

BUDT 703 Fall 2021 Homework #2 – Relational Model

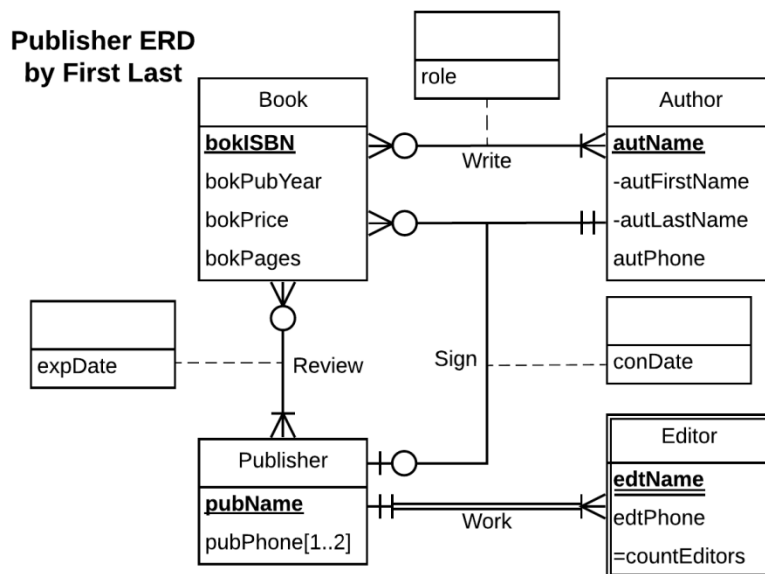
Due by 11:59pm, Wednesday, September 29th, 2021

Note: The file name must be renamed to **HW2_YourLastName_YourFirstName.docx**.

Repeat steps below for the **Terps Enterprise, Inc.** entity-relationship diagram (ERD) on the last page of this document (not what you submitted for Homework #1).

1. Convert ERD into relations (as relational schema):
 - i. Map strong entities to relations.
 - ii. Map multivalued attributes. If any
 - iii. Map weak entities if any.
 - iv. Map binary relationships.
 - v. Map associative entities if any.
 - vi. Map unary relationships if any.
 - vii. Map ternary and n-ary relationships if any.
2. Identify functional dependencies.
3. Propose a set of meaningful business rules on all referential integrities.
4. For each foreign key in each relation:
 - i. Identify the primary key and base relation that is being referenced.
 - ii. Identify the referential integrity for ON DELETE and the associated business rule.
 - iii. Identify the referential integrity for ON UPDATE and the associated business rule.

Example: Publisher, Inc. ERD:



Example Answers:

Relations:

Book (**bokISBN**, bokPubYear, bokPrice, bokPages)
Author (**autFirstName**, **autLastName**, autPhone)
Publisher (**pubName**)
PublisherPhone (*pubName*, **pubPhone**)
Editor (**pubName**, **edtName**, edtPhone)
Write (**bokISBN**, **autFirstName**, **autLastName**, role)
Review (**bokISBN**, **pubName**, expDate)
Sign (**bokISBN**, **autFirstName**, **autLastName**, **pubName**, conDate)

Functional dependency:

bokISBN \rightarrow bokPubYear, bokPrice, bokPages
autLastName, autFirstName \rightarrow autPhone
pubName \rightarrow
pubPhone \rightarrow pubName
pubName, edtName \rightarrow edtPhone
bokISBN, autFirstName, autLastName \rightarrow role
bokISBN, pubName \rightarrow expDate
bokISBN \rightarrow autFirstName, autLastName, pubName, conDate

Business rules:

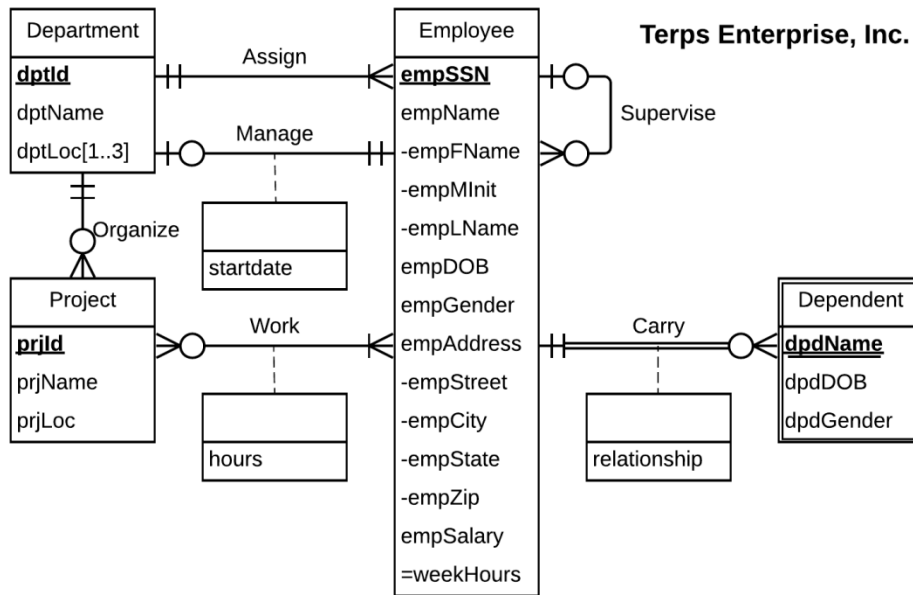
- [R1] When a book is deleted from the database, the authorship information should be deleted from the database.
- [R2] When the information on a book is changed in the database, the corresponding authorship information should be changed accordingly.
- [R3] When an author is no longer in the database, the authorship information should be deleted from the database.
- [R4] When an author changes information in the database, the corresponding authorship information should be changed accordingly.
- [R5] When a publisher is reviewing a book, the book and the publisher cannot be deleted or changed in the database.
- [R6] When a publisher is out of business and deleted from the database, all editors for the publisher should be deleted from the database as well.
- [R7] When publisher information is changed in the database, all editors for the publisher should be changed accordingly.
- [R8] When publisher information is deleted from or changed in the database, all phone numbers of the publisher should be deleted or changed accordingly.
- [R9] When there is a contract on a book signed by one author and the publisher, the book, the author and the publisher cannot be deleted or changed in the database.

Referential integrity:

Relation	Foreign Key	Base Relation	Primary Key	Business Rule	Constraint: ON DELETE	Business Rule	Constraint: ON UPDATE
Publisher Phone	pubName	Publisher	pubName	R8	CASCADE	R8	CASCADE

Editor	pubName	Publisher	pubName	R6	CASCADE	R7	CASCADE
Write	bokISBN	Book	bokISBN	R1	CASCADE	R2	CASCADE
Write	(autFirstName, autLastName)	Author	(autFirstName, autLastName)	R3	CASCADE	R4	CASCADE
Review	bokISBN	Book	bokISBN	R5	NO ACTION	R5	NO ACTION
Review	pubName	Publisher	pubName	R5	NO ACTION	R5	NO ACTION
Sign	bokISBN	Book	bokISBN	R9	NO ACTION	R9	NO ACTION
Sign	(autFirstName, autLastName)	Author	(autFirstName, autLastName)	R9	NO ACTION	R9	NO ACTION
Sign	pubName	Publisher	pubName	R9	NO ACTION	R9	NO ACTION

Terps Enterprise, Inc. ERD:



Relations:

Employee (empSSN, empFName, empMInit, empLName, empDOB, empGender, empStreet, empCity, empState, empZip, empSalary, dptId, supervisorSSN)

Department (dptId, dptName, managerSSN, startdate)

DepartmentLocation (dptId, dptLocName)

Project (prjId, prjName, prjLoc, dptId)

Dependent (dpdName, empSSN, dpdDOB, dpdGender, relationship)

Work (prjId, empSSN, hours)

Functional dependencies:

empSSN → empFName, empMInit, empLName, empDOB, empGender, empStreet, empCity, empState, empZip, empSalary, dptId, supervisorSSN

dptId → dptName, managerSSN, startdate

dptId, dptLocName →

prjId → prjName, prjLoc, dptId

dpdName, empSSN → dpdDOB, dpdGender, relationship

prjId, empSSN → hours

Business rules:

[R1] When the information on a department is changed in the database, all employees assigned to this department should change their information accordingly.

[R2] When a department is assigned by employee(s), the department cannot be deleted from the database.

- [R3] When the information on a supervisor is changed in the database, all employees supervised by him or her should change their information accordingly.
- [R4] When an employee is a supervisor and is deleted from the database, all employees supervised by him or her should set their supervisor Information to NULL.
- [R5] When the information on a manager is changed in the database, the department managed by him or her should change its information accordingly.
- [R6] When an employee is a manager and is managing one department, the employee(manager) cannot be deleted from the database.
- [R7] When department information is deleted from or changed in the database, all department locations information of the department should be deleted or changed accordingly.
- [R8] When there is a project organized by one department, the department cannot be deleted or changed in the database.
- [R9] When the information on an employee is deleted from or changed in the database, all dependents carried by him or her should delete or change their information accordingly.
- [R10] When employee or project information is deleted from or changed in the database, the work by the employee with the project should delete or change its information accordingly.

Referential integrities:

Relation	Foreign Key	Base Relation	Primary Key	Business Rule	Constraint: ON DELETE	Business Rule	Constraint: ON UPDATE
Employee	DptId	Department	DptId	R2	NO ACTION	R1	CASCADE
Employee	supervisorSSN	Employee	empSSN	R4	SET NULL	R3	CASCADE
Department	managerSSN	Employee	empSSN	R6	NO ACTION	R5	CASCADE
Department Location	DptId	Department	DptId	R7	CASCADE	R7	CASCADE
Project	DptId	Department	DptId	R8	NO ACTION	R8	NO ACTION
Dependent	empSSN	Employee	empSSN	R9	CASCADE	R9	CASCADE
Work	PrjId	Project	PrjId	R10	CASCADE	R10	CASCADE
Work	empSSN	Employee	empSSN	R10	CASCADE	R10	CASCADE