Phase 2: ERD to SQL Implementation

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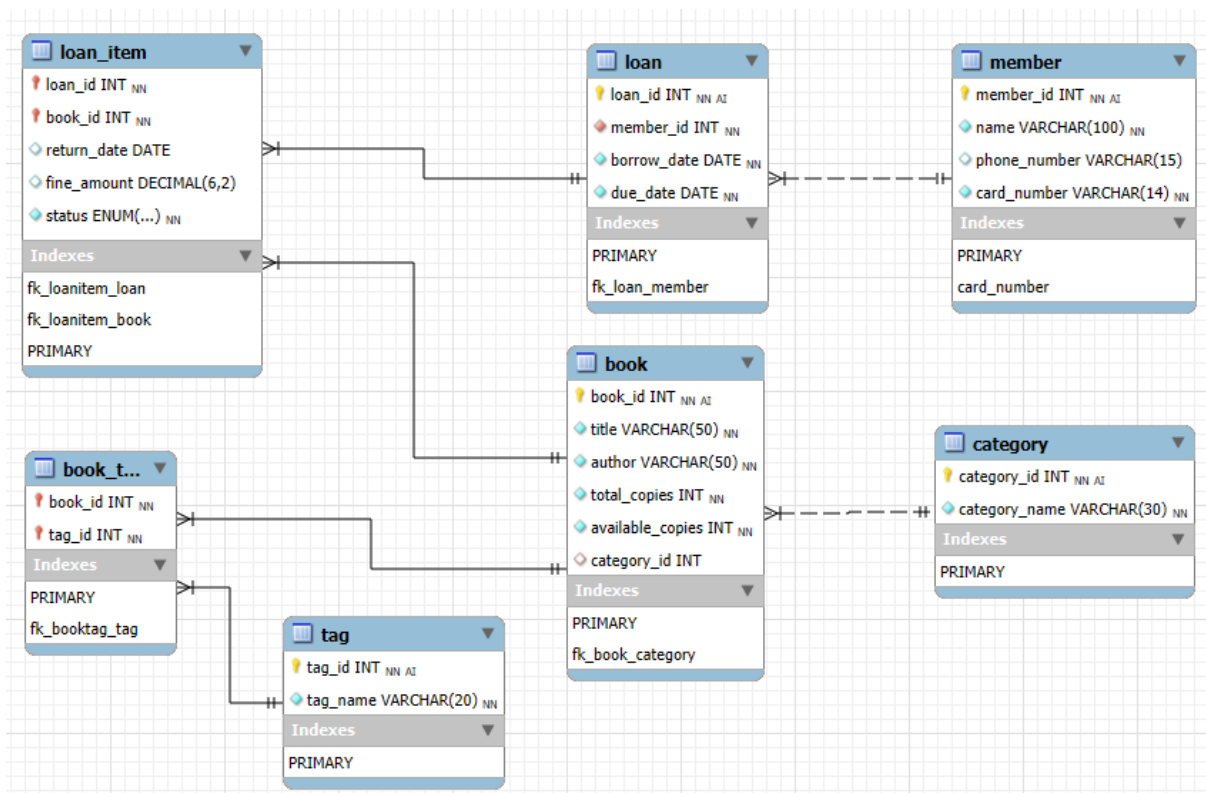**Sur (Family) Name:** Markham
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Section: B/Phase 2

Objective:

Convert the ER diagram (from Phase 1) into a working relational database schema using SQL, and populate the tables with sample data to prepare for backend development in Phase 3.

Tasks:

Tasks	Details
1. SQL Script File – Table Creation	- Convert ER diagram to relational schema
	- Include CREATE TABLE statements
	- Define primary and foreign keys
	- Save as create_tables.sql
2. SQL Script File – Sample Data Insertion	- Provide INSERT INTO statements for each table
	- At least 5–10 sample records per table
	- Save as insert_data.sql
4. Short Report / Documentation	- List of all tables
	- Description of each table and its purpose
	- Brief explanation of test data
5. Screenshots from MySQL Workbench	- Show table structures (DESC table_name)
	- Show sample data (SELECT * FROM table_name)
6. MySQL Workbench Model File	- Submit the .mwb file created with MySQL Workbench
	- The file should include all table definitions and relationships
	- This will allow the database schema to be easily loaded and reviewed in MySQL Workbench

Task 3: Short Report / Documentation

Table Descriptions

1. category

- **Purpose:**
  Stores all book categories (e.g., Science Fiction, History, Literature) to classify books.
- **Key Fields:**
  - category_id: Unique ID for each category (Primary Key).
  - category_name: The name of the category (e.g., "Biography").

2. tag

- **Purpose:**
  Stores descriptive keywords or attributes that can be assigned to books. Tags enable thematic search and filtering (e.g., "Adventure," "Time Travel," "Art").
- **Key Fields:**
  - tag_id: Unique identifier for each tag (Primary Key).
  - tag_name: Tag description.

3. book

- **Purpose:**
  Contains detailed information about each book, including title, author, and availability. Each book is linked to a category and may be associated with multiple tags.
- **Key Fields:**
  - book_id: Unique identifier (Primary Key).
  - title: Name of the book.
  - author: Author of the book.
  - total_copies: Total number of copies owned.
  - available_copies: Copies currently available for borrowing.
  - category_id: Foreign Key referencing category(category_id).

4. member

- **Purpose:**
  Stores registered library members' information. Each member can borrow books and is identified by a unique card number.
- **Key Fields:**
  - member_id: Unique identifier (Primary Key).
  - name: Member's full name.
  - phone_number: Optional contact number.
  - card_number: Unique library card number (Unique constraint).

5. loan

- **Purpose:**
  Represents a transaction when a member borrows one or more books. Each loan has associated borrow and due dates.
- **Key Fields:**
  - loan_id: Unique loan transaction identifier (Primary Key).
  - member_id: Foreign Key referencing member(member_id).
  - borrow_date: The date the loan started.
  - due_date: The return deadline.

6. loan_item

- **Purpose:**
  Connects each book borrowed in a specific loan. It tracks the return date, fine amount, and status of each borrowed book (borrowed, returned, or lost).
- **Key Fields:**
  - Composite Primary Key: (loan_id, book_id)

- ○ return_date: Date when the book was returned (if applicable).
- ○ fine_amount: Monetary fine (if overdue).
- ○ status: ENUM type tracking the state of the book in the transaction.
- ○ Foreign Keys:
  - ■ loan_id → loan(loan_id)
  - ■ book_id → book(book_id)

7. book_tag

- **Purpose:**
  An associative (many-to-many) table connecting book and tag tables. Each record links a specific book to one tag.
- **Key Fields:**
  - ○ Composite Primary Key: (book_id, tag_id)
  - ○ Foreign Keys:
    - ■ book_id → book(book_id)
    - ■ tag_id → tag(tag_id)

Test Data Explanation

Category & Tag Data

- The database includes 5 main categories: *Science Fiction, History, Literature, Biography,* and *Encyclopedia*. These categories represent typical sections found in a modern library.
- In addition, 35 tags are used to describe thematic or contextual aspects of books (e.g., *Adventure, Time Travel, World War II, Romance, Social Critique*).
- This structure allows users to filter and search for books based on both genre and subject matter.

Book Data

- A total of 15 books are inserted across the three primary categories (*Science Fiction, History,* and *Literature*).
- Each entry specifies the title, author, total copies, and available copies, simulating real inventory management.
- Availability values (2-5 copies) reflect a dynamic lending environment where books may be borrowed or returned.

Member Data

- There are 8 members, each with a unique card number and optional phone contact.
- These records provide sufficient variety to test member registration, lookup, and transaction association features.

Loan & Loan Item Data

- 8 distinct loan transactions demonstrate how members borrow books at different times, each with realistic borrow and due dates.
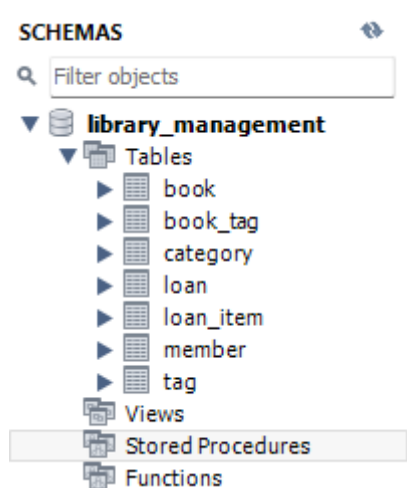
- Associated loan items track multiple books per loan, their status (*borrowed, returned,* or *lost*), and potential fines (e.g., $1.50 for a late return).
- This setup verifies the one-to-many and many-to-many relationships between member, loan, and book.

Book-Tag Mapping

- The book_tag table connects books to multiple descriptive tags, showcasing a functioning many-to-many relationship.
- For example, *"The Galactic Journey"* is linked with *Space Travel, Adventure,* and *Exploration*, enabling rich keyword-based searches.
- This mapping supports thematic categorization beyond the basic category system.

Task 4: Screenshots from MySQL Workbench

Database Schema Tree

SCHEMAS

Filter objects

▼ library_management
  ▼ Tables
    ► book
    ► book_tag
    ► category
    ► loan
    ► loan_item
    ► member
    ► tag
    Views
    Stored Procedures
    Functions

Show table structures

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

Field	Type	Null	Key	Default	Extra
book_id	int	NO	PRI	NULL	
tag_id	int	NO	PRI	NULL	

Category:

Tag:

Field	Type	Null	Key	Default	Extra
tag_id	int	NO	PRI	NULL	auto_increment
tag_name	varchar(100)	NO		NULL	

Book:

Field	Type	Null	Key	Default	Extra
book_id	int	NO	PRI	NULL	auto_increment
title	varchar(50)	NO		NULL	
author	varchar(50)	NO		NULL	
total_copies	int unsigned	NO		NULL	
available_copies	int unsigned	NO		NULL	
category_id	int	YES	MUL	NULL	

Member:

Field	Type	Null	Key	Default	Extra
member_id	int	NO	PRI	NULL	auto_increment
name	varchar(100)	NO		NULL	
phone_number	varchar(15)	YES		NULL	
card_number	varchar(14)	NO	UNI	NULL	

Loan:

Field	Type	Null	Key	Default	Extra
loan_id	int	NO	PRI	NULL	auto_increment
member_id	int	NO	MUL	NULL	
borrow_date	date	NO		NULL	
due_date	date	NO		NULL	

Loan Item:

Field	Type	Null	Key	Default	Extra
loan_id	int	NO	PRI	NULL	
book_id	int	NO	PRI	NULL	
return_date	date	YES		NULL	
fine_amount	decimal(6,1)	NO		0.0	
status	enum('borrowed','returned','lost')	NO		NULL	

Book Tag:

Field	Type	Null	Key	Default	Extra
book_id	int	NO	PRI	NULL	
tag_id	int	NO	PRI	NULL	

Sample Data

Category:

category_id	category_name
1	Science Fiction
2	History
3	Literature
4	Biography
5	Encyclopedia

Tag:

tag_id	tag_name
1	Space Travel
2	Adventure
3	Exploration
4	Time Travel
5	Quantum Physics
6	Paradox
7	Extraterrestrial Life
8	UFOs
9	Parallel Worlds
10	Fantasy
11	Colonization
12	Mars
13	Ancient Civilizations
14	Rome
15	Empire
16	World War I
17	World War II
18	Renaissance
19	Art
20	Culture
21	Political Leaders
22	Revolution
23	Architecture
24	Wonders
25	Classic Novel
26	Romance
27	Social Critique
28	Justice
29	Racial Inequality
30	Dystopian
31	Political Fiction
32	Totalitarian
33	Tragedy
34	Social Class
35	Nature
NULL	NULL

Book:

	book_id	title	author	total_copies	available_copies	category_id
	1	The Galactic Journey	John Doe	5	3	1
	2	Time and Space	Alice Smith	5	4	1
	3	Alien Encounters	Mark Johnson	5	2	1
	4	The Lost Universe	Emily Brown	5	5	1
	5	Mars Colonies	Robert Green	5	3	1
	6	The Ancient World	Sarah White	5	4	2
	7	World Wars	James Black	5	3	2
	8	The Renaissance	Laura Blue	5	2	2
	9	Revolutionary Leaders	David Wilson	5	4	2
	10	Historical Wonders	Susan Lee	5	3	2
	11	Pride and Prejudice	Jane Austen	5	4	3
	12	The Great Gatsby	F. Scott Fitz...	5	3	3
	13	To Kill a Mockingbird	Harper Lee	5	2	3
	14	1984	George Orwell	5	4	3
▶	15	Moby Dick	Herman Melville	5	3	3
*	NULL	NULL	NULL	NULL	NULL	NULL

Member:

	member_id	name	phone_number	card_number
▶	1	John Doe	4165551111	12345678900439
	2	Laura Smith	4165552222	12345678900440
	3	Catherine Lee	4165553333	12345678900441
	4	Daniel Kim	4165554444	12345678900442
	5	Eva Brown	4165555555	12345678900443
	6	Frank Wilson	4165556666	12345678900444
	7	Grace Miller	4165557777	12345678900445
	8	Henry Clark	4165558888	12345678900446
*	NULL	NULL	NULL	NULL

Loan:

	loan_id	member_id	borrow_date	due_date
▶	1	1	2025-09-01	2025-09-15
	2	2	2025-09-05	2025-09-19
	3	3	2025-09-10	2025-09-24
	4	4	2025-09-12	2025-09-26
	5	5	2025-09-15	2025-09-29
	6	6	2025-09-18	2025-10-02
	7	7	2025-09-20	2025-10-04
	8	8	2025-09-25	2025-10-09
*	NULL	NULL	NULL	NULL

Loan Item:

loan_id	book_id	return_date	fine_amount	status
1	1	2025-09-10	0.0	returned
1	2	2025-09-13	0.0	returned
2	3	NULL	0.0	borrowed
2	4	NULL	0.0	borrowed
3	5	2025-09-24	1.5	returned
4	6	NULL	0.0	borrowed
5	7	2025-09-29	0.0	returned
6	8	NULL	0.0	borrowed
7	9	NULL	0.0	borrowed
8	10	NULL	0.0	borrowed
8	11	NULL	0.0	borrowed
NULL	NULL	NULL	NULL	NULL

Book Tag:

book_id	tag_id
1	1
1	2
15	2
1	3
3	3
4	3
5	3
2	4
2	5
2	6
3	7
3	8
4	9
4	10
5	11
5	12
6	13
10	13
6	14
6	15
7	16
7	17
7	18
8	18
9	18
8	19
8	20
9	21
9	22
10	23
10	24
11	25
12	25
13	25
15	25
11	26
11	27
13	28
13	29
14	30
14	31
14	32
12	33
12	34
15	35

ER Diagram:
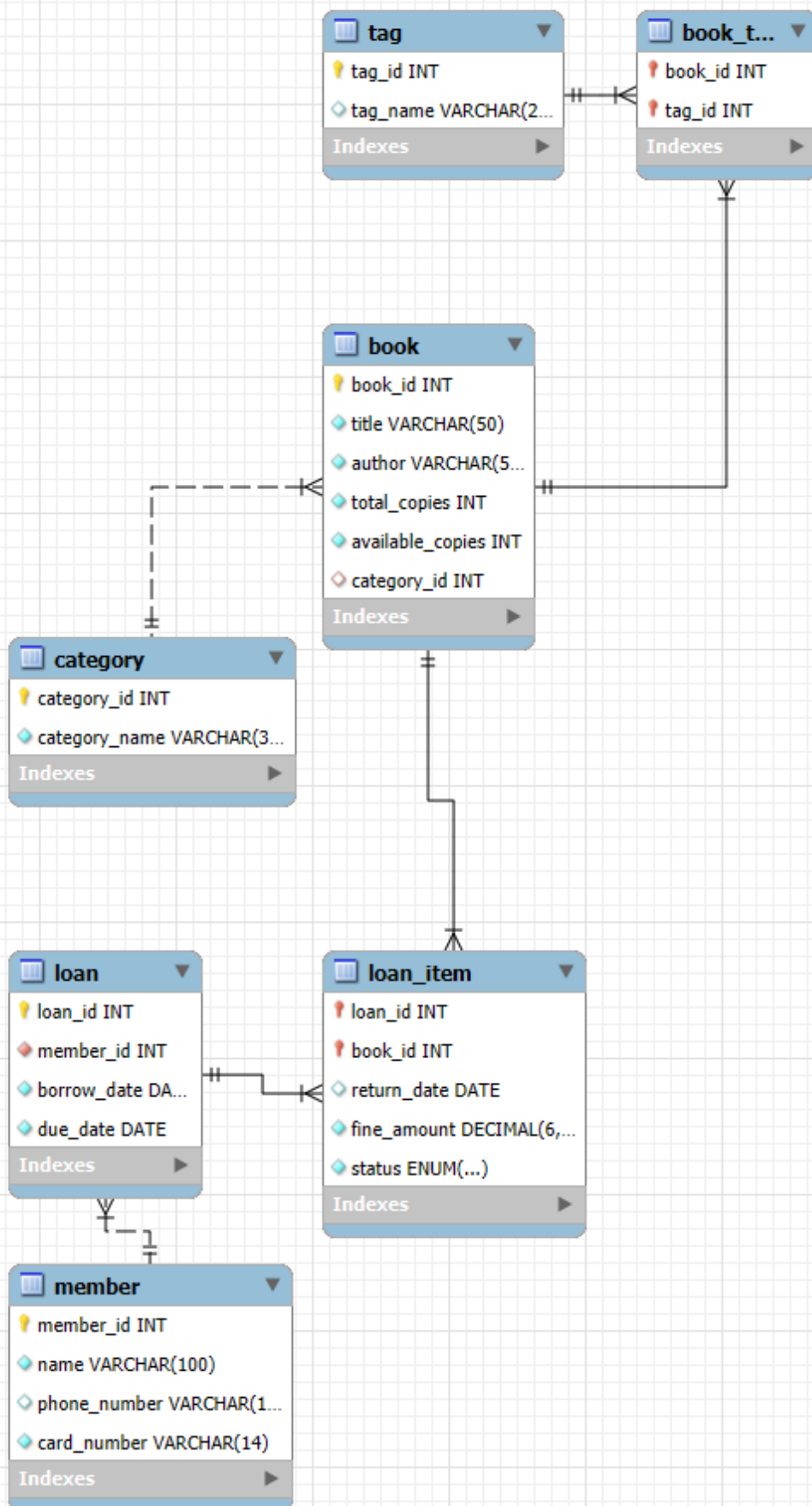
Task 5: MySQL Workbench Model File

.mwb file:
https://drive.google.com/file/d/1BlMKHoQvuiXZ0EqjKNZFx0UJRUyfZftC/view?usp=sharing

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Deliverables for Phase 2:

A. **create_tables.sql** as described above

B. **insert_data.sql** as described above

C. Create **team#_phase2.pdf** containing:
   i. Description of each table and its purpose
   ii. Screenshots from MySQL Workbench as described above

Submission Instructions:

Upload **team#_phase2.pdf and other .sql files** to your **GitHub repository** and then **post** your GitHub repository link on **eClass.**

Must Have:

Please include a cover page when submitting your work, with the student number, name, and section filled out for all team members, formatted as follows.

Student#:

Sur (Family) Name:

Given Name:

Section: