Database Project part 1

Database description:

The **Library Management System** is designed to manage books, members, staff, loans, and transactions efficiently. The system includes libraries where each library has a unique ID, name, location, contact number, and established year. Each library must manage books, where each book is identified by a unique ID, ISBN, title, genre, price, availability status, and shelf location. A book belongs to exactly one library, and a library may own many books.
Members can register with personal information such as ID, full name, email, phone number, and membership start date. A member can borrow zero or more books. Each loan links one member with one book and includes loan date, due date, return date, and status.
Each loan may have zero or more fine payments, where a payment is uniquely identified and includes payment date, amount, and method. A payment always corresponds to one specific loan.
Staff work at a specific library, identified by staff ID, full name, position, and contact number. Each library must have at least one staff member, but each staff works at only one library.
Members may also review books, where a review includes a rating, comments, and review date. Each review is linked to a specific book and a specific member. A member can provide multiple reviews, and a book may receive many reviews.

1- Design a complete ERD diagram of the above system includes (entities, attributes, keys, relationships and their attributes, cardinality and participation)

2- Map the ERD diagram into logical schema applying the conversion rules and also apply the normalization rules (first normal form, second normal form, third normal form) showing the final tables structure along with the referential relationships

3- Implement the physical schema of this database by converting the logical schema into sql code that create the above database, and apply the following constraints:

- **All IDs** should be set as IDENTITY.
- **Foreign keys** should **NOT** be identity.
- All **foreign keys** should include ON DELETE CASCADE and ON UPDATE CASCADE.
- The following must be **UNIQUE**:

- Library name
- Book ISBN
- Member email

- The following fields must be **NOT NULL**:

- Library Name, Location, Contact Number
- Book Title, ISBN, Genre, Shelf Location

- Member Email, Membership Start Date
- Loan Date, Due Date, Status
- Payment Date, Amount
- Review Date, Rating

- Use **CHECK constraints**:

- Book Genre should allow predefined values: 'Fiction', 'Non-fiction', 'Reference', 'Children'
- Loan Status: 'Issued', 'Returned', 'Overdue'
- Price and Payment Amount must be **greater than zero**
- Return Date must be **greater than or equal to** Loan Date
- Review Rating between **1 and 5**

- Use **DEFAULT values**:

- Book IsAvailable = TRUE
- Loan Status = 'Issued'
- Review Comments = 'No comments' if not provided