Database Design Task: Library Management System

Objective:

In this task, you will design a database for a **Library Management System**. You will create three diagrams: a **conceptual model** and **logical model**. The goal is to apply the principles of database design learned in class to a real-world scenario.

Scenario:

You have been hired to design a database for a library. The library needs to track books, members, loans, and publishers. The system should support the following functionalities:

1. **Track Books**: Store information about books, including title, author, ISBN, publisher, publication year, and genre.

2. **Manage Members**: Store information about members, including name, address, phone number, and email.

3. **Track Loans**: Track which books are borrowed by which members, along with the loan date and due date.

4. **Manage Publishers**: Store information about publishers, including name, address, and contact information.

5. **Generate Reports**: The system should be able to generate reports on overdue books, popular genres, and member activity.
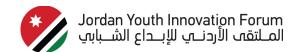
Task Breakdown:

1. Conceptual Model (ER Diagram)

- **Entities**: Identify the major entities (e.g., Books, Members, Loans, Publishers).

- **Relationships**: Define the relationships between entities (e.g., a member can borrow multiple books, a book can have one publisher).

- **Attributes**: List the key attributes for each entity (e.g., Book attributes: Title, Author, ISBN).

- **ER Diagram**: Create an Entity-Relationship (ER) diagram to visually represent the entities and their relationships.

Deliverable: A conceptual model in the form of an ER diagram with entities, relationships, and attributes clearly labeled.

2. Logical Model

- **Tables**: Convert the entities from the conceptual model into tables.

- **Columns**: Define the columns for each table, including data types (e.g., VARCHAR, INTEGER, DATE).

- **Primary Keys**: Identify the primary key for each table.

- **Foreign Keys**: Define foreign keys to establish relationships between tables.

- **Normalization**: Ensure the design is normalized to at least **Third Normal Form (3NF)**.

- **Logical Diagram**: Create a logical model diagram showing tables, columns, primary keys, and foreign keys.

Deliverable: A logical model diagram with tables, columns, primary keys, and foreign keys clearly defined.

Sample Data:

To help you design the database, here is some sample data for the **Books**, **Members**, **Loans**, and **Publishers** tables:

Books Table

BookID	Title	Author	ISBN	PublisherID	PublicationYear	Genre
1	The Great Gatsby	F. Scott Fitzgerald	9780743273565	1	1925	Classic
2	To Kill a Mockingbird	Harper Lee	9780061120084	2	1960	Fiction
3	1984	George Orwell	9780451524935	3	1949	Dystopian
4	Pride and Prejudice	Jane Austen	9780141439518	4	1813	Romance
5	The Catcher in the Rye	J.D. Salinger	9780316769488	5	1951	Fiction

Members Table

MemberID	Name	Address	Phone	Email
1	John Doe	123 Main St, Springfield	555-1234	john.doe@example.com
2	Jane Smith	456 Elm St, Springfield	555-5678	jane.smith@example.com
3	Alice Johnson	789 Oak St, Springfield	555-9101	alice.johnson@example.com
4	Bob Brown	321 Pine St, Springfield	555-1122	bob.brown@example.com
5	Carol White	654 Maple St, Springfield	555-3344	carol.white@example.com

Loans Table

LoanID	MemberID	BookID	LoanDate	DueDate
1	1	1	2023-10-01	2023-10-15
2	2	2	2023-10-02	2023-10-16
3	3	3	2023-10-03	2023-10-17
4	4	4	2023-10-04	2023-10-18
5	5	5	2023-10-05	2023-10-19

Publishers Table

PublisherID	Name	Address	ContactInfo
1	Scribner	123 Publisher Lane, New York	info@scribner.com
2	HarperCollins	456 Publisher Ave, Chicago	info@harpercollins.com
3	Signet Classics	789 Publisher Blvd, Boston	info@signet.com
4	Penguin Classics	321 Publisher Rd, London	info@penguin.com
5	Little, Brown and Co.	654 Publisher St, Los Angeles	info@littlebrown.com

Submission Guidelines:

1. **Conceptual Model**: Submit an ER diagram in PDF or image format.

2. **Logical Model**: Submit a logical model diagram in PDF or image format.

Grading Criteria:

Component	Points	Criteria
Conceptual Model	50	Accuracy of entities, relationships, and attributes.
Logical Model	50	Correctness of tables, columns, primary keys, foreign keys, and normalization.

Tools You Can Use:

- **Diagramming Tools**: Lucidchart, Draw.io, Microsoft Visio, or any ER diagram tool.