

Library Management System Database

This Library Management System (LMS) database is designed to manage and organize essential library functions, including the cataloging of books, tracking of members, authorship records, categorization of books, and management of borrowing transactions. The database comprises six main tables: **Books**, **Members**, **Authors**, **Categories**, **Book Copies**, and **Borrowing Transactions**, all implemented in MySQL with carefully defined data types, constraints, and relationships. This system allows for efficient handling of library resources and user interactions, ensuring smooth operation and record-keeping for library management in a Bangladeshi context.

Steps of Constructing ERD

Step 1: Identifying Entities

- **Books**
- **Members**
- **Authors**
- **Categories**
- **Book Copies**
- **Borrowing Transactions**

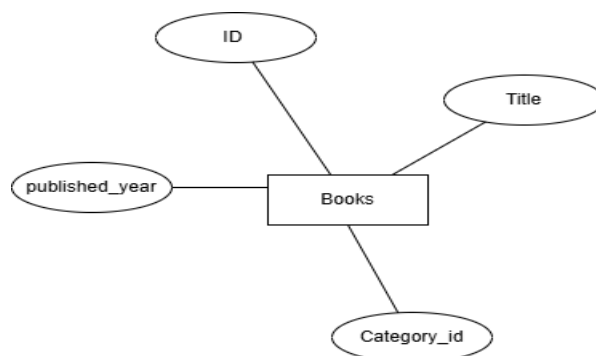
Step 2: Identifying Attributes and PK

- **Books:** id, title, publication_year, category_id.
- **Members:** id, name, address, phone_number, email, copy_id.
- **Authors:** id, name, nationality, birth_year.
- **Categories:** id, category_name.
- **Book Copies:** id, book_id, available
- **Borrowing Transactions:** id, member_id, copy_id, borrow_date, return_date.

Define Primary Keys: Each entity has a unique identifier (e.g. id,).

Representing Entities with attributes

- **Books:** id, title, published_year, category_id.



Step 3: Identifying Relationships

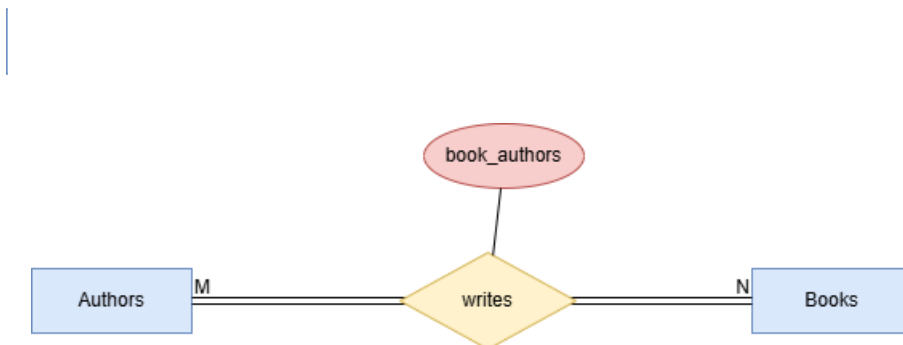
- Authors write Books
- Books belong to a Category
- Books have multiple Book_Copies
- Members borrow Book_Copies
- Book_copies are borrowed in **Borrowing_Transactions**

Step 4: Cardinality Ratio and participation

1. **Authors to Books:** Many-to-Many
2. **Categories to Books:** One-to-Many
3. **Books to Book Copies:** One-to-Many
4. **Book Copies to Borrowing Transactions:** One-to-Many
5. **Books to Categories:** Many-to-one

There will a book_authors table (junction tablea) for many to many relationship bwtween books and authors.

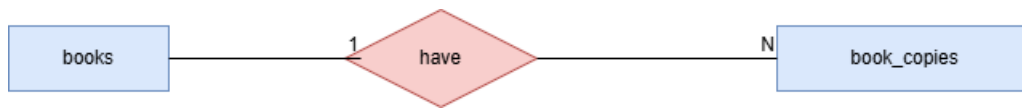
Authors write Books



Books belong to Categories



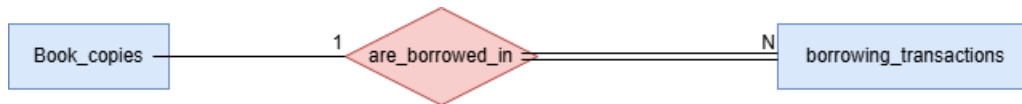
Books have multiple book_Copies



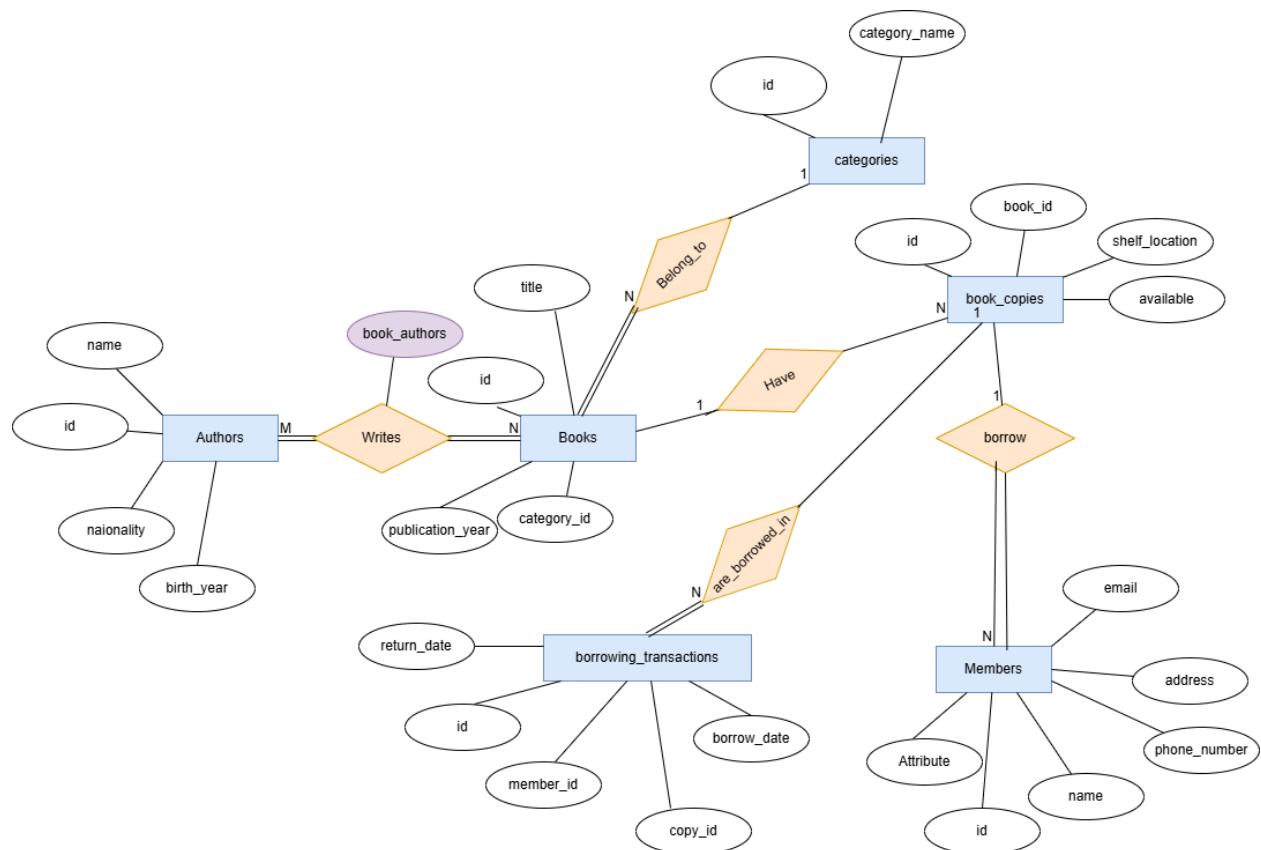
Members borrow Book_Copies



Book_copies are borrowed in Borrowing_Transactions



ERD Of Library Management System



Schema Diagram

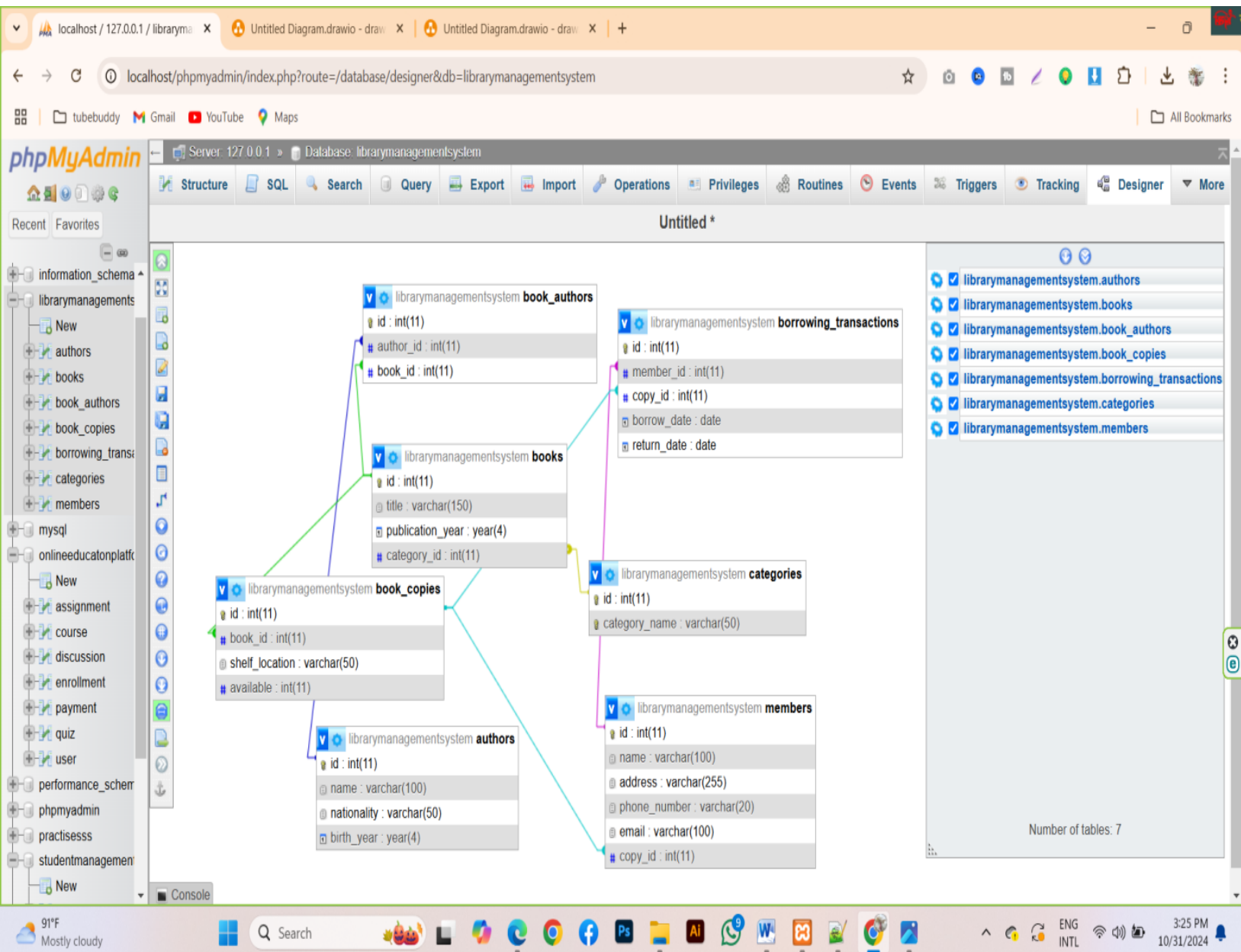


Table Screenshots

The screenshot displays the phpMyAdmin web interface in a browser. The address bar shows the URL: localhost/phpmyadmin/index.php?route=/database/structure&db=librarymanagementsystem. The interface includes a top navigation bar with tabs for Structure, SQL, Search, Query, Export, Import, Operations, Privileges, Routines, Events, Triggers, Tracking, Designer, and More. A left sidebar shows the database hierarchy, including 'information_schema' and 'librarymanagementsystem'. The main content area shows the 'Filters' section with a search box. Below it is a table listing the database structure for 'librarymanagementsystem'.

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> authors	★ Browse Structure Search Insert Empty Drop	60	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> books	★ Browse Structure Search Insert Empty Drop	20	InnoDB	utf8mb4_general_ci	32.0 KiB	-
<input type="checkbox"/> book_authors	★ Browse Structure Search Insert Empty Drop	20	InnoDB	utf8mb4_general_ci	48.0 KiB	-
<input type="checkbox"/> book_copies	★ Browse Structure Search Insert Empty Drop	20	InnoDB	utf8mb4_general_ci	32.0 KiB	-
<input type="checkbox"/> borrowing_transactions	★ Browse Structure Search Insert Empty Drop	13	InnoDB	utf8mb4_general_ci	48.0 KiB	-
<input type="checkbox"/> categories	★ Browse Structure Search Insert Empty Drop	5	InnoDB	utf8mb4_general_ci	32.0 KiB	-
<input type="checkbox"/> members	★ Browse Structure Search Insert Empty Drop	21	InnoDB	utf8mb4_general_ci	32.0 KiB	-
7 tables	Sum	159	InnoDB	utf8mb4_general_ci	240.0 KiB	0 B

Below the table, there is a 'Check all' checkbox and a 'With selected:' dropdown menu. At the bottom, there is a 'Create new table' section with fields for 'Table name' and 'Number of columns' (set to 4), and a 'Create' button. The bottom of the image shows a Windows taskbar with various application icons and system information like '91°F Mostly cloudy' and '3:30 PM 10/31/2024'.

1.Books table

The screenshot displays the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'books' table is selected, and its structure and data are shown. The table has four columns: 'id', 'title', 'publication_year', and 'category_id'. The data is listed in a table with 20 rows, each containing an 'id', a 'title', a 'publication_year', and a 'category_id'. Each row also has action links for 'Edit', 'Copy', and 'Delete'.

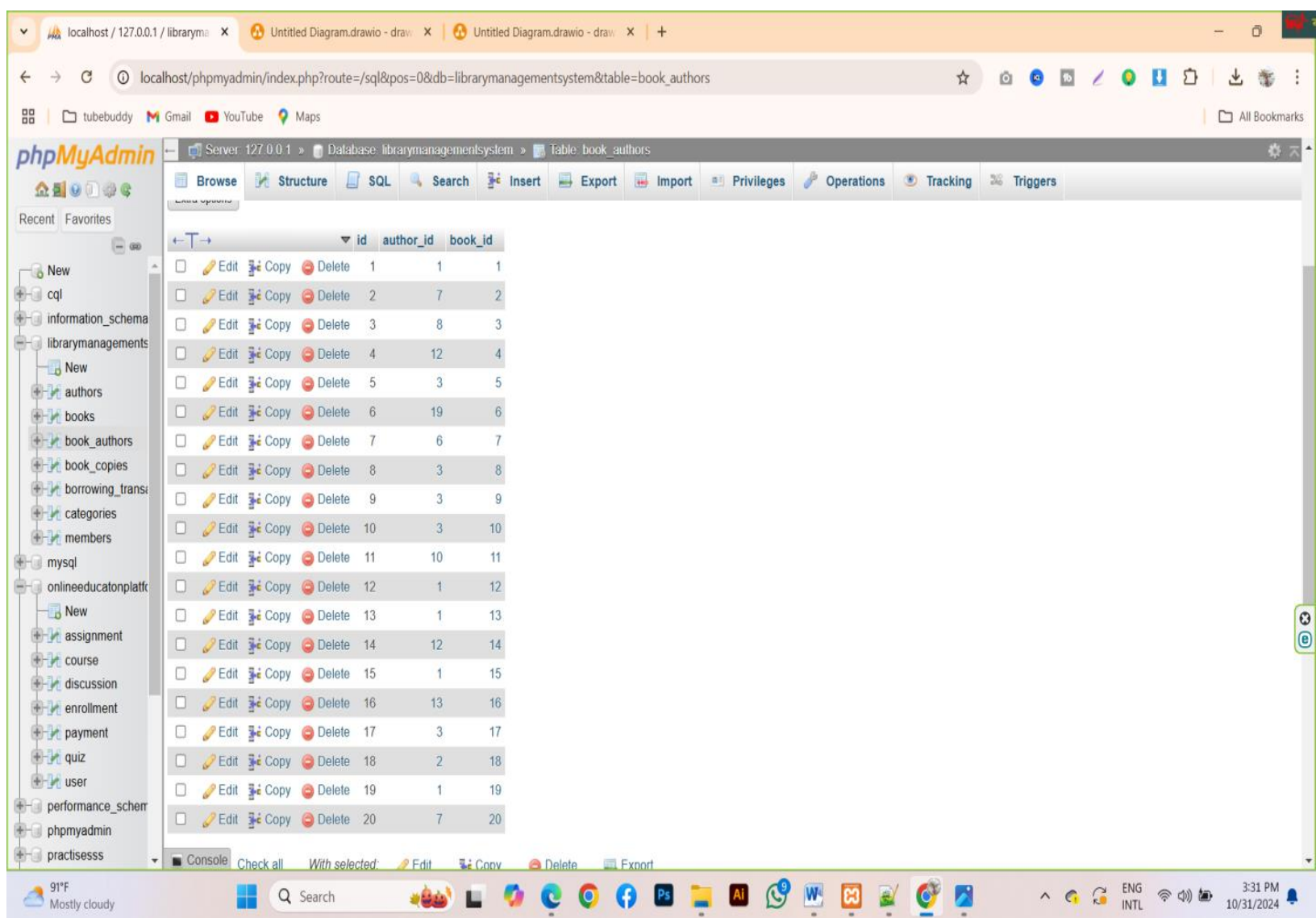
	id	title	publication_year	category_id
<input type="checkbox"/> Edit Copy Delete	1	Lalsalu	1948	1
<input type="checkbox"/> Edit Copy Delete	2	Padma Nadir Majhi	1936	1
<input type="checkbox"/> Edit Copy Delete	3	Chander Pahar	1937	3
<input type="checkbox"/> Edit Copy Delete	4	Ami Topu	2005	3
<input type="checkbox"/> Edit Copy Delete	5	Gitanjali	1910	2
<input type="checkbox"/> Edit Copy Delete	6	Bishad Sindhu	2011	4
<input type="checkbox"/> Edit Copy Delete	7	Jibonanonder Kobita	1942	2
<input type="checkbox"/> Edit Copy Delete	8	Shesher Kobita	1929	1
<input type="checkbox"/> Edit Copy Delete	9	Chokher Bali	1903	1
<input type="checkbox"/> Edit Copy Delete	10	Rakta Karabi	1924	2
<input type="checkbox"/> Edit Copy Delete	11	Jadur Shohor	2011	1
<input type="checkbox"/> Edit Copy Delete	12	Nondito Noroke	1972	1
<input type="checkbox"/> Edit Copy Delete	13	Debi	1985	3
<input type="checkbox"/> Edit Copy Delete	14	Karagar	2006	3
<input type="checkbox"/> Edit Copy Delete	15	Shuvro	1998	1
<input type="checkbox"/> Edit Copy Delete	16	Titumir	1967	4
<input type="checkbox"/> Edit Copy Delete	17	Bishwokabi	1921	5
<input type="checkbox"/> Edit Copy Delete	18	Rajani	2012	1
<input type="checkbox"/> Edit Copy Delete	19	Nurjahan	2001	4
<input type="checkbox"/> Edit Copy Delete	20	Nakshi Kathar Math	1929	2

2. Authors table

The screenshot displays the phpMyAdmin interface for the 'librarymanagementsystem' database. The 'authors' table is selected, showing a list of 21 authors. The table has four columns: 'id', 'name', 'nationality', and 'birth_year'. Each row includes action buttons for Edit, Copy, and Delete. The left sidebar shows the database structure, and the top navigation bar includes options like Browse, Structure, SQL, Search, Insert, Export, Import, Privileges, Operations, Tracking, and Triggers. The bottom status bar shows the system temperature, search bar, and system clock.

	id	name	nationality	birth_year
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	1	Humayun Ahmed	Bangladesh	1948
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	2	Sarat Chandra Chattopadhyay	India	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	3	Rabindranath Tagore	India	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	Kazi Nazrul Islam	Bangladesh	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	Michael Madhusudan Dutt	India	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	6	Jibanananda Das	Bangladesh	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	7	Jasimuddin	Bangladesh	1903
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	8	Sunil Gangopadhyay	India	1934
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	9	Selina Hossain	Bangladesh	1947
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	10	Shamsur Rahman	Bangladesh	1929
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	11	Anisul Hoque	Bangladesh	1965
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	12	Muhammed Zafar Iqbal	Bangladesh	1952
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	13	Fakir Lalon Shah	Bangladesh	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	14	Ahsan Habib	Bangladesh	1917
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	15	Syed Mujtaba Ali	Bangladesh	1904
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	16	Abdul Hakim	Bangladesh	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	17	Bankim Chandra Chattopadhyay	India	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	18	Manik Bandopadhyay	India	1908
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	19	Bibhutibhushan Bandopadhyay	India	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	20	Mir Mosharrar Hossain	Bangladesh	0000
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	21	Humayun Ahmed	Bangladesh	1948

3.book_authors table(junction table)



The screenshot displays the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'book_authors' table is selected, showing its structure and data. The table has three columns: 'id', 'author_id', and 'book_id'. The data is as follows:

	id	author_id	book_id
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	1	1	1
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	2	7	2
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	3	8	3
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	12	4
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	3	5
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	6	19	6
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	7	6	7
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	8	3	8
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	9	3	9
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	10	3	10
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	11	10	11
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	12	1	12
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	13	1	13
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	14	12	14
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	15	1	15
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	16	13	16
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	17	3	17
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	18	2	18
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	19	1	19
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	20	7	20

4.Categories table

5.book_copies table

The screenshot displays a web browser window with multiple tabs. The active tab is 'localhost/phpmyadmin/index.php?route=/sql&pos=0&db=librarymanagementsystem&table=book_copies'. The browser's address bar and tabs are visible at the top. Below the browser window, the phpMyAdmin interface is shown. The top navigation bar includes links for 'Browse', 'Structure', 'SQL', 'Search', 'Insert', 'Export', 'Import', 'Privileges', 'Operations', 'Tracking', and 'Triggers'. The main content area displays the 'book_copies' table with the following columns: 'id', 'book_id', 'shelf_location', and 'available'. The table contains 20 rows of data. The left sidebar shows the database structure with 'librarymanagementsystem' selected. The bottom status bar shows '91°F Mostly cloudy' and system icons.

	id	book_id	shelf_location	available
<input type="checkbox"/>	1	1	A1	23
<input type="checkbox"/>	2	2	A2	2
<input type="checkbox"/>	3	3	B1	0
<input type="checkbox"/>	4	4	B2	1
<input type="checkbox"/>	5	5	C1	1
<input type="checkbox"/>	6	6	C2	0
<input type="checkbox"/>	7	7	D1	20
<input type="checkbox"/>	8	8	D2	3
<input type="checkbox"/>	9	9	E1	18
<input type="checkbox"/>	10	10	E2	0
<input type="checkbox"/>	11	11	F1	1
<input type="checkbox"/>	12	12	F2	18
<input type="checkbox"/>	13	13	G1	1
<input type="checkbox"/>	14	14	G2	1
<input type="checkbox"/>	15	15	H1	12
<input type="checkbox"/>	16	16	H2	1
<input type="checkbox"/>	17	17	I1	1
<input type="checkbox"/>	18	18	I2	5
<input type="checkbox"/>	19	19	J1	3
<input type="checkbox"/>	20	20	J2	3

6. members table

localhost / 127.0.0.1 / libraryma x x x x +

localhost/phpmyadmin/index.php?route=/sql&pos=0&db=librarymanagementsystem&table=members

phpMyAdmin

Server: 127.0.0.1 » Database: librarymanagementsystem » Table: members

Recent Favorites

Librarymanagementsystem

members

		id	name	address	phone_number	email	copy_id
<input type="checkbox"/>	Edit Copy Delete	1	Md. Akash Rahman	Dhaka	01700000001	akash@example.com	15
<input type="checkbox"/>	Edit Copy Delete	2	Nahidul Islam	Khulna	01700000002	nahid@example.com	19
<input type="checkbox"/>	Edit Copy Delete	3	Jui Sultana	Chittagong	01700000003	jui@example.com	20
<input type="checkbox"/>	Edit Copy Delete	4	Abul Kalam	Rajshahi	01700000004	abul@example.com	11
<input type="checkbox"/>	Edit Copy Delete	5	Rahima Begum	Sylhet	01700000005	rahima@example.com	18
<input type="checkbox"/>	Edit Copy Delete	6	Nasrin Akter	Barisal	01700000006	nasrin@example.com	2
<input type="checkbox"/>	Edit Copy Delete	7	Jahid Hasan	Mymensingh	01700000007	jahid@example.com	4
<input type="checkbox"/>	Edit Copy Delete	8	Shakib Al Hasan	Dhaka	01700000008	shakib@example.com	9
<input type="checkbox"/>	Edit Copy Delete	9	Mim Akter	Khulna	01700000009	mim@example.com	8
<input type="checkbox"/>	Edit Copy Delete	10	Tamim Iqbal	Chittagong	01700000010	tamim@example.com	16
<input type="checkbox"/>	Edit Copy Delete	11	Sumaiya Rahman	Dhaka	01700000011	sumaiya@example.com	4
<input type="checkbox"/>	Edit Copy Delete	12	Al-Amin Hossain	Sylhet	01700000012	alam@example.com	5
<input type="checkbox"/>	Edit Copy Delete	13	Sultana Begum	Rajshahi	01700000013	sultana@example.com	1
<input type="checkbox"/>	Edit Copy Delete	14	Farzana Shakil	Mymensingh	01700000014	farzana@example.com	11
<input type="checkbox"/>	Edit Copy Delete	15	Rafiul Islam	Barisal	01700000015	rafiul@example.com	10
<input type="checkbox"/>	Edit Copy Delete	16	Tania Jahan	Chittagong	01700000016	taniam@example.com	13
<input type="checkbox"/>	Edit Copy Delete	17	Mohammed Salim	Khulna	01700000017	salim@example.com	16
<input type="checkbox"/>	Edit Copy Delete	18	Arman Khan	Dhaka	01700000018	arman@example.com	10
<input type="checkbox"/>	Edit Copy Delete	19	Sumon Ahmed	Rajshahi	01700000019	sumon@example.com	8
<input type="checkbox"/>	Edit Copy Delete	20	Bristy Akter	Mymensingh	01700000020	bristy@example.com	18
<input type="checkbox"/>	Edit Copy Delete	21	Rahima Begum	Sylhet	01700000005	rahima@example.com	2

localhost/phpmyadmin/index.php Console

91°F Mostly cloudy

Search

ENG INTL

4:03 PM 10/31/2024

7.borrowing_transactions table

localhost / 127.0.0.1 / libraryman... x x x +

localhost/phpmyadmin/index.php?route=/sql&pos=0&db=librarymanagementsystem&table=borrowing_transactions

phpMyAdmin

Server: 127.0.0.1 » Database: librarymanagementsystem » Table: borrowing_transactions

Browse Structure SQL Search Insert Export Import Privileges Operations Tracking Triggers

Recent Favorites

New

- cql
- information_schema
- librarymanagements
 - New
 - authors
 - books
 - book_authors
 - book_copies
 - borrowing_transactions
 - categories
 - members
- mysql
- onlineeducationplatform
 - New
 - assignment
 - course
 - discussion
 - enrollment
 - payment
 - quiz
 - user
- performance_schema
- phpmyadmin
- practicissess

				id	member_id	copy_id	borrow_date	return_date
<input type="checkbox"/>	Edit	Copy	Delete	1	12	6	2024-02-12	2024-03-29
<input type="checkbox"/>	Edit	Copy	Delete	2	8	15	2024-01-05	2024-02-25
<input type="checkbox"/>	Edit	Copy	Delete	3	15	16	2024-06-06	2024-07-06
<input type="checkbox"/>	Edit	Copy	Delete	4	18	18	2024-03-30	2024-09-09
<input type="checkbox"/>	Edit	Copy	Delete	5	20	4	2024-05-12	2024-06-13
<input type="checkbox"/>	Edit	Copy	Delete	6	1	7	2024-02-12	2024-03-24
<input type="checkbox"/>	Edit	Copy	Delete	7	6	10	2024-01-05	2024-02-25
<input type="checkbox"/>	Edit	Copy	Delete	8	3	9	2024-02-13	2024-03-23
<input type="checkbox"/>	Edit	Copy	Delete	9	20	20	2024-01-05	2024-02-02
<input type="checkbox"/>	Edit	Copy	Delete	10	5	13	2024-02-13	2024-03-23
<input type="checkbox"/>	Edit	Copy	Delete	11	11	16	2024-02-14	2024-03-23
<input type="checkbox"/>	Edit	Copy	Delete	12	21	8	2024-02-12	2024-03-29
<input type="checkbox"/>	Edit	Copy	Delete	13	14	13	2024-01-05	2024-02-25

☐ Check all With selected: Edit Copy Delete Export

☐ Show all Number of rows: 25 Filter rows: Search this table Sort by key: None

Query results operations

Print Copy to clipboard Export Display chart Create view

Console mark this SQL query

91°F Mostly cloudy

Search

ENG INTL

3:32 PM 10/31/2024