**Library System Database Schema**

This schema utilizes several tables to represent the core entities of a library system and their relationships.

**Tables:**

1. **Books:**
   * **Fields:**
     + **book\_id** (INT, PRIMARY KEY, NOT NULL): Unique identifier for the book.
     + **title** (VARCHAR(255), NOT NULL): Title of the book.
     + **isbn** (VARCHAR(13), UNIQUE, CHECK (LENGTH(isbn) = 13)): International Standard Book Number (unique identifier for published books).
     + **publication\_year** (INT): Year the book was published.
     + **edition** (INT): Edition number of the book.
     + **summary** (TEXT): Brief description of the book.
     + **category\_id** (INT, FOREIGN KEY REFERENCES Categories(category\_id)): Identifier referencing the category the book belongs to (e.g., fiction, non-fiction).
2. **Categories:**
   * **Fields:**
     + **category\_id** (INT, PRIMARY KEY, NOT NULL): Unique identifier for the category.
     + **name** (VARCHAR(50), NOT NULL, UNIQUE): Name of the book category.
3. **Authors:**
   * **Fields:**
     + **author\_id** (INT, PRIMARY KEY, NOT NULL): Unique identifier for the author.
     + **first\_name** (VARCHAR(50), NOT NULL): Author's first name.
     + **last\_name** (VARCHAR(50), NOT NULL): Author's last name.
4. **Book\_Authors:** (Many-to-Many relationship between Books and Authors)
   * **Fields:**
     + **book\_id** (INT, FOREIGN KEY REFERENCES Books(book\_id), PRIMARY KEY (book\_id, author\_id)): References the book identifier.
     + **author\_id** (INT, FOREIGN KEY REFERENCES Authors(author\_id), PRIMARY KEY (book\_id, author\_id)): References the author identifier.
5. **Patrons:**
   * **Fields:**
     + **patron\_id** (INT, PRIMARY KEY, NOT NULL): Unique identifier for the library patron.
     + **first\_name** (VARCHAR(50), NOT NULL): Patron's first name.
     + **last\_name** (VARCHAR(50), NOT NULL): Patron's last name.
     + **address** (VARCHAR(255)): Patron's address.
     + **phone\_number** (VARCHAR(20)): Patron's phone number.
     + **email** (VARCHAR(255), UNIQUE): Patron's email address (unique for identification).
6. **Book\_Copies:**
   * **Fields:**
     + **book\_copy\_id** (INT, PRIMARY KEY, NOT NULL): Unique identifier for the book copy.
     + **book\_id** (INT, FOREIGN KEY REFERENCES Books(book\_id), NOT NULL): References the book this copy belongs to.
     + **condition** (ENUM('Excellent', 'Good', 'Fair', 'Poor')): Condition of the book copy.
7. **Checkouts:**
   * **Fields:**
     + **checkout\_id** (INT, PRIMARY KEY, NOT NULL): Unique identifier for the checkout record.
     + **book\_copy\_id** (INT, FOREIGN KEY REFERENCES Book\_Copies(book\_copy\_id), NOT NULL): References the specific book copy checked out.
     + **patron\_id** (INT, FOREIGN KEY REFERENCES Patrons(patron\_id), NOT NULL): References the patron who checked out the book.
     + **checkout\_date** (DATETIME, NOT NULL): Date and time the book was checked out.
     + **due\_date** (DATETIME, NOT NULL): Date and time the book is due for return.
     + **return\_date** (DATETIME): Date and time the book was returned (null if not returned yet).

**Relationships:**

* A Book can have many Authors (Many-to-Many relationship implemented through Book\_Authors table).
* An Author can write many Books (Many-to-Many relationship implemented through Book\_Authors table).
* A Book can have many Copies (One-to-Many relationship between Books and Book\_Copies).
* A Patron can have many Checkouts (One-to-Many relationship between Patrons and Checkouts).
* A Book Copy can be in one Checkout at a time (One-to-One relationship between Book\_Copies and Checkouts enforced by business logic, not a foreign key).