Introduction [5 points].

Project Overview: This database is intended to maintain records of inventory and services for a small town's library. This includes all typical operations expected of a small town's library. The system will cover a variety of library operations such as renting different kinds of literature, managing memberships, handling transactions, and other various actions users and employees take. The project will include designing an Entity Relationship diagram, then mapping it to a real schema and implementation using MariaDB. Then creating a simple user interface that can handle the various queries needed for customers and employees of the library. Finally, wrapping up with some form of testing, possibly unit and integration tests, and documentation/instructions.

*Scope***:** Items included in the scope: loanable items (Books, DVDs, CDs, Magazines), in library services (computer access, newspaper, microfiche), customers, and librarians. It will include a borrowing/returning system with limits, fees, and reservations. Different user interfaces will be created for staff and clients, allowing book checkouts, catalog searches, and overdue fee tracking. The database will be implemented in MariaDB and will include queries for generating various reports. The system will not include a fully developed UI, AI-based recommendations, external payment integration, or multi-library support.

*Glossary***:** Update your glossary with any new terms or concepts relevant to relational database design. The introduction section is for continuity; the *italic* parts are subsections.

- **ISBN** – International Standard Book Number, a unique identifier for books.
- **Loanable Items** – Books, DVDs, CDs, and magazines that members can borrow.
- **Reservation** – The process of placing a hold on a currently checked-out item.
- **Overdue Fee** – A fine charged to a member for returning an item late.
- **MariaDB** – The relational database management system used for implementation.
- **ISSN** – International Standard Serial Number, a unique code used to identify journals, magazines, and newspapers
- **DDC** – the Dewey Decimal System, a library classification system that organizes books by subject

Relational Schema Mapping [30]

Borrows

Key	Attribute	Domain
Primary Key	Loan_id	INT NOTNULL
Foreign Key	ItemID	INT NOTNULL
Foreign Key	UserID	INT NOTNULL
	Loan_date	DATETIME NOTNULL
	Due_date	DATETIME NOTNULL
	return_date	DATETIME

Uses

Key	Attribute	Domain
PK/FK	UserID	INT NOTNULL
Foreign Key	ID	INT NOTNULL

Contains

Key	Attribute	Domain
PK/FK	ID	INT NOTNULL
PK/FK	ISSN	INT NOTNULL

Rentable Item

Key	Attribute	Domain
PK/FK	Item_ID	INT NOTNULL
	Loanable	BOOL
	Age_rating	INT

Books

Key	Attribute	Domain
Primary Key/Foreign Key	ItemID	INT NOTNULL
	ISBN	INT NOTNULL
	Dewey_Decimal	VARCHAR
	Title	VARCHAR
	Author	VARCHAR
	Genre	VARCHAR
	Year	YEAR
	Publisher	VARCHAR
	Stock	INT NOTNULL
	Shelved	BOOL NOTNULL

DVDs

Key	Attribute	Domain
Primary Key/Foreign Key	ItemID	INT NOTNULL
	Title	VARCHAR
	Directors	VARCHAR
	Publisher	VARCHAR
	Year	YEAR
	Stock	INT NOTNULL
	Shelved	BOOL NOTNULL

CDs

Key	Attribute	Domain
Primary Key/Foreign Key	ItemID	INT NOTNULL
	Title	VARCHAR
	Performing Artists	VARCHAR
	Distributor	VARCHAR
	Year	YEAR
	Stock	INT NOTNULL
	Shelved	BOOL NOTNULL

Magazines

Key	Attribute	Domain
Primary Key/Foreign Key	ItemID	INT NOTNULL
	Title	VARCHAR
	Issue number	INT
	Publication date	DATE
	Stock	INT NOTNULL
	Shelved	BOOL NOTNULL

Member

Key	Attribute	Domain
Primary Key	User_ID	INT NOTNULL
	Name	VARCHAR NOTNULL
	Contact_Info	VARCHAR
	Age	INT

Customer

Key	Attribute	Domain
Primary Key/Foreign Key	User_ID	INT NOTNULL
	Fees	FLOAT
	Status	VARCHAR
	Membership_type	VARCHAR
	library_card_number	INT NOTNULL

Staff_member

Key	Attribute	Domain
Primary Key/Foreign Key	User_ID	INT NOTNULL
	Position	VARCHAR NOTNULL
	Staff_ID	INT

Computer

Key	Attribute	Domain
Primary Key	ID	INT NOTNULL
	Availability	BOOL

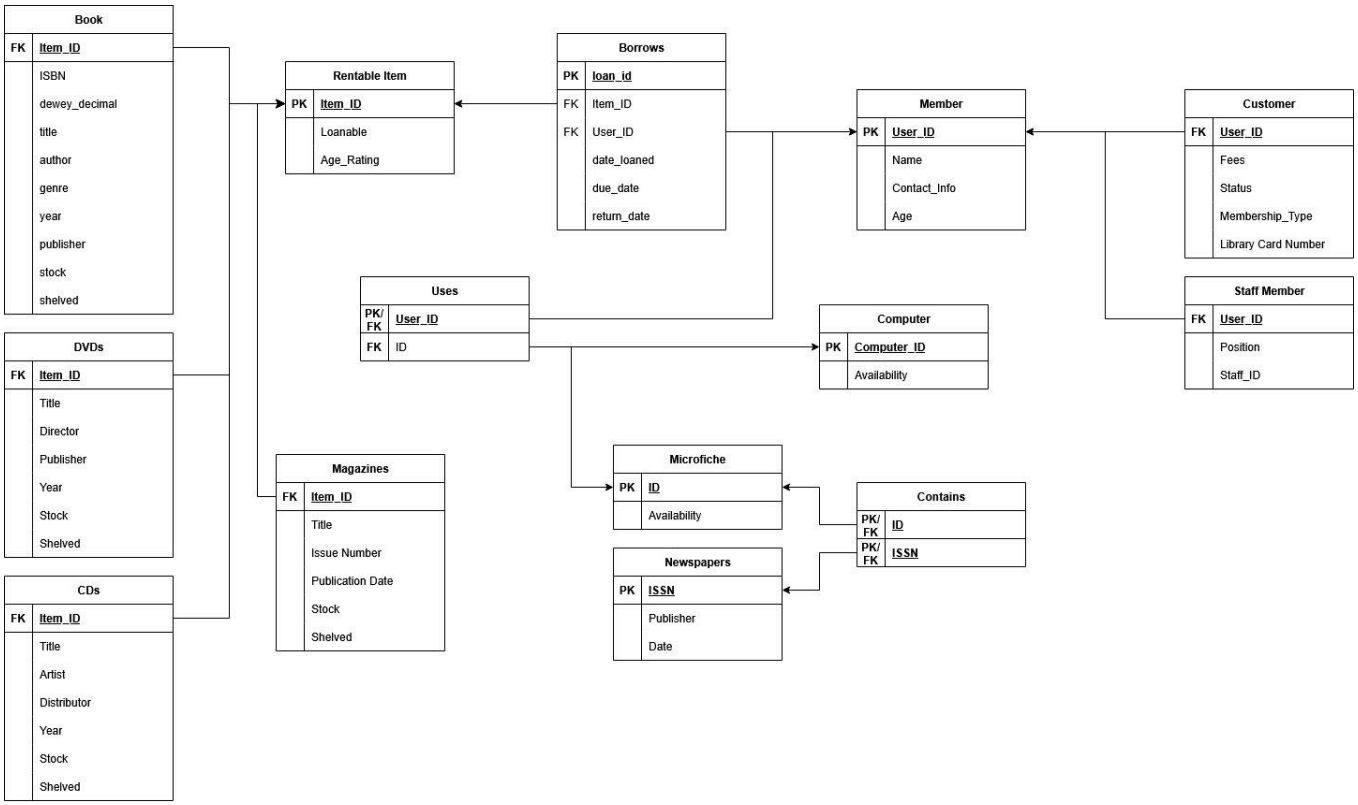
Microfiche

Key	Attribute	Domain
Primary Key	ID	INT NOTNULL
	Availability	BOOL

Newspaper

Key	Attribute	Domain
Primary Key	Publisher/Name	VARCHAR NOTNULL
Primary Key	Publishing date	DATE NOTNULL

Create a relational schema diagram [10 points].



Schema Documentation with a Data Dictionary [10 points]:

Relation	Attribute Name	Data Type	Description
Borrows	Loan_id	INT NOTNULL	Primary key to identify loans
Borrows	ItemID	INT NOTNULL	Foreign key identifying item loaned
Borrows	UserID	INT NOTNULL	Foreign key identifying member loaned to
Borrows	Loan_date	DATETIME NOTNULL	Date the loan was taken out
Borrows	Due_date	DATETIME NOTNULL	Date the loaned item should be returned by
Borrows	return_date	DATETIME	Date the loaned item was returned
Uses	UserID	INT NOTNULL	Primary key to identify who is using the device
Uses	ID	INT NOTNULL	Foreign Key of the computer/microfiche being used
Contains	ID	INT NOTNULL	Foreign Key of the microfiche which contains the issue
Contains	ISSN	INT NOTNULL	ISSN of the newspaper contained in the microfiche
Rentable Item	Item_ID	INT NOTNULL	Primary key to identify rentable items
Rentable Item	Loanable	BOOL	Used to determine if an item can be loaned. True if it can be loaned. False if not.
Rentable Item	Age_rating	INT	The age at which a user can check out this item. Typically 0 or 18.
Books	ItemID	INT NOTNULL	Foreign key of rentable item ID used to uniquely identify books
Books	ISBN	INT NOTNULL	ISBN of the book
Books	Dewey_Decimal	VARCHAR	Dewey decimal category of the book.

Books	Title	VARCHAR	Title of the book
Books	Author	VARCHAR	Author of the book
Books	Genre	VARCHAR	Genre of the book
Books	Year	YEAR	Year the book was first published
Books	Publisher	VARCHAR	Publisher of the book
Books	Stock	INT NOTNULL	How many copies of the book are in stock
Books	Shelved	BOOL NOTNULL	Whether or not a copy of the book has been shelved. True if shelved, false if not.
DVDs	ItemID	INT NOTNULL	Foreign key of rentable item ID used to uniquely identify DVDs
DVDs	Title	VARCHAR	Title of the DVD
DVDs	Directors	VARCHAR	Director of the content on the DVD
DVDs	Publisher	VARCHAR	Publisher of the DVD
DVDs	Year	YEAR	Year the DVD was first released
DVDs	Stock	INT NOTNULL	How many copies of the DVD are in stock
DVDs	Shelved	BOOL NOTNULL	Whether or not a copy of the DVD has been shelved. True if shelved, false if not.
CDs	ItemID	INT NOTNULL	Foreign key of rentable item ID used to uniquely identify CDs
CDs	Title	VARCHAR	Title of the CD
CDs	Performing Artists	VARCHAR	Name/s of artist/s who performed on the CD
CDs	Distributor	VARCHAR	Distributor of the CD
CDs	Year	YEAR	Year the CD was first released
CDs	Stock	INT NOTNULL	How many copies of the CD are in stock
CDs	Shelved	BOOL	Whether or not a copy of the CD

		NOTNULL	has been shelved. True if shelved, false if not.
Magazines	ItemID	INT NOTNULL	Foreign key of rentable item ID used to uniquely identify magazines
Magazines	Title	VARCHAR	Title of the magazine
Magazines	Issue number	INT	Issue number of the magazine
Magazines	Publication date	DATE	Date the magazine was published
Magazines	Stock	INT NOTNULL	How many copies of the magazine are in stock
Magazines	Shelved	BOOL NOTNULL	Whether or not a copy of the magazine has been shelved. True if shelved, false if not.
Member	User_ID	INT NOTNULL	Primary key to identify members
Member	Name	VARCHAR NOTNULL	Name of the member
Member	Contact_Info	VARCHAR	Contact info of the member
Member	Age	INT	Age of the member
Customer	User_ID	INT NOTNULL	Foreign key of member.User_ID used to uniquely identify customers
Customer	Fees	FLOAT	The amount of money in fees a user has. If fees are greater than $5, users cannot rent items.
Customer	Status	VARCHAR	The status of a member (banned, good, restricted, etc). If the user's status is banned, they cannot rent items.
Customer	Membership_type	VARCHAR	Used to identify what a member can loan. Typically related to age_rating. Also determines the number of items a member can borrow at one time.
Staff_member	User_ID	INT NOTNULL	Foreign key of member.User_ID used to uniquely identify staff members

Staff_member	Position	VARCHAR NOTNULL	Position that staff member fullfills
Staff_member	Staff_ID	INT	ID of staff member
Computer	ID	INT NOTNULL	Primary key to identify computers
Computer	Availability	BOOL	Bool to determine if computer can be used. True if it can be used, false if not.
Microfiche	ID	INT NOTNULL	Primary key to identify microfiches
Microfiche	Availability	BOOL	Bool to determine if computer can be used. True if it can be used, false if not.
Newspaper	Publisher/Name	VARCHAR NOTNULL	Name of the newspaper
Newspaper	Publishing date	DATE NOTNULL	Publishing date of the newspaper