

BUDT 703 Fall 2021 Homework #2 – Relational Model

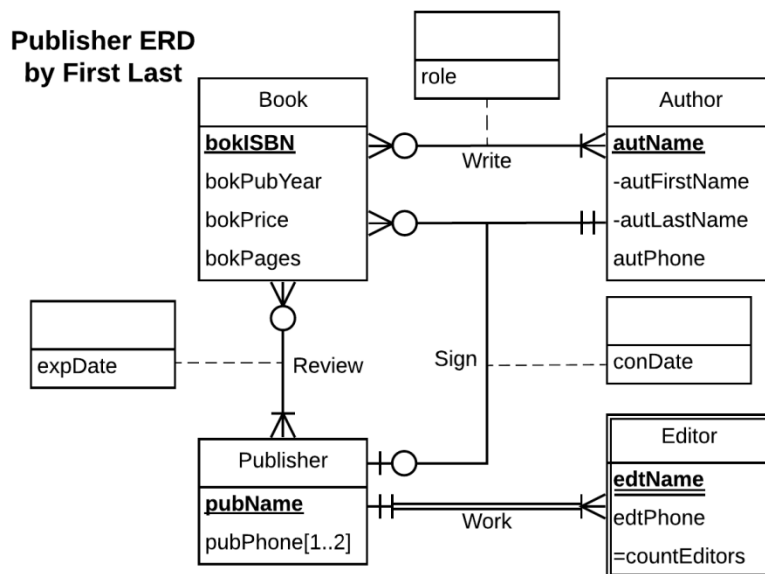
Due by 11:59pm, Wednesday, September 29th, 2021

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:

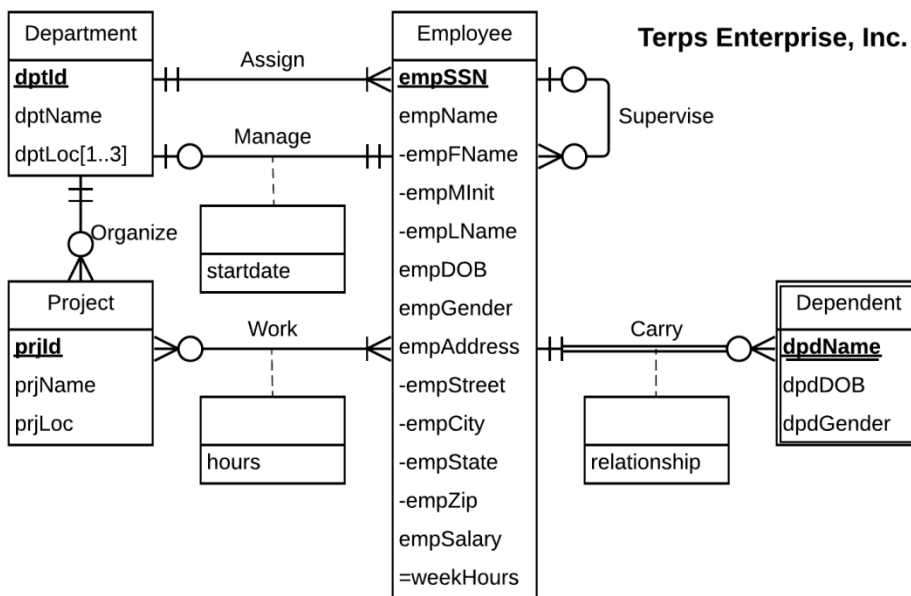
- [R1] When a **book** is **deleted** from the database, the **authorship** information should be deleted from the database.
- [R2] When the information on a **book** is **changed** in the database, the corresponding **authorship** information should be changed accordingly.
- [R3] When an **author** 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, *mgrSSN*, startDate)

Department_Loc(**dptId**, **dptLoc**)

Project(**prjId**, prjName, prjLoc, *dptId*)

Dependent(**empSSN**, **dptName**, dpdDOB, dpdGender, relationship)

Work(**prjId**, **empSSN**, hours)

Functional dependencies:

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

dptId → dptName, mgrSSN, startDate

dptLoc, dptId →

prjId → prjName, prjLoc, dptId

empSSN, dptName → dpdDOB, dpdGender, relationship

prjId, empSSN → hours

Business rules:

[R1] When **Department** information is **deleted** from or **changed** in the database, department locations should be **deleted** or **changed** accordingly.

[R2] When a **Employee** is out of the company and **deleted** from the database, all **Dependents** for the employee should be **deleted** from the database as well.

[R3] When **Employee** information is **changed** in the database, all **Dependents** for the employee should be changed accordingly.

[R4] When an Employee is **deleted** from the database, the **Work related** information should be deleted from the database.

[R5] When the information on a **Employee** is **changed** in the database, the corresponding **Work** information should be changed accordingly.

[R6] When an **Project** is **no longer in** the database, all the **Work** information for the project should be deleted from the database.

[R7] When a **Project** information in the database changes, the corresponding **work** information should be changed accordingly.

[R8] When an Employee is deleted, the corresponding supervisor information on the same table should be set to NULL, for the employees who he was supervisor for.

[R9] When a Employee record is changed, supervisor information corresponding should not change.

[R10] When a Department record is changed the corresponding employee record shouldn't be changed

[R11] When an employee is Changed, the corresponding information on the department table shouldn't change

- [R12] When an employee is deleted, the corresponding information on the department table shouldn't be deleted
- [R13] When a department is deleted the corresponding project information should also be deleted.
- [R14] When department information is changed, the corresponding information on project should not be changed
- [R15] When department is deleted the corresponding information on employee should be set to NULL

Referential integrities:

Relation	Foreign Key	Base Relation	Primary Key	Business Rule	Constraint: ON DELETE	Business Rule	Constraint: ON UPDATE
Department_Loc	dptId	Department	dptId	R1	CASCADE	R1	CASCADE
Dependent	empSSN	Employee	empSSN	R2	CASCADE	R3	CASCADE
Work	prjId	Project	prjId	R6	CASCADE	R7	CASCADE
Work	empSSN	Employee	empSSN	R4	CASCADE	R5	CASCADE
Project	dptId	Department	dptId	R13	CASCADE	R14	NO ACTION
Department	mgrSSN	Employee	empSSN	R12	NO ACTION	R11	NO ACTION
Employee	dptId	Department	dptId	R15	SET NULL	R10	NO ACTION
Employee	supervisorSSN	Employee	empSSN	R8	SET NULL	R9	NO ACTION