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Objective: Now that you have a conceptual model (ER diagram), map it into a robust logical relational schema using the algorithms described in the classroom. This schema will define the structure of your database tables, including attributes, data types, primary keys, and foreign keys, functional dependencies, ensuring data integrity and efficiency.

Introduction [5 points].

Project Overview: The purpose of our database is to give both library administrators and users accurate information as to what the library currently has to offer. For the end users, they want to be able to search for products such as books, magazines, and digital media. The library staff may also want to search for this media to check what they have in stock, however they additionally will get feedback based on who has checked what out in order to properly take stock of what the library should be expecting from people.

Scope: The library database will manage and track the collection of physical and digital media (Books, Magazines, DVDs, CDs, and Video Games) alongside the interactions between users and staff. End users (Library Users) will be able to search for available items to check out, while staff members (Library Staff) will have access to administrative functions such as restocking, reshelving, and tracking checkouts and returns.

The system ensures:

- Accurate cataloging of all library items with detailed metadata.
- Tracking of user borrowing history.
- Staff oversight of checkouts, returns, and restocking processes.
- Availability of search functions for both users and staff.
- Maintenance of accurate stock levels.

Glossary:

Book – A physical printed work with attributes including ISBN, Title, multiple Authors, Page Count, Genre, Edition, and Quantity in stock.

Magazine: A periodical publication identified by ISBN, Title, Issue number, Publisher, and Page Count.

DVD: A digital video disc item with attributes such as Title, unique DVD_ID, Genre, Length, Actor(s), and Director.

CD: A compact disc with attributes including Title, Track listing, CD_ID, and Author.

Video Game: A digital or physical game with Name, Genre, Rating, and Release Date.

Library User: A person registered to borrow items from the library. Attributes: First Name, Last Name, Start Date, End Date, and User ID.

Library Staff: A staff member responsible for managing library resources. Attributes: First Name, Last Name, Start Date, End Date, ID, and Position.

Check Out: The process of a Library User borrowing an item (Book, DVD, CD, Magazine or Video Game).

Reshelving: The act of a Library Staff member returning an item to stock after a user has checked it out.

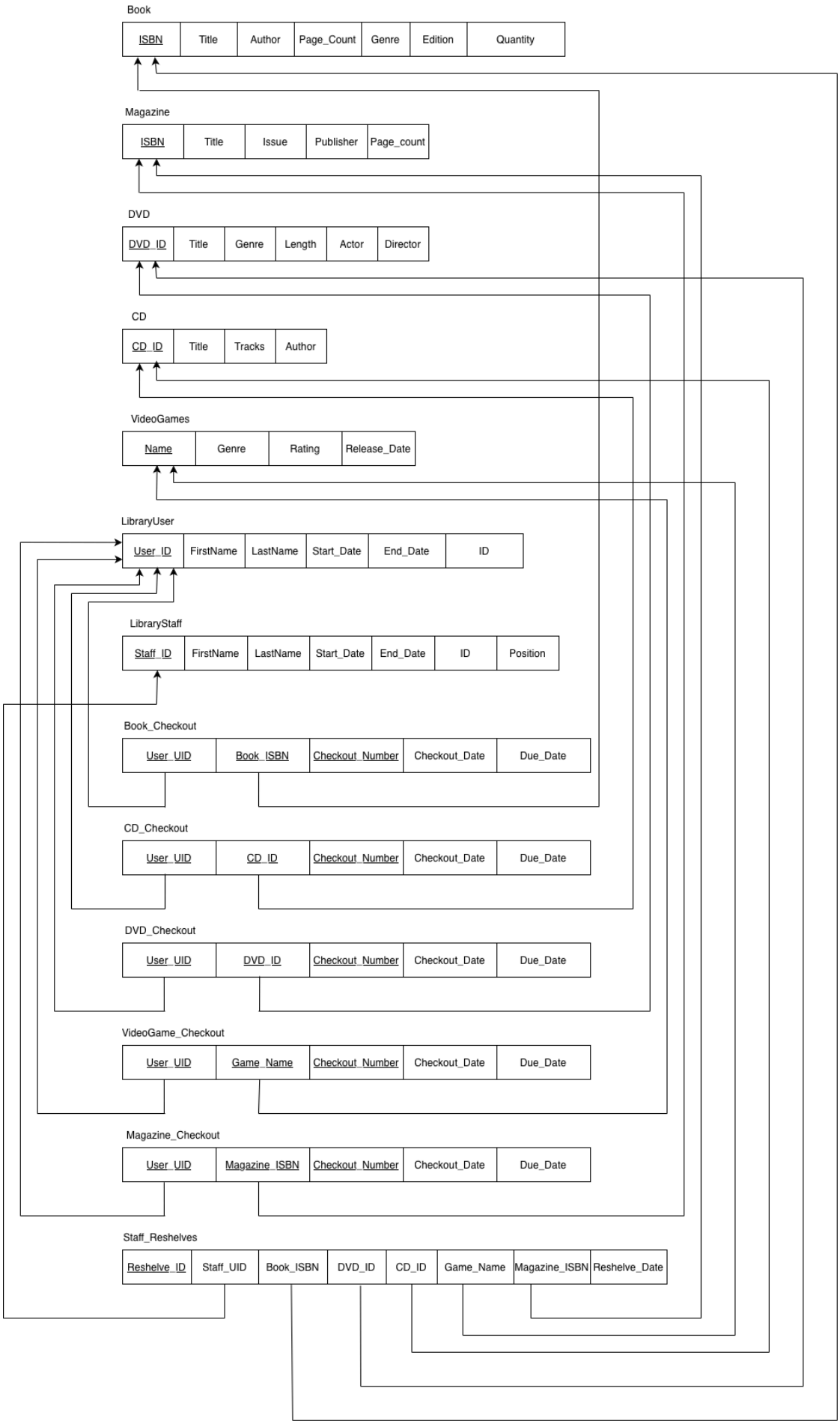
Restocked Date: The date when an item is returned and made available again.

Search: A function available to both Users and Staff for finding items in the library's collection.

Relational Schema Mapping [30]

- **Identify relations:** For each entity and relationship sets in your ER diagram, create a corresponding relation (table).
- **Define attributes and domains:** For each attribute in your entity and relationship sets, define the corresponding attribute in the appropriate relation. Clearly document the domain of each attribute (i.e., the valid range of values). This can be done as a separate within a data dictionary (see below).
- **Determine primary keys:** Identify the primary key for each relation. This key will uniquely identify each tuple (row) in the relation.
- **Establish foreign keys:** For each relationship in your ER diagram, implement foreign key constraints in the corresponding relations to maintain referential integrity. Ensure that foreign keys reference the primary key of the related relation.
- **Establish the functional dependencies (FDs):** The FDs represent the constraints from the real world and are useful for maintaining the integrity of the database.

Create a relational schema diagram [10 points]. This diagram should clearly show all relations, attributes, primary keys, and foreign keys. Draw a line from a foreign key to its corresponding primary key. See the Company and University sample diagrams below (one from each of the recommended textbooks).


Book
ISBN
Title
Author
Page_Count
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ISBN
Title
Issue
Publisher
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DVD_ID
Title
Genre
Length
Actor
Director
CD
CD_ID
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Author
VideoGames
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VideoGame_Checkout
User_UID
Game_Name
Checkout_Number
Checkout_Date
Due_Date
Magazine_Checkout
User_UID
Magazine_ISBN
Checkout_Number
Checkout_Date
Due_Date
Staff_Reshelves
Reshelve_ID
Staff_UID
Book_ISBN
DVD_ID
CD_ID
Game_Name
Magazine_ISBN
Reshelve_Date

Schema Documentation with a Data Dictionary [10 points]: Develop a data dictionary that documents each relation, its attributes, data types, domains, and any constraints. This dictionary serves as a central repository of information about your database schema. While data dictionaries can be very complex, a simple table created using Excel (or Word or your favorite editing tool), like the following contrived sample, will suffice

.Data Ranges

Data Type	Description	Allowed Values
CHAR(n)	**A string of characters of fixed length, where n is the length.**	**Any sequence of ASCII characters of length n.**
TEXT	**A string of characters of arbitrary length.**	**Any sequence of ASCII characters of any length.**
INTEGER	**An integer value, i.e. a number with no fractional part.**	**-2,147,483,648 to 2,147,483,647.**
DATE	**A format which encodes an associated time, day, month, and year in the real world.**	**Any date representable by the format "YYYY-MM-DD HH:MM:SS.SSS". 'Y's encode the year, 'M' encodes the month, 'D' encodes the day, 'H' encodes the hour, 'M' encodes the minute, and 'S' encodes the seconds and any fractional part thereof.**

Data Dictionary

Book Table

Attribute	Data Type	Domain/Description	Constraints
ISBN	**CHAR(13)**	**The International Standard Book Number, a unique identifier for the book.**	**PRIMARY KEY, NOT NULL**
Title	**TEXT**	**The title of the book.**	**NOT NULL**
Author	**TEXT**	**The author(s) of the book.**	
Page_Count	**INTEGER**	**The total number of pages in the book.**	

Genre	**TEXT**	**The genre of the book (e.g., Science Fiction, Fantasy, etc.).**	
Edition	**TEXT**	**The edition of the book.**	
Quantity	**INTEGER**	**The number of copies of the book available in the library.**	**NOT NULL, CHECK (Quantity >= 0)**

Magazine Table

Attribute	Data Type	Domain/Description	Constraints
ISBN	**TEXT**	**The International Standard Book Number, a unique identifier for the magazine.**	**PRIMARY KEY, NOT NULL**
Title	**TEXT**	**The title of the magazine.**	**NOT NULL**
Issue	**INTEGER**	**The issue number of the magazine.**	
Publisher	**TEXT**	**The publisher of the magazine.**	
Page_Count	**INTEGER**	**The total number of pages in the magazine.**	

DVD Table

Attribute	Data Type	Domain/Description	Constraints
DVD_ID	**INTEGER**	**A unique identifier for the DVD.**	**PRIMARY KEY, AUTOINCREMENT**
Title	**TEXT**	**The title of the DVD.**	**NOT NULL**
Genre	**TEXT**	**The genre of the DVD (e.g., Action, Comedy, etc.).**	
Length	**INTEGER**	**The length of the DVD in minutes.**	

Actor	**TEXT**	**The main actor(s) in the DVD.**	
Director	**TEXT**	**The director of the DVD.**	

CD Table

Attribute	Data Type	Domain/Description	Constraints
CD_ID	**INTEGER**	**A unique identifier for the CD.**	**PRIMARY KEY, AUTOINCREMENT**
Title	**TEXT**	**The title of the CD.**	**NOT NULL**
Tracks	**INTEGER**	**The number of tracks on the CD.**	
Author	**TEXT**	**The artist or author of the CD.**	

VideoGames Table

Attribute	Data Type	Domain/Description	Constraints
Name	**TEXT**	**The name of the video game.**	**PRIMARY KEY, NOT NULL**
Genre	**TEXT**	**The genre of the video game (e.g., RPG, Action, etc.).**	
Rating	**TEXT**	**The age rating of the video game (e.g., E for Everyone, M for Mature, etc.).**	
Release_Date	**DATE**	**The release date of the video game.**	

LibraryUser Table

Attribute	Data Type	Domain/Description	Constraints

User_ID	**INTEGER**	**A unique identifier for the library user.**	**PRIMARY KEY, AUTOINCREMENT**
FirstName	**TEXT**	**The first name of the library user.**	**NOT NULL**
LastName	**TEXT**	**The last name of the library user.**	**NOT NULL**
Start_date	**DATE**	**The date the user's library membership starts.**	
End_date	**DATE**	**The date the user's library membership ends.**	
ID	**TEXT**	**A unique identification string for the user.**	**UNIQUE**

LibraryStaff Table

Attribute	Data Type	Domain/Description	Constraints
Staff_ID	**INTEGER**	**A unique identifier for the library staff member.**	**PRIMARY KEY, AUTOINCREMENT**
FirstName	**TEXT**	**The first name of the staff member.**	**NOT NULL**
LastName	**TEXT**	**The last name of the staff member.**	**NOT NULL**
Start_date	**DATE**	**The employment start date of the staff member.**	
End_Date	**DATE**	**The employment end date of the staff member.**	
ID	**TEXT**	**A unique identification string for the staff member.**	**UNIQUE**

Position	**TEXT**	**The job position of the staff member (e.g., Librarian, Assistant, etc.).**	

Book_Checkout Table

Attribute	Data Type	Domain/Description	Constraints
User_UID	**INTEGER**	**The unique ID of the user checking out the book.**	**PRIMARY KEY, FOREIGN KEY (User_UID) REFERENCES LibraryUser(ID)**
Book_ISBN	**TEXT**	**The ISBN of the book being checked out.**	**PRIMARY KEY, FOREIGN KEY (Book_ISBN) REFERENCES Book(ISBN)**
Checkout_Number	**INTEGER**	**A number representing the checkout instance for a user and a specific book.**	**PRIMARY KEY, CHECK (Checkout_Number > 0 AND Checkout_Number <= 5)**
Checkout_Date	**DATE**	**The date the book was checked out.**	
Due_Date	**DATE**	**The date the book is due to be returned.**	

CD_Checkout Table

Attribute	Data Type	Domain/Description	Constraints

User_UID	**INTEGER**	**The unique ID of the user checking out the CD.**	**PRIMARY KEY, FOREIGN KEY (User_UID) REFERENCES LibraryUser(ID)**
CD_ID	**INTEGER**	**The ID of the CD being checked out.**	**PRIMARY KEY, FOREIGN KEY (CD_ID) REFERENCES CD(CD_ID)**
Checkout_Number	**INTEGER**	**A number representing the checkout instance for a user and a specific CD.**	**PRIMARY KEY, CHECK (Checkout_Number > 0 AND Checkout_Number <= 5)**
Checkout_Date	**DATE**	**The date the CD was checked out.**	
Due_Date	**DATE**	**The date the CD is due to be returned.**	

DVD_Checkout Table

Attribute	Data Type	Domain/Description	Constraints
User_UID	**INTEGER**	**The unique ID of the user checking out the DVD.**	**PRIMARY KEY, FOREIGN KEY (User_UID) REFERENCES LibraryUser(ID)**
DVD_ID	**INTEGER**	**The ID of the DVD being checked out.**	**PRIMARY KEY, FOREIGN KEY (DVD_ID) REFERENCES DVD(DVD_ID)**

Checkout_Number	**INTEGER**	**A number representing the checkout instance for a user and a specific DVD.**	**PRIMARY KEY, CHECK (Checkout_Number > 0 AND Checkout_Number <= 5)**
Checkout_Date	**DATE**	**The date the DVD was checked out.**	
Due_Date	**DATE**	**The date the DVD is due to be returned.**	

Magazine_Checkout Table

Attribute	Data Type	Domain/Description	Constraints
User_UID	**INTEGER**	**The unique ID of the user checking out the Magazine.**	**PRIMARY KEY, FOREIGN KEY (User_UID) REFERENCES LibraryUser(ID)**
Magazine_ISBN	**INTEGER**	**The ISBN of the Magazine being checked out.**	**PRIMARY KEY, FOREIGN KEY (Magazine_ISBN) REFERENCES DVD(ISBN)**
Checkout_Number	**INTEGER**	**A number representing the checkout instance for a user and a specific Magazine.**	**PRIMARY KEY, CHECK (Checkout_Number > 0 AND Checkout_Number <= 5)**
Checkout_Date	**DATE**	**The date the Magazine was checked out.**	
Due_Date	**DATE**	**The date the Magazine is due to be returned.**	

VideoGame_Checkout Table

Attribute	Data Type	Domain/Description	Constraints
User_UID	INTEGER	The unique ID of the user checking out the video game.	PRIMARY KEY, FOREIGN KEY (User_UID) REFERENCES LibraryUser(ID)
Game_Name	TEXT	The name of the video game being checked out.	PRIMARY KEY, FOREIGN KEY (Game_Name) REFERENCES VideoGames(Name)
Checkout_Number	INTEGER	A number representing the checkout instance for a user and a specific video game.	PRIMARY KEY, CHECK (Checkout_Number > 0 AND Checkout_Number <= 5)
Checkout_Date	DATE	The date the video game was checked out.	
Due_Date	DATE	The date the video game is due to be returned.	

Staff_Reshelves Table

Attribute	Data Type	Domain/Description	Constraints
Reshelve_ID	INTEGER	A unique identifier for the reshelving event.	PRIMARY KEY, AUTOINCREMENT
Staff_UID	INTEGER	The unique ID of the staff member reshelving the item.	FOREIGN KEY (Staff_UID) REFERENCES LibraryStaff(ID)

Book_ISBN	**TEXT**	**The ISBN of the book being reshelved.**	**FOREIGN KEY (Book_ISBN) REFERENCES Book(ISBN)**
DVD_ID	**INTEGER**	**The ID of the DVD being reshelved.**	**FOREIGN KEY (DVD_ID) REFERENCES DVD(DVD_ID)**
CD_ID	**INTEGER**	**The ID of the CD being reshelved.**	**FOREIGN KEY (CD_ID) REFERENCES CD(CD_ID)**
Game_Name	**TEXT**	**The name of the video game being reshelved.**	**FOREIGN KEY (Game_Name) REFERENCES VideoGames(Name)**
Magazine_ISBN	**TEXT**	**The ISBN of the magazine being reshelved.**	**FOREIGN KEY (Magazine_ISBN) REFERENCES Magazine(ISBN)**
Reshelve_Date	**DATE**	**The date the item was reshelved.**	

Meeting Date: Wednesday, October 15th

Meeting Time: 4:00 PM to 4:30 PM

Meeting Location: Table in Front of 2300 in LEAP2

Objectives:

- **Finished Project Artifact 4**
- **Continue working on Artifact 5**

Team Members:

Daniel Neugent – Present

- **Tasks/Roles Assigned: Project Manager/Lead & Backend**

Tanner Gurley – Present

- **Tasks/Roles Assigned: Team Meeting Logs & Integration**

Mariam Oraby – Present

- **Tasks/Roles Assigned: Quality Assurance & Testing**

Jake Bernard – Present

- **Tasks/Roles Assigned: Front End**

Jacob Fonyi – Present

- **Tasks/Roles Assigned: Backend**

Github Link: https://github.com/l33tdaniel/databases-447-queryreaders

Meeting Notes:

- **Went over and finished Artifact 4**
- **Started finishing Artifact 5**
- **Starting talking more in-depth about constraints and the data-dictionary for Artifact 4**
- **Finished data-dictionary**
- **Talked about who would pick up what tasks for the rest of the project**