

# **Project Proposal**

**SE953212**

**Database System and Database system design**

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## **1. Business Problem & Motivation**

This database system is designed to improve the ordering process by providing clear information for customers to find the exact book along with all relevant details. Many readers often face difficulties when pre-ordering books from different publishers, as they must rely on third-party sellers who may not always be trustworthy. In addition, book collectors sometimes miss out on rare or special editions due to incomplete or unclear information provided by online stores.

For customers who do not want to handle pre-orders themselves or who do not trust informal sellers, the store acts as a reliable intermediary, ensuring secure and dependable pre-ordering services. To address these issues, our database system provides a more detailed catalog of books to facilitate their classification, identification, and distribution to collectors.

## 2. Business Rules

- Each Book has a set price.
- Each Warehouse has many books.
- Each translated genre has at least one translator.
- Each Member can pre-order many times but all pre-order needs membership.
- Each Warehouse can supply many books to any number of members.
- Each Book can be ordered by any number of customers from more than one warehouse.
- Each Member can order more than one book.
- Each Member must have a unique member id.
- Each Member must provide Email, Phone Number, Address, Date Of Birth.
- Each Order must be associated with one Member.
- Each Order must include at least one book.
- Each Book has at least one genre.
- Each Book has at least one author.
- Each Book must have one ISBN.
- Each Book has at least one publisher.
- Each Book has only one warehouse.
- Each Member can have many Orders
- Each Warehouse has exactly one Warehouse Address.
- Each Pre-Order must belong to one Member.
- Each Pre-Order must contain at least one Pre-Order Detail.
- Each Order must have at least one Order Detail.
- Each Member can have one or more Addresses.
- Each Order has exactly one Receipt or one E-Receipt.
- Each Receipt or E-Receipt can contain multiple Receipt Details or E-receipt Details.
- Each Pre-Order Detail must reference one Book.
- Each Order is processed by one Warehouse.

### 3. Preliminary ER Diagram

After executing our SQL queries, we realized that the original ER diagram needed modification. The initial design allowed each order to contain only one book title, which prevented support for multiple titles within a single order. To fix this, we added an Order\_Detail entity to handle the essential details for each book in an order. The same adjustment was made for Pre\_Order to allow multiple titles as well. Additionally, we introduced new entities for E\_Book and Receipt to properly manage both physical and electronic book transactions.

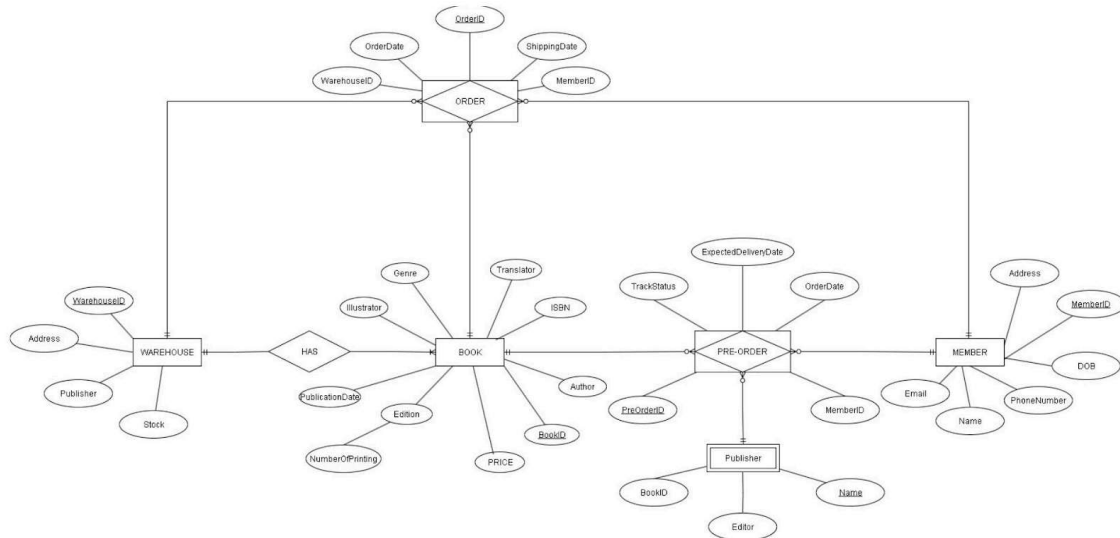


Figure 1 EER Diagram in 1st presentation

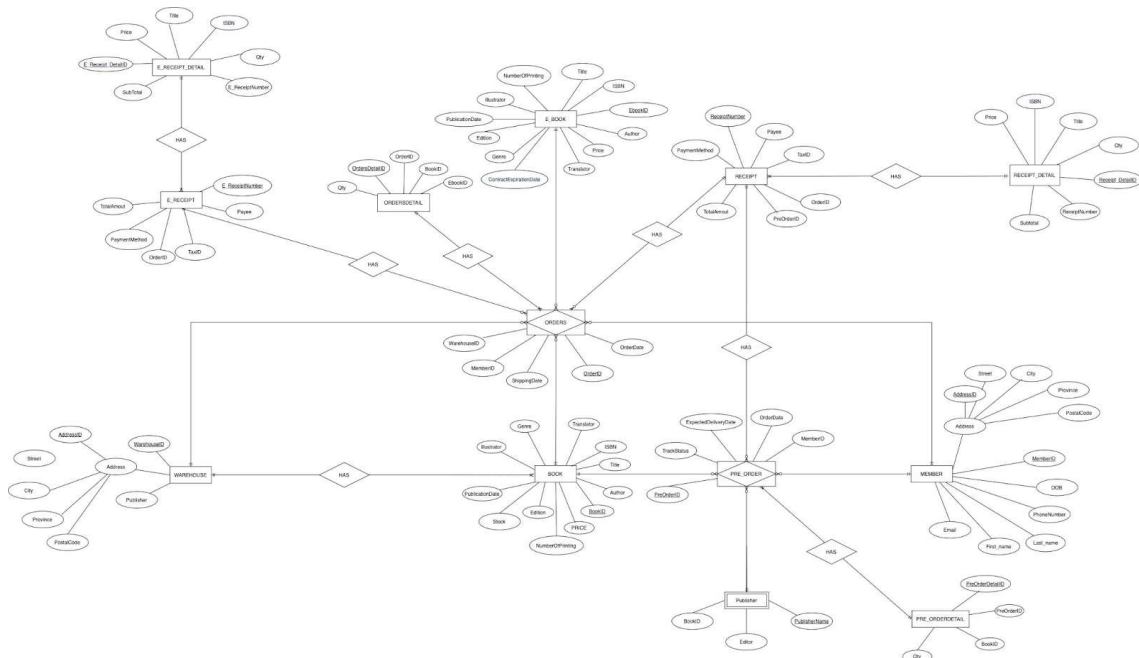


Figure 2 EER Diagram in 2nd presentation

#### 4. Domain Table

Entities	Description	Attribute	Not Null	Description
BOOK	Books that are available in our online book store. Each book record contains details about its identity, publication, and sales information.	BookID (PK)	✓	The ID of a book for our store.
		ISBN	✓	International Standard Book Number.
		Author	✓	A pen name or nom-de-plume is a pseudonym adopted by a book's author.
		Genre	✓	The category in which the book is classified.
		Illustrator		A pen name or nom-de-plume is a pseudonym adopted by a book's illustrator.
		PublicationDate		The first official date that a book is available to the public for purchase.
		Edition		The title of the book edition.
		NumberOfPrintings		It is a set of numbers that indicates which edition of a book it was printed in.
		Translator		A translator's name, who translates a book into a different language.
		Price		The selling price for each book which displayed as a float.
		Title	✓	The name of the book as displayed to users and in transactions.
		Stock		The amount that currently be available to sell in the warehouse
E_BOOK	Informations of digital versions of books which are available for online reading.	EbookID (PK)	✓	The ID of a book for our store.
		ISBN	✓	International Standard Book Number.
		Author	✓	A pen name or nom-de-plume is a pseudonym adopted by a book's author.
		Genre	✓	The category in which the book is classified.
		Illustrator		A pen name or nom-de-plume is a pseudonym adopted by a book's illustrator.

Entities	Description	Attribute	Not Null	Description
		PublicationDate		The first official date that a book is available to the public for purchase.
		Edition		The title of the book edition.
		NumberOf Printings		It is a set of numbers that indicates which edition of a book it was printed in.
		Translator		A translator's name, who translates a book into a different language.
		Price		The selling price for each book which displayed as a float.
		ContractExpiration Date		The date on which the publisher's or author's digital distribution rights expire, after which the e-book may no longer be available for sale.
		Title	✓	The name of the e-book as displayed to users and in transactions.
PUBLISHER	Represents information of the publishing company who is responsible for sending the book.	Name (PK)	✓	The name of the Publisher.
		Editor	✓	The name of the person who decides what will be published in a book or novel.
		BookID	✓	The ID of a book for our store.
WAREHOUSE	Storage locations where books are kept before being shipped to members.	WarehouseID (PK)	✓	A unique identifier for each Warehouse.
		Address	✓	Independent entity, that provides AddressID, Street, City, Province, and PostalCode which are a location of our warehouse.
		Publisher	✓	A publisher's name that sends books to the warehouse.
MEMBER	The customers who register on the bookstore platform.	MemberID (PK)	✓	A unique identifier for each member.
		First_name	✓	The first name of the member.
		Last_name	✓	The last name of the member.
		DateOfBirth		The birth date of the member.

Entities	Description	Attribute	Not Null	Description
		Email	✓	The email address of the member.
		Address	✓	Independent entity that provides <u>AddressID(PK)</u> , Street, City, Province, and PostalCode which are a location of our warehouse.
		PhoneNumber	✓	The contact phone number of the member.
ORDER	Records the details of ready to shipping book purchases and shipping information made by members.	OrderID (PK)	✓	A unique identifier for each order.
		ShippingDate		The date when the order is shipped to the member.
		OrderDate		The date when the order was placed.
		MemberID		A member's ID who placed the order.
		WarehouseID		A warehouse that shipped the order.
ORDER DETAIL	Information of each order included in an order, such as quantity, price, and book ID.	OrderDetailID (PK)	✓	A unique identifier for each record in the Pre_OrderDetail table. It distinguishes individual items within an order.
		OrderID		A foreign key referencing the main Pre_Order table, indicating which order this detail belongs to.
		BookID		A foreign key referencing the Book table, representing the physical book being ordered
		EBookID		A foreign key referencing the EBook table, representing the physical book being ordered
		Qty	✓	An amount of items in the order.
PRE_ORDER	Represents books pre-orders information placed by members before the book officially releases.	PreorderID (PK)	✓	A unique identifier for each pre-order.
		OrderDate		The date when the pre-order was placed.
		TrackStatus		The current status of the pre-order.
		Expected Delivery Date		The estimated date when the pre-order book will be delivered.



Entities	Description	Attribute	Not Null	Description
		MemberID		A member's ID who placed the order.
PRE_ORDER_DETAIL	Contains specific details of each book included in a pre-order, including expected release date and quantity.	PreOrderDetailID (PK)	✓	A unique identifier for each record in the Pre_OrderDetail table. It distinguishes individual items within a pre-order.
		PreOrderID		A foreign key referencing the main Pre_Order table, indicating which pre-order this detail belongs to.
		BookID		A foreign key referencing the Book table, representing the physical book being pre-ordered.
		Qty	✓	An amount of items in the pre-order.
E_RECEIPT	Electronic receipts generated for completed purchases, including payment confirmation and digital signature. Each receipt is linked to a specific order and contains payment details.	E_ReceiptNumber (PK)	✓	Unique identifier for each electronic receipt issued after an order is successfully paid. Serves as the primary key.
		Payee		The name of the individual or entity who made the payment for the order.
		TaxID	✓	A foreign key referencing the Order table, linking the receipt to the specific order it confirms.
		OrderID		A foreign key referencing the Order table, linking the receipt to the specific order it confirms.
		PaymentMethod	✓	The method used to complete the payment (e.g., credit card, debit card, e-wallet, PayPal).
		TotalAmount		The total amount paid for the entire order, including all items, taxes, and fees.
E_RECEIPT_DETAIL	Detailed items of each electronic receipt, specifying the books purchased, quantity, and pricing	E_Receipt_DetailID (PK)	✓	A unique identifier for each record in the E_Receipt_Detail table. Serves as the primary key for the detailed line items.
		E_ReceiptNumber		Foreign key referencing the E_RECEIPT table, indicating which electronic receipt this detail belongs to

Entities	Description	Attribute	Not Null	Description
	information.	Qty	✓	The number of units of the electronic books included in the transaction.
		ISBN	✓	The International Standard Book Number of the book purchased, uniquely identifying the title.
		Title	✓	The title of the book corresponds to the ISBN.
		Price	✓	The unit price of the book at the time of purchase.
		SubTotal	✓	The total cost for this specific item line
RECEIPT	Receipts generated for completed purchases, including payment confirmation. Each receipt is linked to a specific order and contains payment details	ReceiptNumber (PK)	✓	Unique identifier for each receipt issued after an order is successfully paid. Serves as the primary key.
		Payee		The name of the individual or entity who made the payment for the order.
		TaxID	✓	A foreign key referencing the Order table, linking the receipt to the specific order it confirms.
		OrderID		A foreign key referencing the Order table, linking the receipt to the specific order it confirms.
		PreOrderID		A foreign key referencing the Pre-order table, linking the receipt to the specific order it confirms.
		PaymentMethod	✓	The method used to complete the payment (e.g., credit card, debit card, e-wallet, PayPal).
		TotalAmount		The total amount paid for the entire order, including all items, taxes, and fees.
RECEIPT DETAIL	Detailed line items of each receipt, specifying the books	Receipt_DetailID (PK)	✓	A unique identifier for each record in the Receipt_Detail table. Serves as the primary key for detailed receipt items.
		ReceiptNumber		A foreign key referencing the main Receipt

Entities	Description	Attribute	Not Null	Description
	purchased, quantity, and pricing information.			table, indicating which receipt this detail belongs to.
		Qty	✓	The quantity of the specific book item purchased in this transaction
		ISBN	✓	The International Standard Book Number identifying the purchased book title.
		Title	✓	The title of the book included in the receipt detail.
		Price	✓	The unit price of the book at the time of purchase.
		SubTotal	✓	The total cost for this specific item line

## 5. Functional dependencies

BookID  $\rightarrow$  ISBN, Title, Author, Translator, Illustrator, Genre, PublicationDate, Edition, NumberOfPrinting, Stock, Price

EBookID  $\rightarrow$  ISBN, Title, Author, Translator, Illustrator, Genre, PublicationDate, Edition, NumberOfPrinting, Price, ContractExpirationDate

MemberID  $\rightarrow$  First\_Name, Last\_Name, Email, PhoneNumber, DOB

AddressID  $\rightarrow$  MemberID, Street, City, Province, Postcode

WarehouseID  $\rightarrow$  Publisher

WarehouseAddressID  $\rightarrow$  WarehouseID, Street, City, Province, Postcode

OrderID  $\rightarrow$  MemberID, OrderDate, ShippingDate, WarehouseID

OrderDetailID  $\rightarrow$  OrderID, BookID, EBookID, Quantity

PreOrderID  $\rightarrow$  MemberID, BookID, OrderDate, ExpectedDeliveryDate, TrackStatus, BookQuantity

PreOrderDetailID  $\rightarrow$  PreOrderID, BookID, Quantity

ReceiptNumber  $\rightarrow$  PaymentMethod, OrderID, PreOrderID, TaxID, Payee, TotalAmount

ReceiptDetailID  $\rightarrow$  ReceiptNumber, ISBN, Title, Qty, Price, SubTotal

EReceiptNumber  $\rightarrow$  PaymentMethod, OrderID, TaxID, Payee, TotalAmount

PublisherName  $\rightarrow$  BookID, Editor

## 6. First and Third Normalization Form

Book(BookID, ISBN, Title, Author, Translator, Illustrator, Genre, PublicationDate, Edition, NumberOfPrinting, Stock, Price)

E\_Book(EBookID, ISBN, Title, Author, Translator, Illustrator, Genre, PublicationDate, Edition, NumberOfPrinting, Price, ContractExpirationDate)

Member(MemberID, First\_Name, Last\_Name, Email, PhoneNumber, DOB)

Member\_Address(AddressID, MemberID(FK), Street, City, Province, Postcode)

Warehouse(WarehouseID, Publisher)

Warehouse\_Address(AddressID, WarehouseID(FK), Street, City, Province, Postcode)

Orders(OrderID, MemberID(FK), OrderDate, ShippingDate, WarehouseID)

OrderDetail(OrderDetailID, OrderID(FK), BookID(FK), EBookID(FK), Quantity)

Pre\_Order(PreOrderID, MemberID(FK), BookID(FK), OrderDate, ExpectedDeliveryDate, TrackStatus, BookQuantity)

Pre\_Order\_Detail(PreOrderDetailID, PreOrderID(FK), BookID(FK), Quantity)

Receipt(ReceiptNumber, PaymentMethod, OrderID(FK), PreOrderID(FK), TaxID, Payee, TotalAmount)

Receipt\_Detail(ReceiptDetailID, ReceiptNumber(FK), ISBN, Title, Qty, Price, SubTotal)

E\_Receipt(E\_ReceiptNumber, PaymentMethod, OrderID(FK), TaxID, Payee, TotalAmount)

Publisher(PublisherName, BookID(FK), Editor)

### 1st normal form



Figure 3 1st normal form

3rd normal form

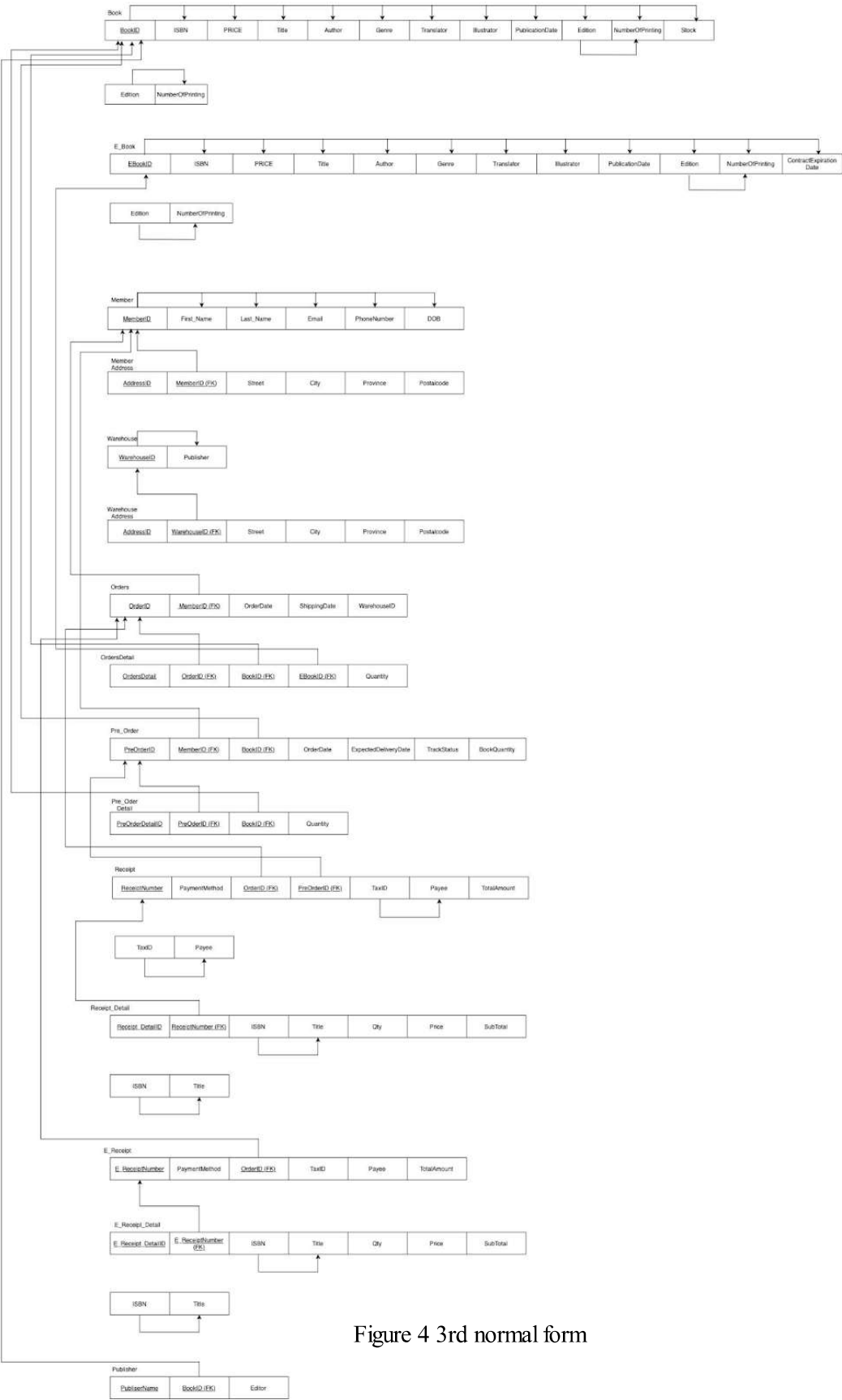


Figure 4 3rd normal form

## 7. Final schema with primary key & foreign key

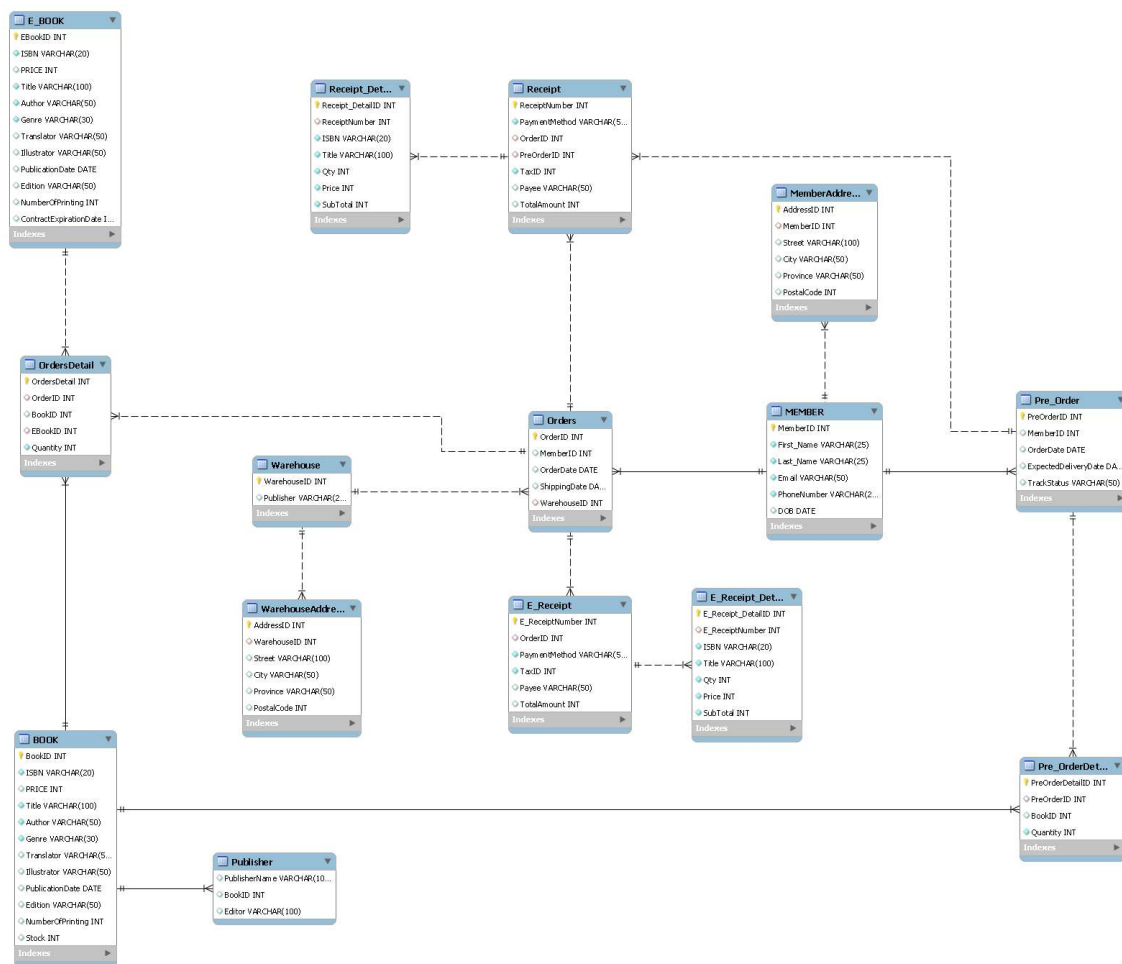


Figure 5 Final schema