

PRACTICE PROBLEM SET #4

CSC 261/461 (Database Systems), Spring 2018,
University of Rochester
02/22/2017

Problem 1

Convert the following ER diagram into a relational database schema

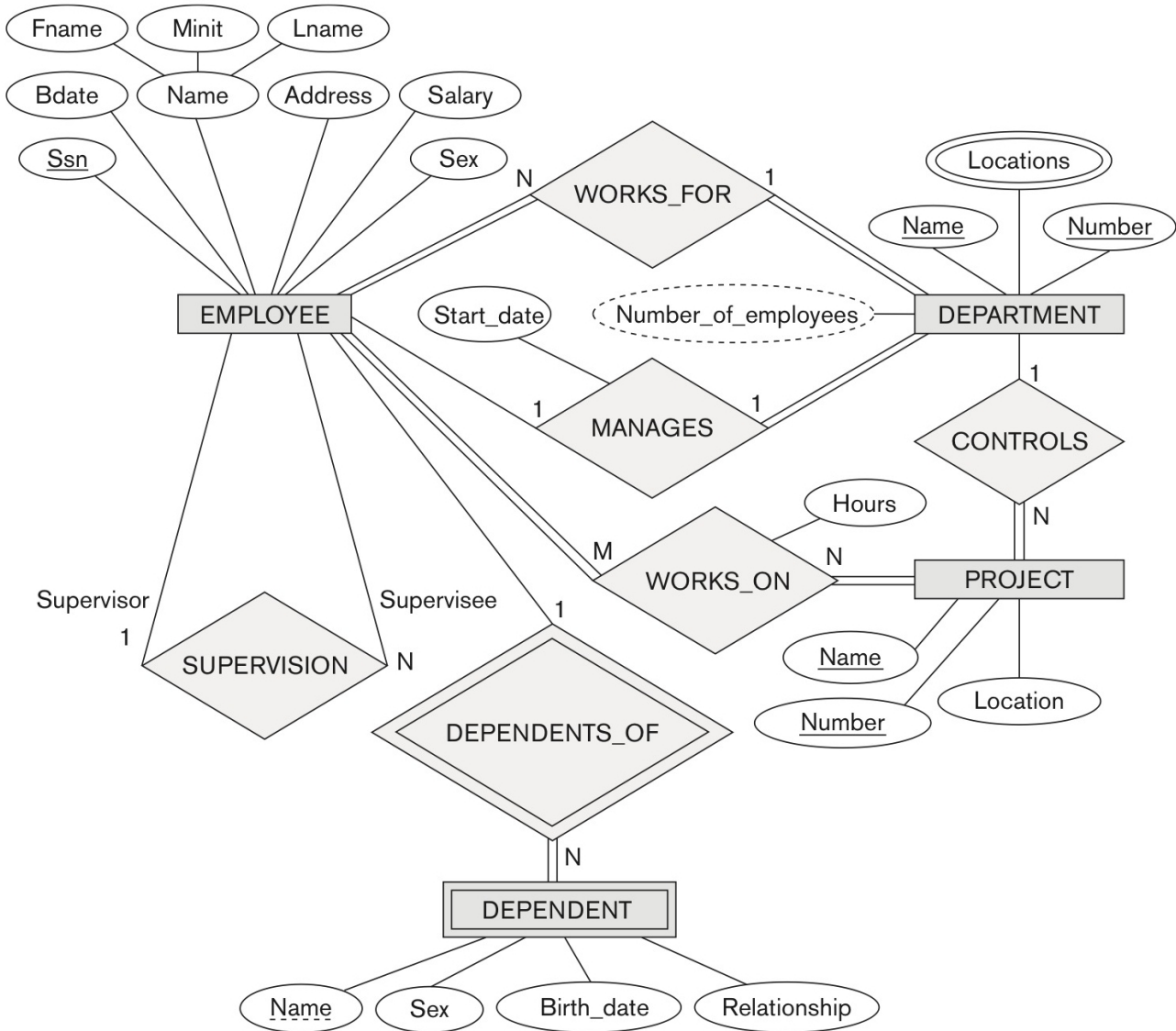


Figure 1: ER diagram for Company Database

Solution:

Follow the steps of the algorithm for ER-to-relational mapping (Chapter 9)

EMPLOYEE

Fname	Minit	Lname	<u>Ssn</u>	Bdate	Address	Sex	Salary	Super_ssn	Dno
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DEPARTMENT

Dname	<u>Dnumber</u>	Mgr_ssn	Mgr_start_date
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DEPT_LOCATIONS

<u>Dnumber</u>	<u>Dlocation</u>
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PROJECT

Pname	<u>Pnumber</u>	<u>Plocation</u>	Dnum
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WORKS_ON

<u>Essn</u>	<u>Pno</u>	Hours
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DEPENDENT

<u>Essn</u>	<u>Dependent_name</u>	Sex	Bdate	Relationship
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Figure 2: Database schema for Company

Problem 2

Consider figure 3. Show scenarios where insertion, deletion, and modification anomalies may be present in the relation.

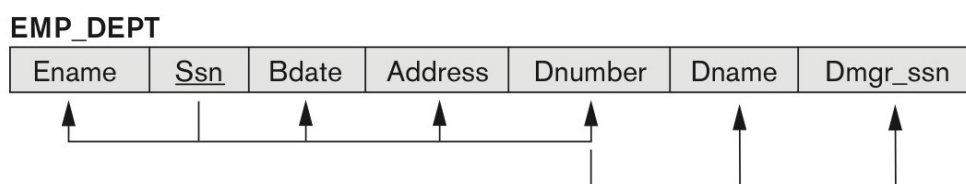


Figure 3: Emp_dept relation

Solution:

- Insertion anomalies

Two scenarios:

- a) We must include correct attribute values for the department for each employee while inserting.
- b) It is difficult to insert a new department that has no employee as yet.

- Deletion anomalies:

If we delete all the employees who were working for a particular department, the information concerning the department is lost.

- Modification anomalies:

If we update one of the attributes of a particular department, say Dname for a particular employee without doing so for all the employees who work in the same department, the database will be inconsistent.

Note: Read section 14.1.2 for further details.

Problem 3

Prove Armstrong's axioms (reflexive rule, augmentation rule, and transitive rule).

Solution:

Please refer Section 15.1.1 of the textbook (page 507)

Problem 4

Consider a schema with attributes $X=A,B,C,D,E,F,G,H$. Determine $\{A, B, F\}^+$, the closure of $\{A, B, F\}$. The following FDs are provided:

$$\begin{aligned}A, C &\rightarrow D \\D, H, G &\rightarrow E \\A, B &\rightarrow G \\F, B, G &\rightarrow C\end{aligned}$$

Solution:

$\{A,B,C,D,F,G\}$