

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**

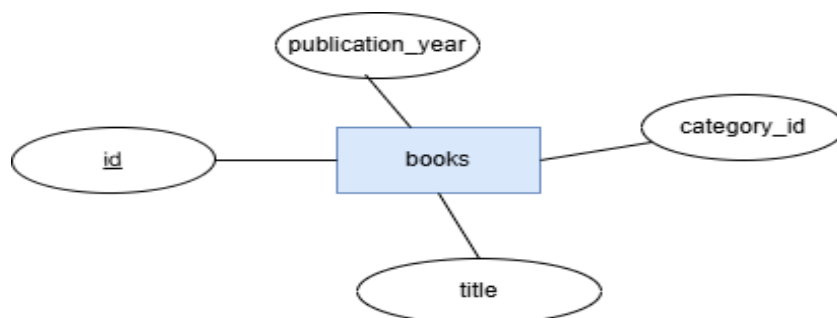
Step 2: Identifying Attributes and PK

- **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.

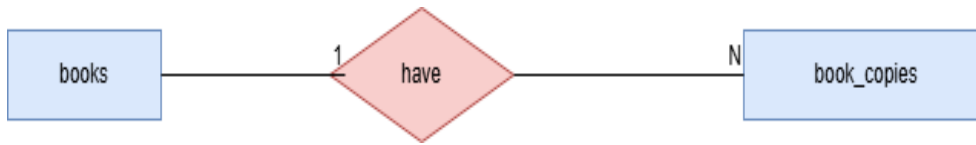
Authors write Books



Books belong to Categories



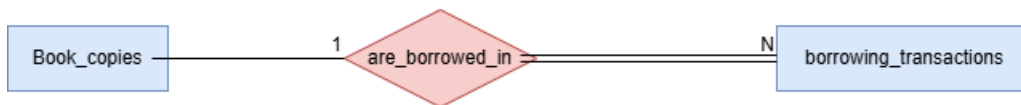
Books have multiple book_Copies



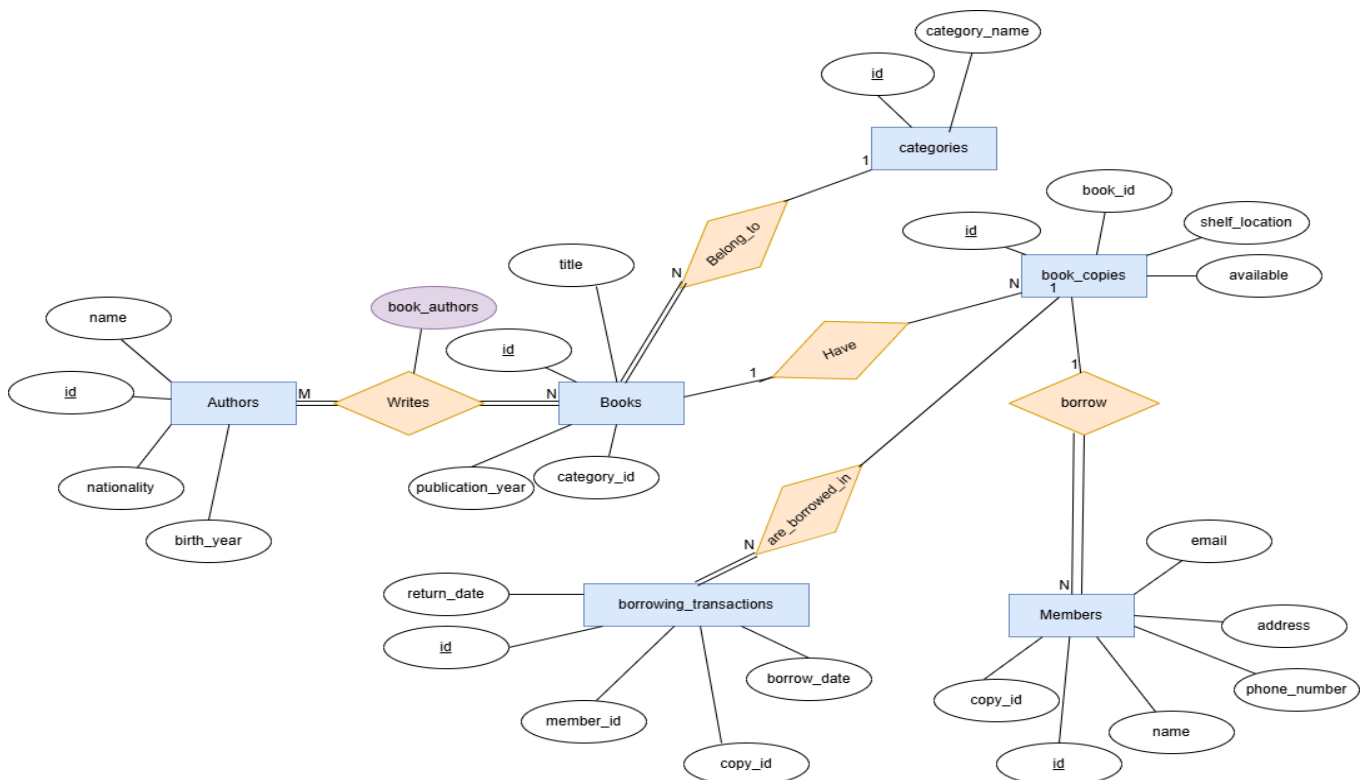
Members borrow Book_Copies



Book_copies are borrowed in Borrowing_Transactions



ERD Of Library Management System



Schema Diagram

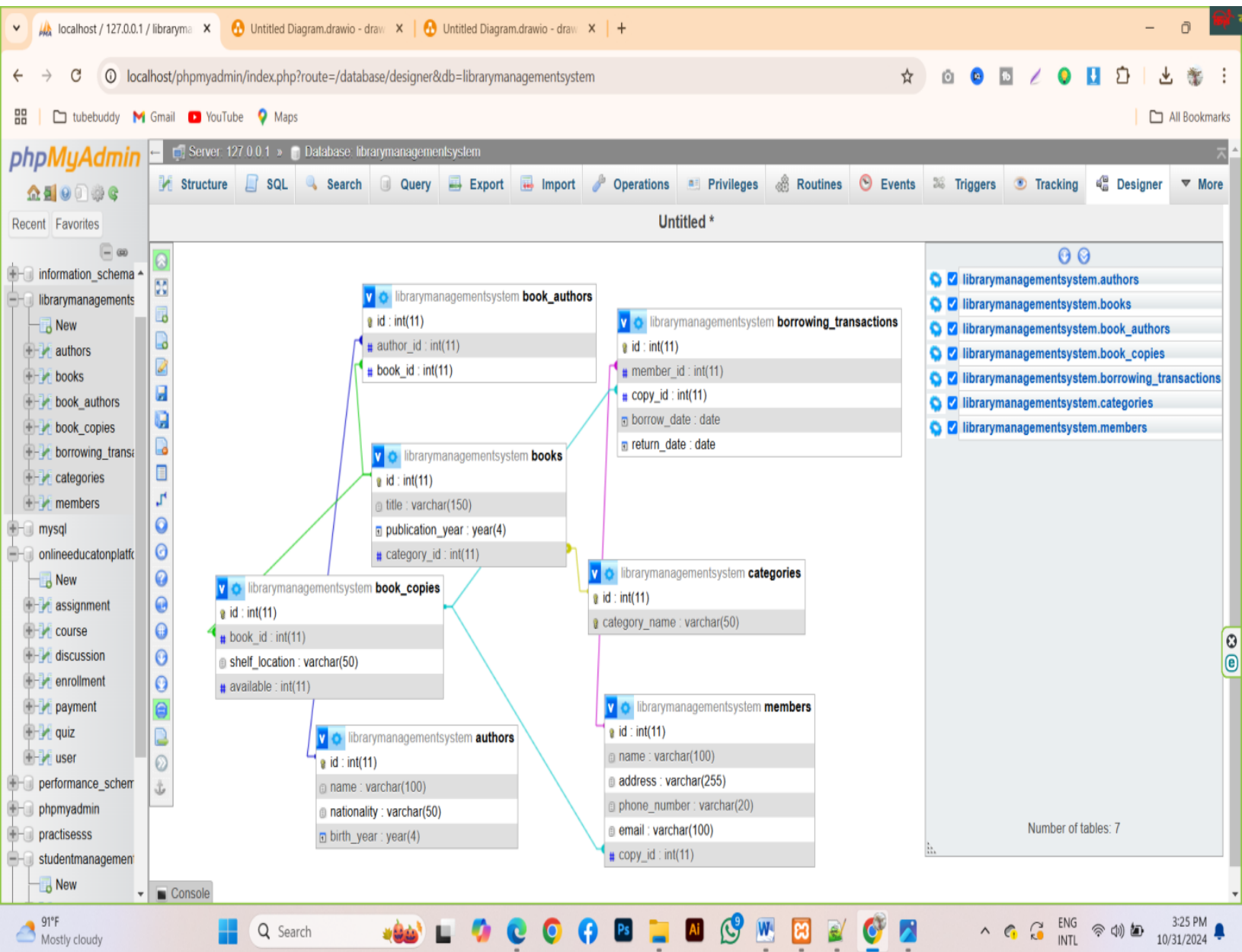


Table Screenshots

The screenshot shows the phpMyAdmin interface for the 'librarymanagementsystem' database. The 'Structure' tab is active, displaying a list of tables. The tables are: authors, books, book_authors, book_copies, borrowing_transactions, categories, and members. Each table has a set of actions (Browse, Structure, Search, Insert, Empty, Drop) and a star icon. The 'Sum' row shows 7 tables with a total of 159 rows and 240.0 KiB size.

Table	Action	Rows	Type	Collation	Size	Overhead
authors	Browse Structure Search Insert Empty Drop	60	InnoDB	utf8mb4_general_ci	16.0 KiB	-
books	Browse Structure Search Insert Empty Drop	20	InnoDB	utf8mb4_general_ci	32.0 KiB	-
book_authors	Browse Structure Search Insert Empty Drop	20	InnoDB	utf8mb4_general_ci	48.0 KiB	-
book_copies	Browse Structure Search Insert Empty Drop	20	InnoDB	utf8mb4_general_ci	32.0 KiB	-
borrowing_transactions	Browse Structure Search Insert Empty Drop	13	InnoDB	utf8mb4_general_ci	48.0 KiB	-
categories	Browse Structure Search Insert Empty Drop	5	InnoDB	utf8mb4_general_ci	32.0 KiB	-
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

The 'Create new table' dialog is open, showing the 'Table name' field and the 'Number of columns' field set to 4. The 'Create' button is visible.

1.Books table

The screenshot displays a web browser window with the phpMyAdmin interface. The browser's address bar shows the URL: `localhost/phpmyadmin/index.php?route=/sql&db=librarymanagementsystem&table=books&pos=0`. The phpMyAdmin interface is titled "Server: 127.0.0.1 » Database: librarymanagementsystem » Table: books". The main content area shows the structure of the "books" table, which has four columns: `id`, `title`, `publication_year`, and `category_id`. The table contains 20 rows of data, each with a checkbox for selection and icons for Edit, Copy, and Delete. The left sidebar shows the database structure, with "librarymanagementsystem" selected. The bottom status bar shows system information, including a temperature of 91°F, a search bar, and the time 3:36 PM on 10/31/2024.

id	title	publication_year	category_id
1	Lalsalu	1948	1
2	Padma Nadir 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	Titumir	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 the 'librarymanagementsystem' database. The 'authors' table is selected, showing a list of 21 authors with columns for id, name, nationality, and birth_year. The interface includes a sidebar with a database structure tree, a top navigation bar with various actions like Browse, Structure, SQL, Search, Insert, Export, Import, Privileges, Operations, Tracking, and Triggers, and a bottom status bar with system information.

	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)

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

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

phpMyAdmin

Server: 127.0.0.1 » Database: librarymanagementsystem » Table: book_authors

Recent Favorites

Database: librarymanagementsystem

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

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

Console Check all With selected: Edit Copy Delete Export

91°F Mostly cloudy Search ENG INTL 3:31 PM 10/31/2024

4.Categories 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=categories'. 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 tabs for 'Browse', 'Structure', 'SQL', 'Search', 'Insert', 'Export', 'Import', 'Privileges', 'Operations', 'Tracking', and 'Triggers'. The main content area shows the 'categories' table with 5 rows. The table columns are 'id' and 'category_name'. The rows are: 5 Biography, 4 Historical, 1 Novel, 2 Poetry, and 3 Science Fiction. The interface includes a 'Query results operations' section with buttons for 'Print', 'Copy to clipboard', 'Export', 'Display chart', and 'Create view'. The left sidebar shows a tree view of databases and tables. The bottom status bar shows the system clock as 3:32 PM on 10/31/2024.

5.book_copies table

localhost / 127.0.0.1 / libraryma x x x x +

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

tubebuddy Gmail YouTube Maps All Bookmarks

phpMyAdmin

Server: 127.0.0.1 » Database: librarymanagementsystem » Table: book_copies

Browse Structure SQL Search Insert Export Import Privileges Operations Tracking Triggers

Recent Favorites

<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

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Search

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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

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Search

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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_schemas
- 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

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Search

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