Mini-project Part-1 - Database Design and Normalisation

Q 1: Public Library: - **Business scenario**

In the vibrant city of Geelong, Victoria, the Geelong Regional Library (GRL) stands as an intellectual haven, fostering an atmosphere of lifelong learning and community engagement. With a mission to enrich lives through education, entertainment, and exploration, the GRL's comprehensive services resonate with individuals of diverse backgrounds, ages, and interests.

At the heart of the GRL's operation are its valued members, each with a unique journey seeking knowledge and connection. Members, characterized by their Member ID, embark on a captivating quest driven by curiosity. Armed with the library's extensive collection, they dive into a world of literary treasures spanning across genres, facilitated by the Library Item entity. Every book, eBook, or DVD becomes a portal to adventure, with attributes like Title, Author, ISBN, and Format serving as gateways to these captivating worlds.

The GRL branches themselves, epitomized by the Library Branch entity, emerge as cultural centres within the city's landscape. Each branch boasts its own Branch ID, Branch Name, Address, Phone Number, and Operating Hours, inviting patrons to partake in a harmonious blend of knowledge-seeking and community involvement. The tangible becomes digital as the Loan Transaction entity comes into play, capturing the dance of borrowing and returning items. These transactions, embodied by attributes like Transaction ID, Member ID, Item ID, and Loan Dates, weave a story of shared resources and temporal connections.

A symphony of intellectual discourse and creativity comes alive through the Library Program entity. With attributes such as Program Name, Description, Date, Location, and Attendee Count, the GRL orchestrates a diverse range of workshops, dialogues, and events, fostering connections among patrons and nurturing the cultural fabric of the community. As patrons engage with these programs, they might also encounter the Staff entity, where library personnel take on roles denoted by Staff ID, First Name, Last Name, Position, and affiliations with various Library Branches. These staff members serve as the guides on this journey of exploration and empowerment, acting as bridges between patrons and the wealth of resources at their fingertips.

Together, these entities form the intricate tapestry of the Geelong Regional Library, embodying a shared pursuit of knowledge, connection, and community engagement. As the GRL facilitates interactions, intellectual growth, and meaningful experiences, it continues to evolve as a treasured cornerstone in the lives of those it serves.

Q 2: Entities and Attributes

Based on the business scenario discussed for Geelong Regional Library, the following entities and their attributes are identified:

---> Member:- Member ID (PK), First Name, Last Name, Address, Email, Phone Number, Date of Birth, Membership Type, Membership Expiry Date

---> Library Item: - Item ID (PK), Title, Author, ISBN (International Standard Book Number), Category, Format (e.g., book, eBook, DVD), Publication Year, Availability Status
---> Library Branch: - Branch ID (PK), Branch Name, Address, Phone Number, Operating Hours
---> Loan Transaction: - Transaction ID (PK), Loan Date, Due Date, Return Date, Member ID (FK), Item ID (FK)
---> Library Program: - Program ID (PK), Program Name, Description, Date, Location, and Attendee Count, Branch ID (FK)
---> Staff: - Staff ID (PK), First Name, Last Name, Email, Phone Number, Branch ID (FK)

Q 3: Normalization

Before normalizing the entities, we need to ensure that they are in the First Normal Form (1NF). 1NF requires that there are no repeating groups and that each attribute holds a single value.

-->Member is in 1NF as each attribute holds a single value.
-->Library Item is in 1NF as each attribute holds a single value.
-->Library Branch is in 1NF as each attribute holds a single value.
-->Loan Transaction is in 1NF as each attribute holds a single value.
-->Library Program is in 1NF as each attribute holds a single value.
-->Staff is in 1NF as each attribute holds a single value.

Now, let's proceed to Second Normal Form (2NF) and Third Normal Form (3NF) for each entity:

-->Member: partial and transitive dependencies are absent. So, considered in 2NF and 3NF.
-->Library Item: partial and transitive dependencies are absent. So, considered in 2NF and 3NF.
-->Library Branch: partial and transitive dependencies are absent. So, considered in 2NF and 3NF.
-->Loan Transaction: partial dependency is absent so , already 2NF. Here, "Member ID" and "Item ID" both seem to be non-key attributes that could potentially determine the "Member" and "Library Item" attributes respectively. To remove this transitive dependency and achieve 3NF, you could split the "Loan Transaction" entity into two separate entities: "Loan" and "Transaction.
-->Library Program: partial and transitive dependencies are absent. So, considered in 2NF and 3NF.
-->Staff: partial and transitive dependencies are absent. So, considered in 2NF and 3NF.

Member
Member ID (PK)
First Name
Last Name
Address
Email
Phone Number
Date of Birth
Membership Type
Membership Expiry Date

Library Item
Item ID (PK)
Title
Author
ISBN
Category
Format
Publication Year
Availability Status

Library Branch
Branch ID (PK)
Branch Name
Address
Phone Number
Operating Hours
Item ID

Loan
Transaction ID
Loan Date
Due Date
Return Date

Transition
Transaction ID (PK)
Item ID (FK)
Member ID (FK)

Library Program
Program ID (PK)
Program Name
Description
Date
Location
Attendee Count
Branch ID

Staff
Staff ID (PK)
First Name
Last Name
Email
Phone Number
Branch ID

Q 4: Entity Relationship Diagram (ERD)

MEMBER

PK	MEMBER_ID
	MEMBER_FIRST NAME
	MEMBER_LAST NAME
	MEMBER_ADDRESS
	MEMBER_EMAIL
	MEMBER_PHONE NUMBER
	MEMBER_DATE OF BIRTH
	MEMBER_MEMBERSHIP TYPE
	MEMBER_MEMBERSHIP EXPIRY DATE

STAFF

PK	STAFF_ID
	STAFF_FIRST NAME
	STAFF_LAST NAME
	STAFF_POSITION
	STAFF_EMAIL
	STAFF_PHONE NUMBER
FK	BRANCH_ID

LOAN TRANSACTION

PK	LOAN_ID
	LOAN_DATE
	LOAN_DUE DATE
	LOAN_RETURN DATE
FK1	MEMBER_ID
FK2	ITEM_ID

LIBRARY ITEM

PK	ITEM_ID
	ITEM_TITLE
	ITEM_AUTHOR
	ITEM_ISBN
	ITEM_CATEGORY
	ITEM_FORMAT
	ITEM_PUBLICATION YEAR
	ITEM_AVAILABILITY STATUS

LIBRARY PROGRAM

PK	PROGRAM_ID
	PROGRAM_NAME
	PROGRAM_DESCRIPTION
	PROGRAM_DATE
	PROGRAM_LOCATION
	PROGRAM_ATTENDEE COUNT
FK	BRANCH_ID

LIBRARY BRANCH

PK	BRANCH_ID
	BRANCH_NAME
	BRANCH_ADDRESS
	BRANCH_PHONE NUMBER
	BRANCH_OPERATING HOURS
FK	ITEM_ID