

# EDGE BU CSE DIGITAL SKILLS TRAINING

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## **Project on Library Management System Database**

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# 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.

## 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,shelf\_location
- **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, publication\_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.

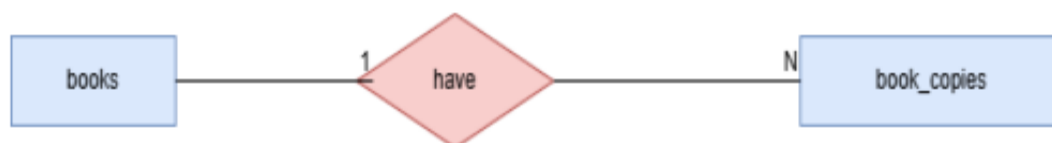
## Authors write Books



## Books belong to Categories



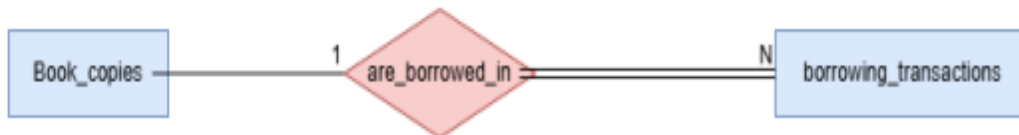
## Books have multiple book\_Copies



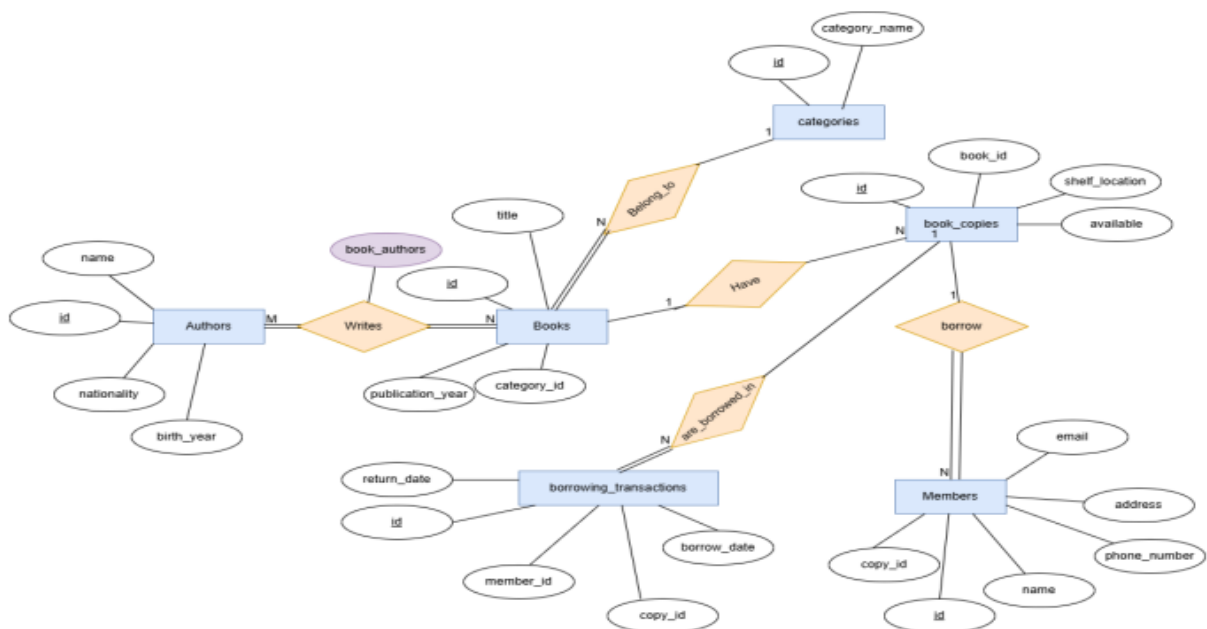
## Members borrow Book\_Copies



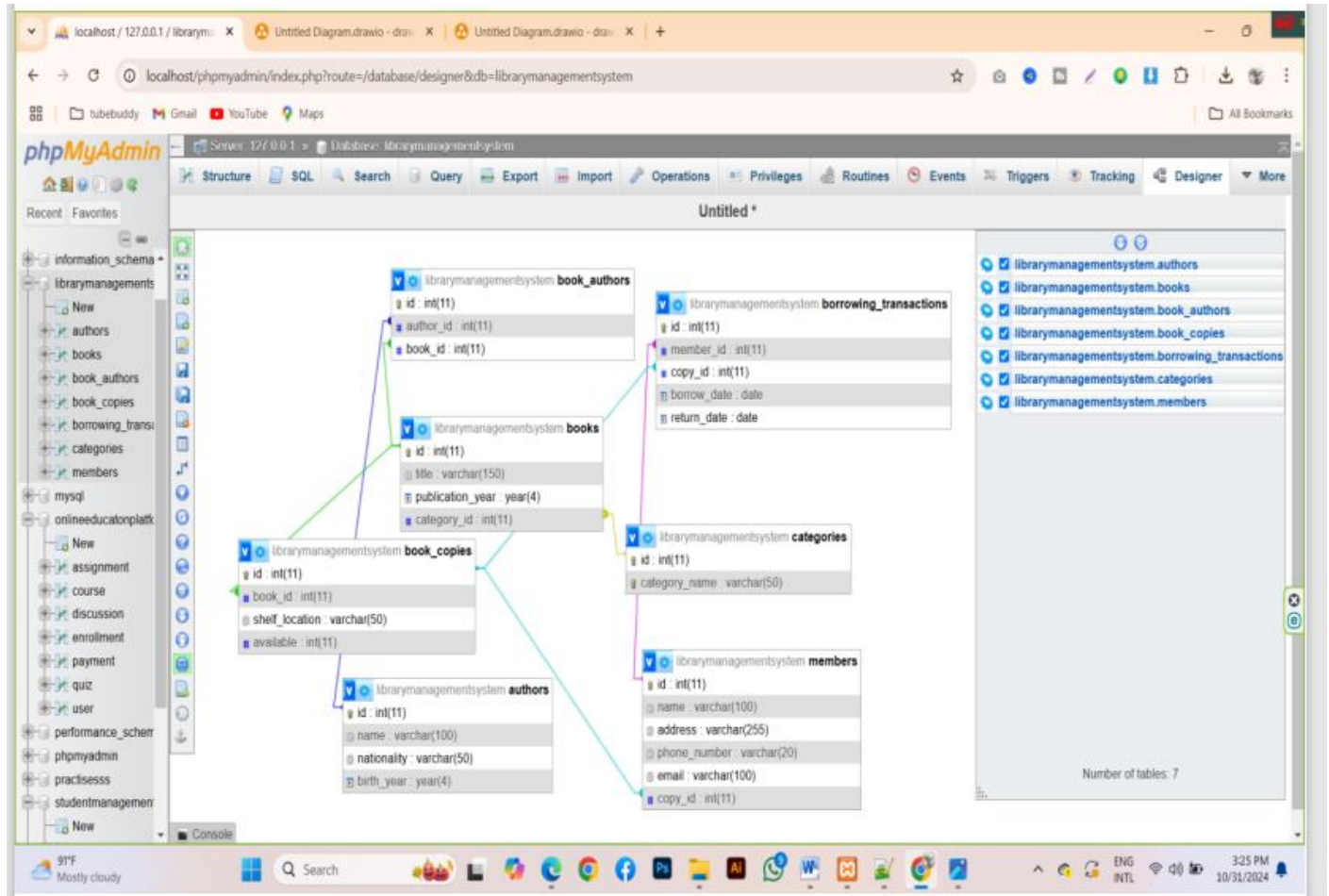
## Book\_copies are borrowed in Borrowing\_Transactions



## ERD Of Library Management System



# Schema Diagram



# Table Screenshots

The screenshot displays the phpMyAdmin web interface for a database named 'librarymanagementsystem'. The 'Structure' tab is active, showing a list of tables. A search filter is present at the top, and a 'Create new table' dialog is open at the bottom.

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> authors	☆ Browse Structure Search Insert Empty Drop	68	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	-
<b>7 tables</b>	<b>Sum</b>	<b>159</b>	<b>InnoDB</b>	<b>utf8mb4_general_ci</b>	<b>240.0 KiB</b>	<b>0 B</b>

☐ Check all    With selected: ▼

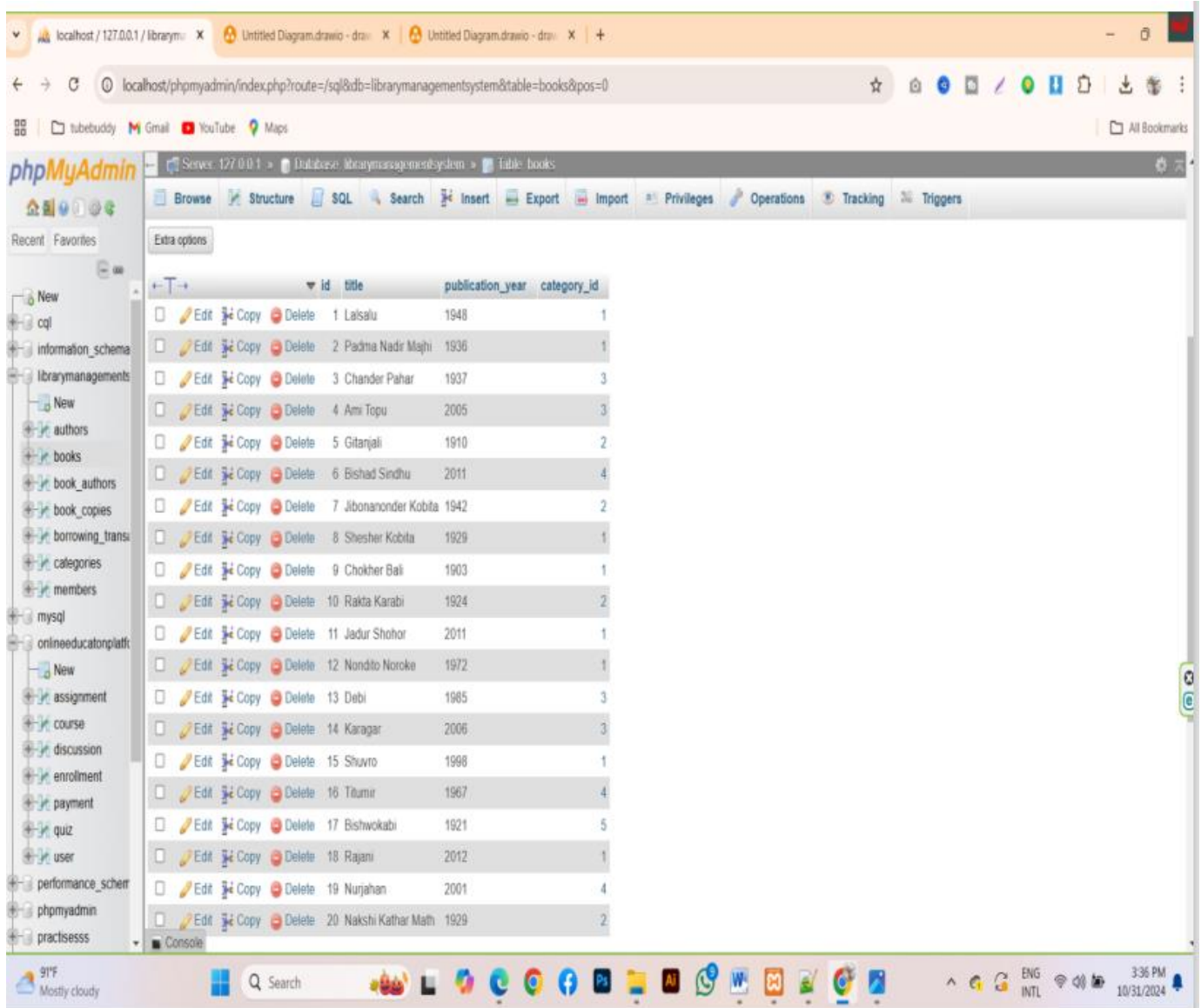
Print    Data dictionary

Create new table

Table name:     Number of columns:    

Console

# 1. Books table

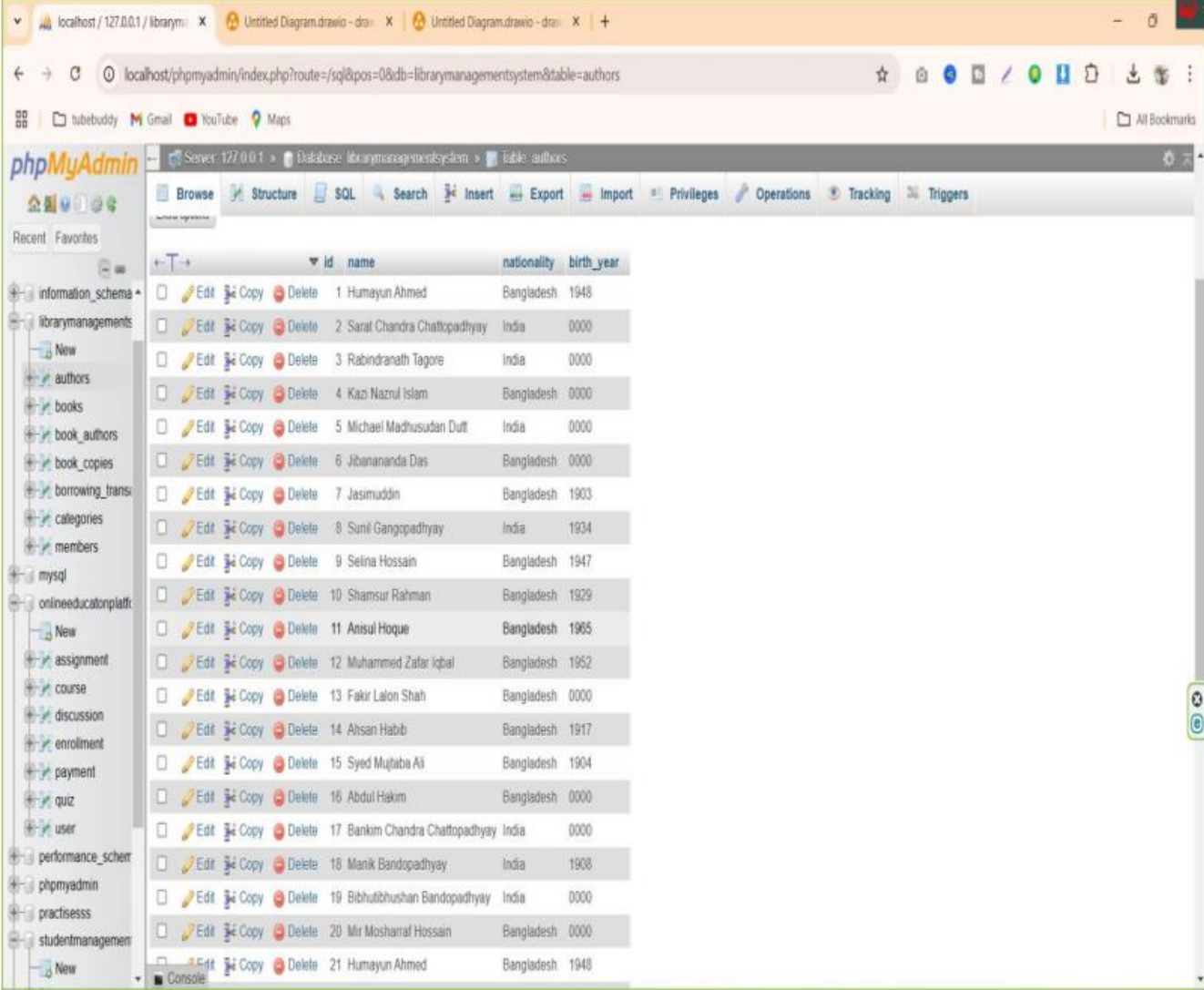


The screenshot displays the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'books' table is selected, showing its structure and data. The table has four columns: 'id', 'title', 'publication\_year', and 'category\_id'. The data is as follows:

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



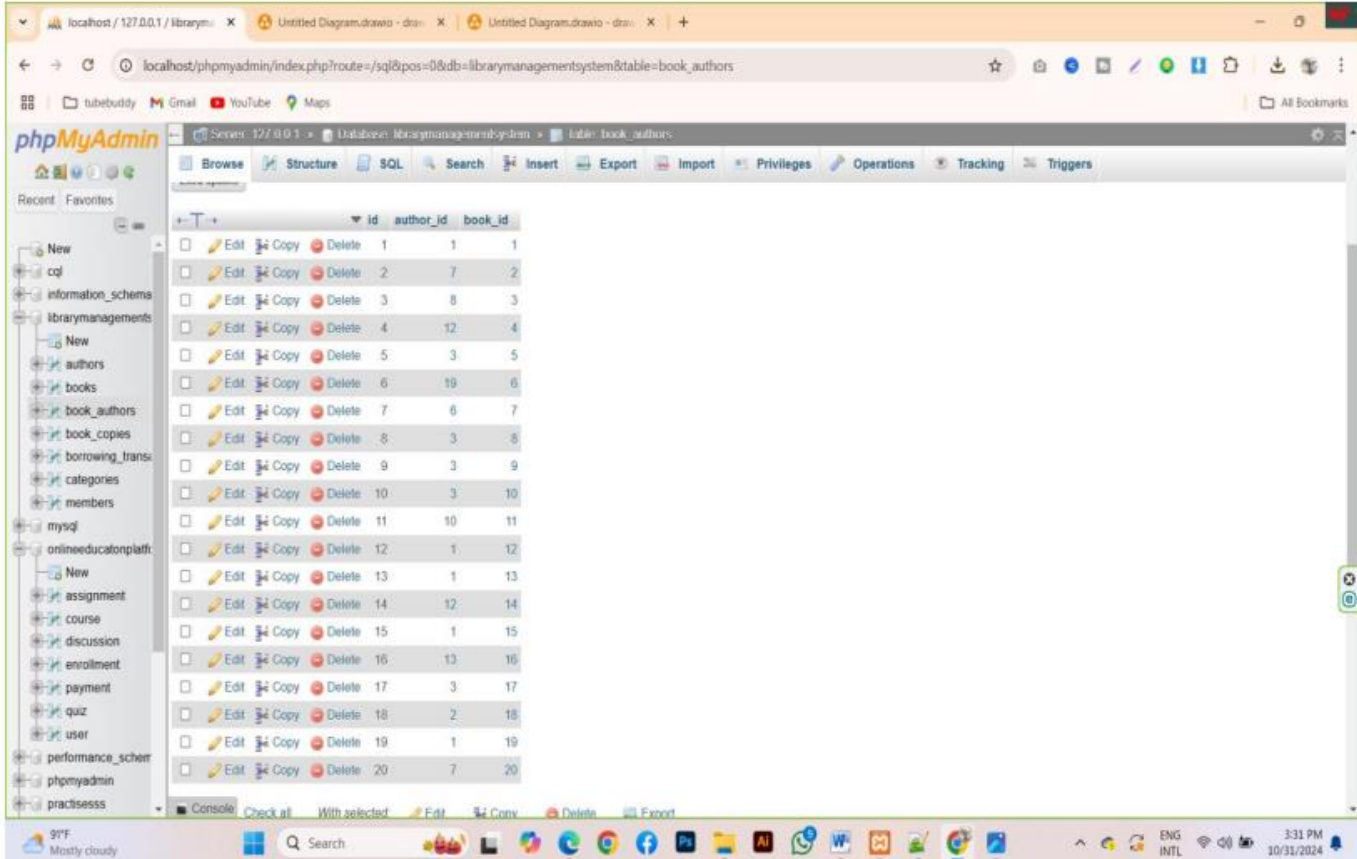
## 2. Authors table



The screenshot displays the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'authors' table is selected, showing its structure and data. The table has four columns: 'id', 'name', 'nationality', and 'birth\_year'. There are 21 records listed, each with an 'id', a 'name', a 'nationality', and a 'birth\_year'.

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

### 3.book\_authors table(junction table)



The screenshot shows the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'book\_authors' table is selected, and its structure and data are displayed. The table has three columns: 'id', 'author\_id', and 'book\_id'. The data is as follows:

	id	author_id	book_id
	1	1	1
	2	7	2
	3	8	3
	4	12	4
	5	3	5
	6	19	6
	7	6	7
	8	3	8
	9	3	9
	10	3	10
	11	10	11
	12	1	12
	13	1	13
	14	12	14
	15	1	15
	16	13	16
	17	3	17
	18	2	18
	19	1	19
	20	7	20

## 4.Categories table

The screenshot displays the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'categories' table is selected, and the 'Browse' tab is active. The table structure shows two columns: 'id' (primary key) and 'category\_name'. The data is displayed in a table with 5 rows.

Showing rows 0 - 4 (5 total, Query took 0.0006 seconds)

```
SELECT * FROM `categories`
```

Extra options

	id	category_name
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	Biography
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	Historical
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	1	Novel
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	2	Poetry
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	3	Science Fiction

Query results operations

Print Copy to clipboard Export Display chart Create view

Bookmark this SQL query

Console

## 5.Book\_copies table

localhost / 127.0.0.1 / librarym... x Untitled Diagram.drawio - draw... x +

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

phpMyAdmin

Server: 127.0.0.1 » Database: librarymanagementsystem » Table: book\_copies

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\_trans  
categories  
members  
mysql  
onlineeducatorplatt  
New  
assignment  
course  
discussion  
enrolment  
payment  
quiz  
user  
performance\_schen  
phpmyadmin  
practicesss

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

Console Check all With selected Edit Copy Delete Export

91°F Mostly cloudy

Q Search

ENG INTL

3:31 PM 10/31/2024

## 6. Members table

The screenshot displays the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'members' table is selected, showing a list of 21 members. Each row includes an ID, name, address, phone number, email, and a copy ID. The interface includes a sidebar with a database structure tree, a top navigation bar with various tools like Browse, Structure, SQL, Search, Insert, Export, Import, Privileges, Operations, Tracking, and Triggers, and a bottom status bar showing system information.

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



## 7. Borrowing\_transactions table

The screenshot displays the phpMyAdmin interface for a database named 'librarymanagementsystem'. The 'Borrowing\_transactions' table is selected, and its structure and data are visible. The table has five columns: 'id', 'member\_id', 'copy\_id', 'borrow\_date', and 'return\_date'. The data is presented in a table with 13 rows, each containing a unique 'id' and corresponding 'member\_id', 'copy\_id', 'borrow\_date', and 'return\_date'.

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

Below the table, there are options to 'Check all', 'With selected', 'Edit', 'Copy', 'Delete', and 'Export'. A 'Query results operations' section includes 'Print', 'Copy to clipboard', 'Export', 'Display chart', and 'Create view'. The bottom of the interface shows a 'Console' tab with the text 'mark this SQL query'.