed in a theatre. Each theatre has an identified number, location, and may be equipped for certain classes of operations.

Question:
1. Create an entity-relationship diagram with all the necessary information for the hospital database described above. Make sure to identify all the constraints.

2. Map the ER above to Relational schema

Exercise 4 (solution)