



CPCS 241
Databases
Group Project – Phase III

Student Names:

Student Numbers:

Group Number:

Semester: Spring 2022

Submission Date: Monday 15/10/1443 H, 16/05/2022 G

Submission Time: DAR & GAR @ 9:30 AM, IAR @ 12:30 PM

Submission Format: Paper copy + Soft copy via BB

Criteria	Max Mark	Obtained Mark
Normalization	1	
Creation of Tables, Relationships and Constraints	1	
Data Population	1	
Queries	1	
Report Organization	1	
Total	5	

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CPCS241 - Database I - Spring2022 Project

[Naffis Bookstore]

DB Design

Group No: 3

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PART I: Analysis

1 Problem Definition and Data Requirements

1.1 Problem Description

We established a database system of Naffis bookstore to sell and lend books to our customers.

Books are classified into several sections in the bookstore, including philosophy, art, history, and other sections. All the available books are also classified based on age categories, so the book should be suitable for reading according to the customer's age, especially for children. The bookstore provides books for a lot of authors. However, some authors are prohibited from selling their books in the Naffis bookstore. In addition, some books are not allowed to be available in the bookstore.

In general, all customers are able to buy books. But not all customers are able to borrow books; only VIP customers can do that. When a VIP customer wants to borrow books, he/she is limited to at most three borrowed books per month. Furthermore, the customer can return the borrowed books to one of our three branches. In case the returned books were damaged and not in the original condition, the customer will pay a fine, and if the act is repeated, then the customer's name will be added to the black list as well as be prohibited from borrowing books.

The bookstore employees are cashiers and salesmen who accomplish their job by serving customers and performing the customer's orders. Cashiers issue the invoice of the customer's order.

The bookstore provides services to its employees, which are health insurance for them and their dependents and the ability to benefit from the bookstore's offers.

1.2 Data Requirements

1- Customer requirements

Each customer has:

- Unique ID (primary key)
- Name (first name, last name)
- Email
- Gender
- birthDate

- *Age (derived attribute)*
- *Phone number*

VIP customers are a sub-entity of customer entity which has a special attributes:

- *VIP ID*
- *Total number of borrowed books (limited to maximum 3 per month)*

In one word, all customers will have a general membership in the bookstore; if the customer wants to be a VIP customer, then he/she will get a special VIP ID.

2 - Branch requirements

Each branch has:

- *Branch number (primary key)*: Special number for each branch.
- *City*: Name of the city in which the branch is located.
- *Address*: Contains various information, like street name, building number..etc.
- *number of employees (derived attribute)*: Counting all employees in the branch.

3- Book requirements

Each book has:

- *ISBN (primary key)*: International Standard Book Number.
- *Title: Book's name.*
- *Section*: there are two sections in the book store: children section and adults section.
- *Classification* : scientific, philosophy, ..etc.
- *publication date*
- *permissible age*: The minimum age limit for the book reader (ex: age > 15).
- *Language*: English or Arabic only.
- *Price*: The book's price including VAT.
- *Author ID*: A special number for each author.

Books are available to be bought by any customer but be borrowed by only VIP customers.

In terms of bought books, there is an entity called order:

4- Order requirements

Each order has:

- *Unique Order number (primary key)*
- *Order date* : the day in which the pill was created.
- *Order time*: the time in which the pill was created.
- *Customer ID*: special number for each customer.
- *Book ID: ISBN*
- *Employee ID (salesman who served the customer)*
- *Quantity* : number of books that the customer purchased.

- *Discount percent*
- *Total cost*: after applying discounts.
- *Branch number*

In terms of borrowed books, there is an entity called borrows:

5- *Borrows requirements:*

- *Order number*: a special number for each order.
- *Book ID*
- *Borrow date*: the date in which the book will be taken
- *Number of borrowing days*: number of rental days.
- *Return date (derived attribute)*

6- *Author requirements*

Each author has:

- *Author ID (primary key)*
- *First name, last name*

7- *Employee requirements*

Each employee has:

- *Employee ID (primary key)*
- *Employee first, middle, and last name*
- *Start Date*: date of the first day at work.
- *Birth date*
- *Age (derived attribute)*: will be BirthDate - currentDate.
- *Gender*
- *Email*
- *Phone number*
- *Salary*
- *Nationality*
- *Branch number* : the branch where the employee works at .
- *Salesmen and cashiers are sub-entities of employees, and each one has its special attributes.*

- *Cashiers entity special attribute:*

- *Working hours:*

The cashier's salary is determined by his/her working hours per a day.

- *Salesmen entity special attribute:*

- *number of served customers*

The salesman's salary is determined by the number of customers he/she serves per month.

8- *Dependent requirements*

Each employee may have several dependents, and each dependent has:

- Employee ID
- Dependent's first and last name
- Gender
- Birth date
- Phone number: phone number of the dependent.
- Relationship to the employee: mother, grandparent, daughter... etc.

1.3 Business Rules

Customers' rules:

- *There are two types of customers, general customers, and VIP customers.*
- *Both have a unique ID and can purchase any number of books at a time.*
- *VIP members have a special ID in addition.*
- *Only VIP customers are able to borrow books from the store.*
- *In each borrowing or buying operation, the system will check if the customer's age is compatible with the permissible age of the book.*

Borrowing Rules:

- *The maximum number of borrowed books for one VIP customer is three books per month.*
- *When a borrowed book is returned to the bookstore and it is in a bad state, the customer must pay a fine of about 50 SR.*
- *If the same customer returns the borrowed books in bad condition more than three times, then the customer's name will be added to the blacklist. The customer also will not be allowed to borrow books anymore.*
- *The limited time to borrow a book is 30 days. For any delay in returning the book, the customer will pay a fine of 15 SR for each delaying day.*
- *The customer must return the book to the same branch they borrowed from.*

Books' rules:

- *Books are distributed in two sections: children and adults sections.*
- *Each book is categorised into several classifications: science, art, history, philosophy, novels, and religious books.*
- *In naffis bookstore, books are available only in two languages: English and Arabic.*

Employees' rules:

- *There are two types of employees: Salesmen and cashiers.*
- *Salesmen's salary is determined by the number of customers they serve per month.*
- *One salesman can serve more than one customer, but a customer is served by only one salesman.*
- *Cashier's salary is determined by working hours per day.*
- *Each employee must work in only one branch, and a single branch can have many employees.*
- *Each employee may have several dependents, and each dependent may be related to several employees.*

Authors' rule:

- *A single author can write several books.*
- *A book may be written by more than one author.*

1.4 Intended Output of the system

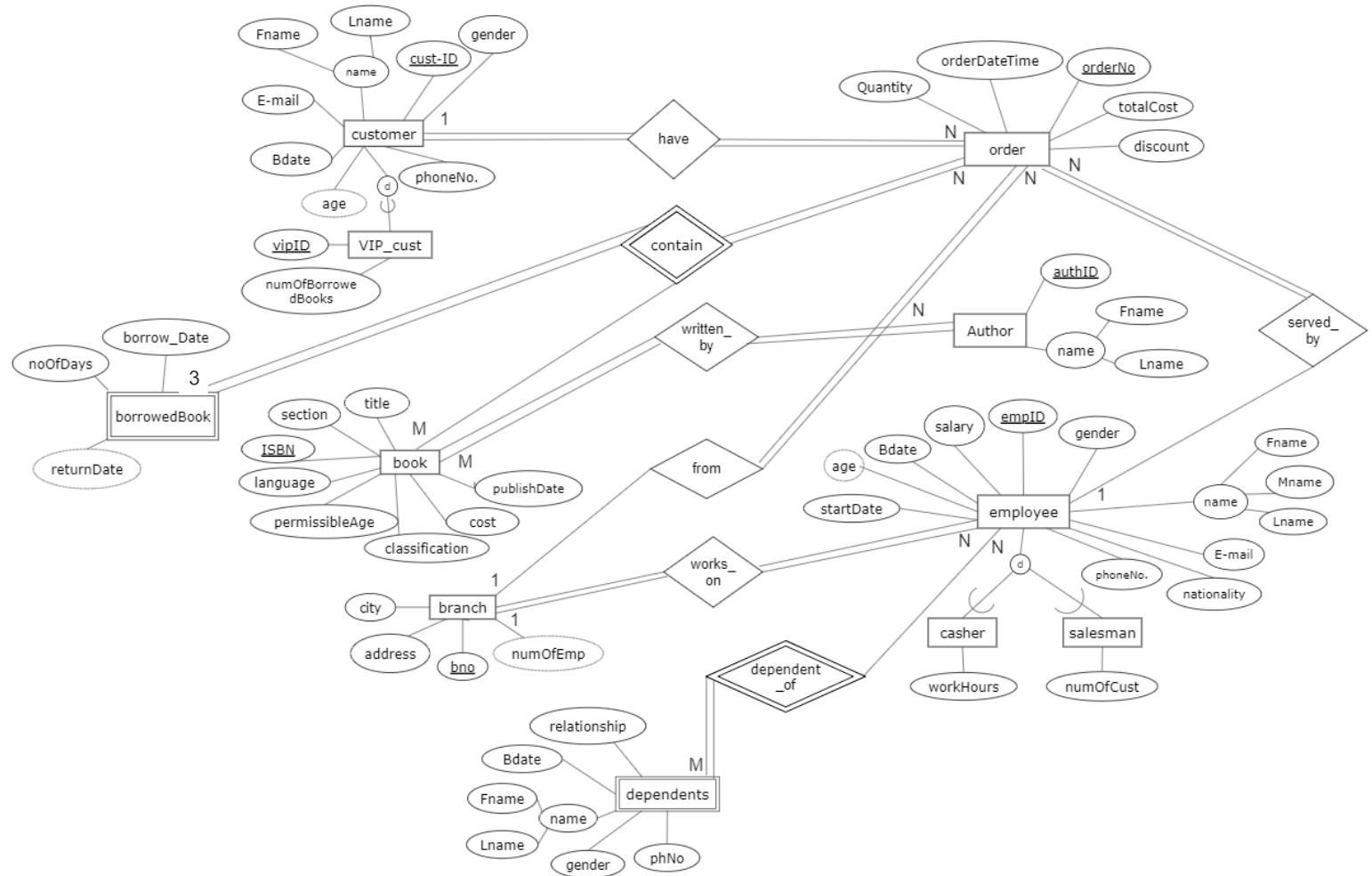
The desired outputs of the bookstore system will be as the following:

1. *Books of the most popular authors, who are Ghazi Al Qusaibi and Ghada Al Samman .*
2. *Customers who ordered during April, 2022.*
3. *Information of the customer who ordered the most in the bookstore.*
4. *The employee in the salesmen section who served the highest number of customers in all branches of the bookstore.*
5. *The employees who have dependents in the bookstore, and the number of dependents for each.*

PART II: DB DESIGN

2 ER Diagram Design

2.1 ER diagram



2.2 Design of Business Rules

In this subsection, show how the business rules have been translated into design decisions. Some business rules can be deployed during the implementation phase only. Provide sufficient justification.

Business Rule	Design Decisions	Justification (if any)
<i>Each employee must work in only one branch, and a branch can have many employees</i>	N:1 <i>Binary relationship between EMPLOYEE and BRANCH.</i>	<i>A single employee cannot work in two branches at the same time. However, a single branch may have several salesmen to serve customers and cashiers to issue their invoice.</i>
<i>Each order should be done in one branch, and in each branch many orders can be generated.</i>	N:1 <i>Binary relationship between ORDER and BRANCH</i>	<i>Many customers can make orders in one branch, but a single customer cannot make an order in more than one branch at the same time.</i>
<i>A book can be written by several authors, and an author can write many books.</i>	N:M <i>Binary relationship between AUTHOR and BOOK.</i>	<i>Several authors can collaborate to write a single book, and a single author can write and publish many books.</i>
<i>Each employee may have several dependents, and each dependent may be related to several employees.</i>	M:N <i>Binary relationship between EMPLOYEE and DEPENDENT</i>	<i>A dependent may be related to more than one employee. For example, if we have two employees in the database who are siblings, then they may have the same dependents like the mother.</i>
<i>A customer can make many orders, and each order should be done by one customer.</i>	1:N <i>Binary relationship between CUSTOMER and ORDER</i>	<i>It's possible for a customer to have many orders in different branches, but each order must be generated for only one customer.</i>

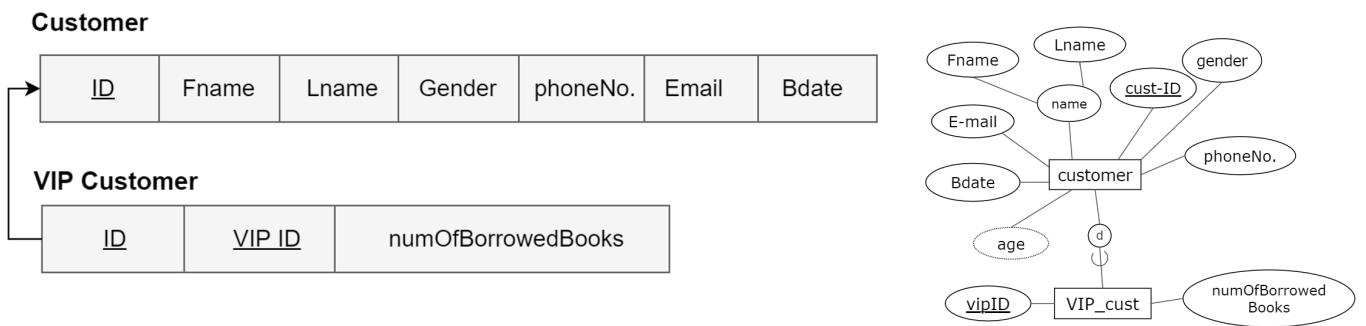
<p><i>An employee can serve many orders, and each order is served by only one employee.</i></p>	<p>N:1 <i>binary relationship between ORDER and EMPLOYEE</i></p>	<p><i>The main role of salesmen employees is to serve the customers. When generating the customer's order, the ID of the salesman who served this customer should be included in the order details. According to this, a salesman can serve many customers, and each customer can be served by only one salesman.</i></p>
<p><i>The customer's order is either for purchasing books or borrowing books.</i></p>	<p>Ternary relationship between ORDER and BOOK and BORROWED_BOOKS</p>	<p><i>Any customer in our bookstore can make orders for purchasing books, and as we mentioned before, only VIP customers can make orders for borrowing books for at most three books for each VIP customer. Therefore, an order may be for purchasing or borrowing books from our bookstore.</i></p>

3 ER-to-logical schema mapping

3.1 Mapping of Regular Entity Types

Each regular entity will have a relation with its attributes, one of these attributes will be the primary key (the underlined attribute in each entity), which is unique data.

1- Mapping customer entity and VIP customer subentity:



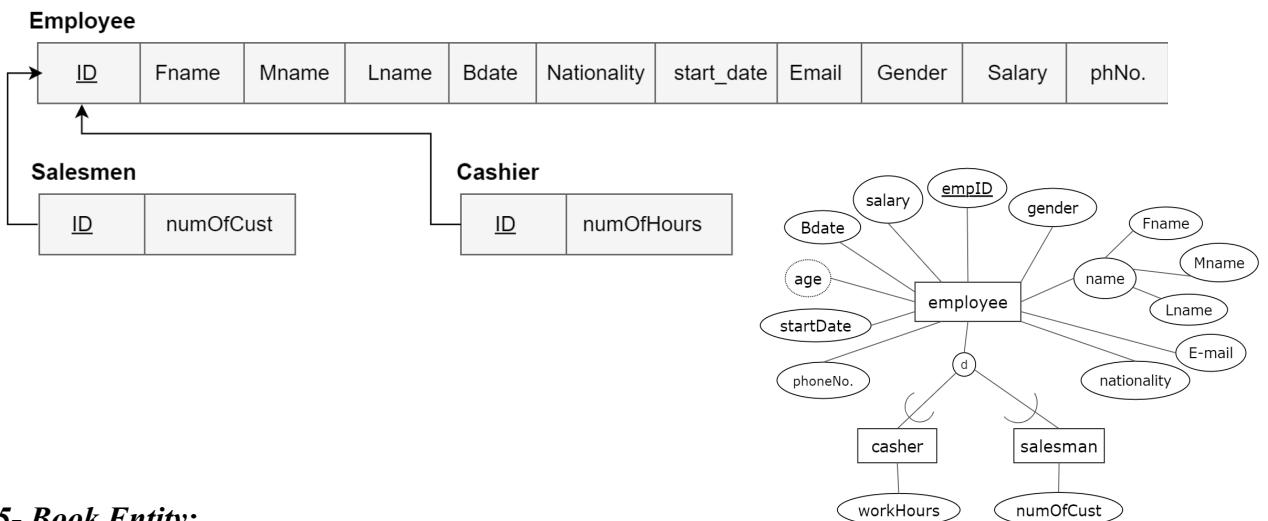
2- Order entity:



3- Branch Entity:



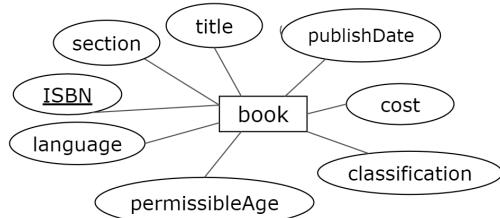
4- Employee entity and its subclasses:



5- Book Entity:

Book

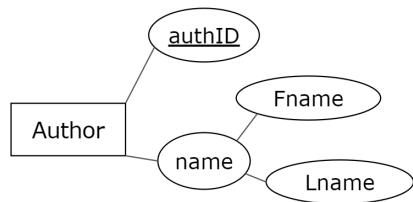
ISBN	title	publisDate	permissAge	Cost	Classification	Section	Language
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6- Author entity:

Author

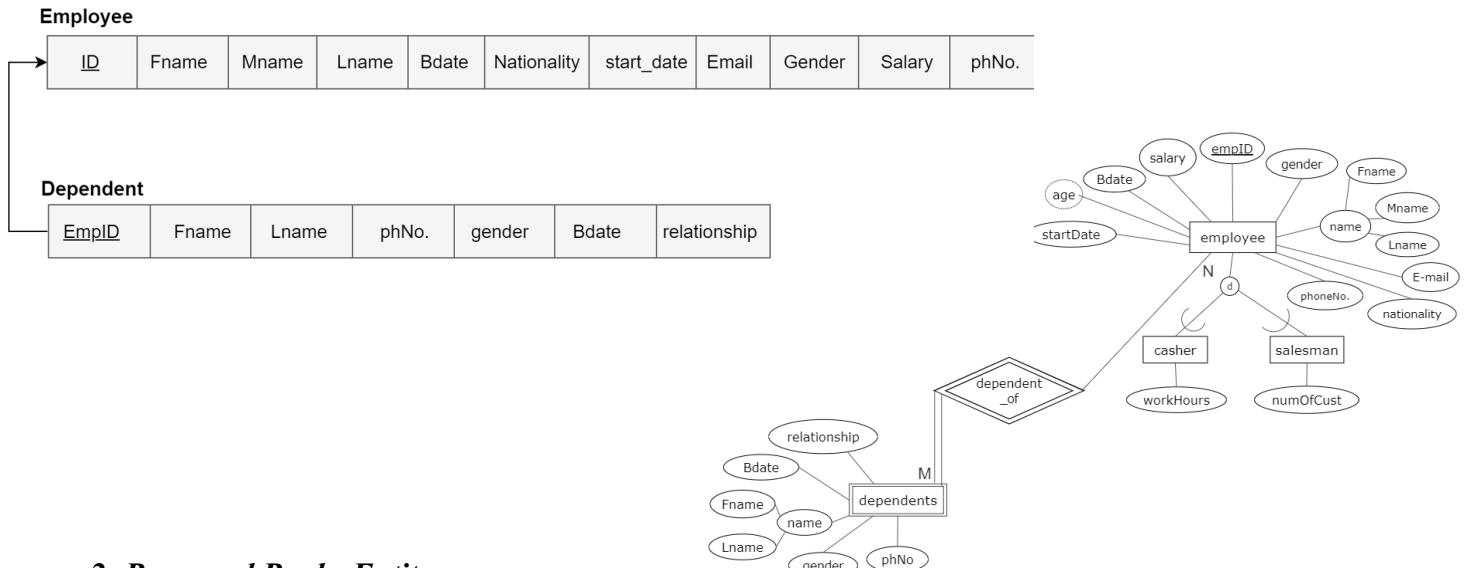
AuthorID	Fname	Lname
----------	-------	-------



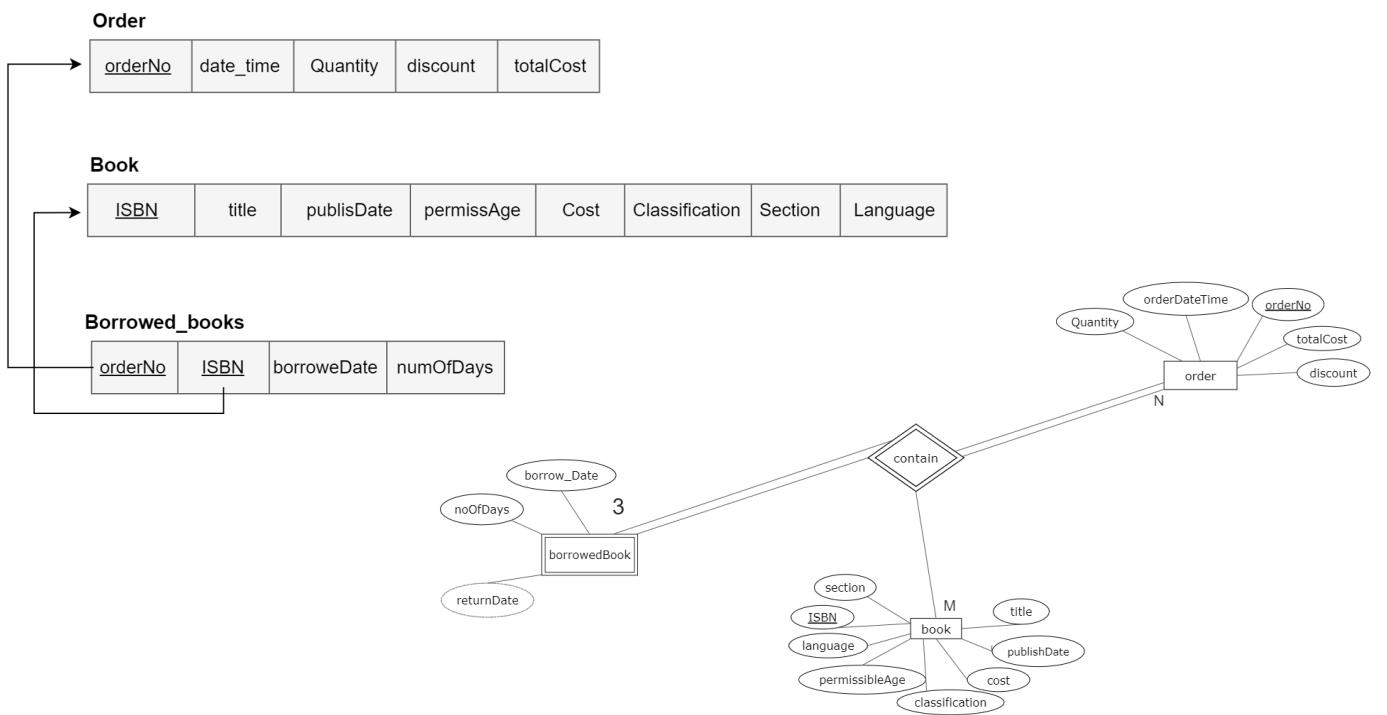
3.2 Mapping of Weak Entity Types

Two weak entities in the database: dependent and borrowed books. Weak entities do not have primary keys. Instead, they have partial keys (underlined):

1- Dependent Entity:



2- Borrowed Books Entity:



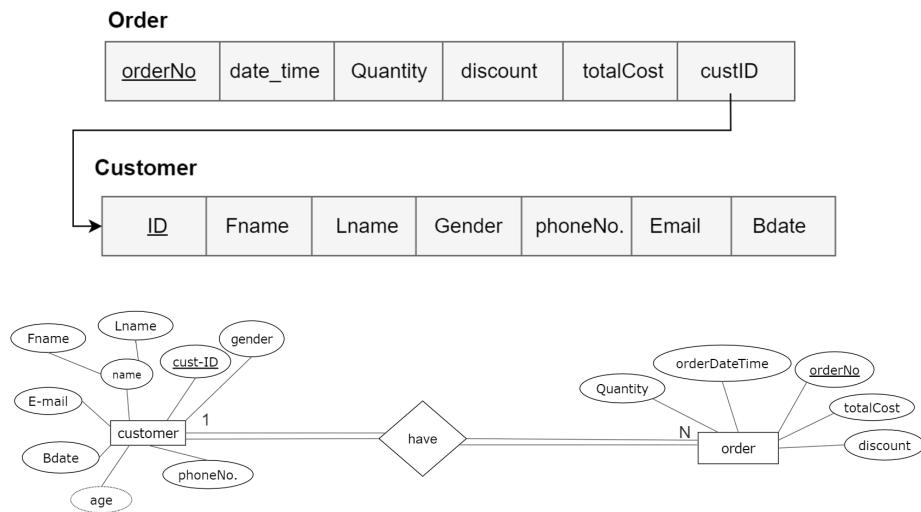
3.3 Mapping of binary 1-1 relationship types

We don't have 1:1 relationship types.

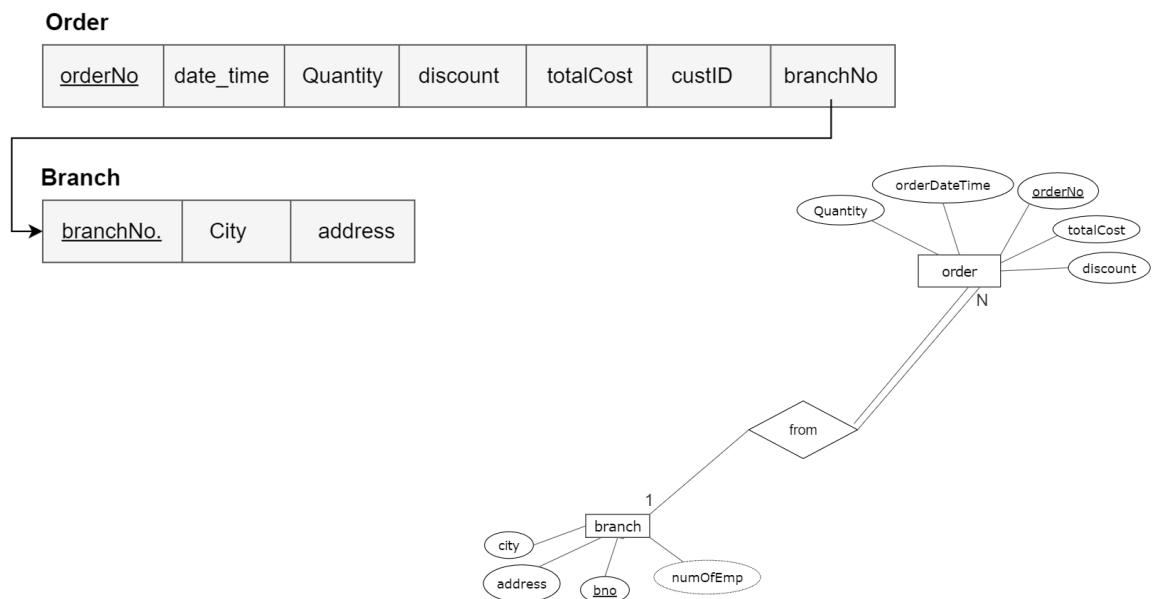
3.4 Mapping of binary 1-N relationship types

Four 1-N relationships in the database:

1- customer HAVE order



2- order FROM branch



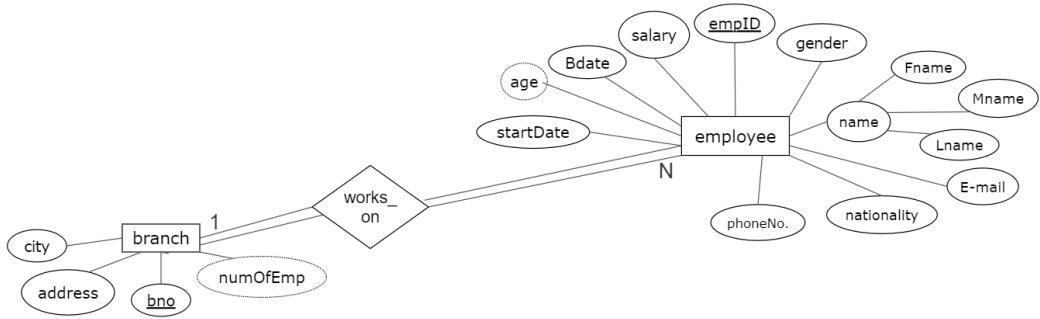
3- employee WORKS_ON branch

Employee

ID	Fname	Mname	Lname	Bdate	Nationality	start_date	Email	Gender	Salary	phNo.	branchNo
----	-------	-------	-------	-------	-------------	------------	-------	--------	--------	-------	----------

Branch

branchNo.	City	address
-----------	------	---------



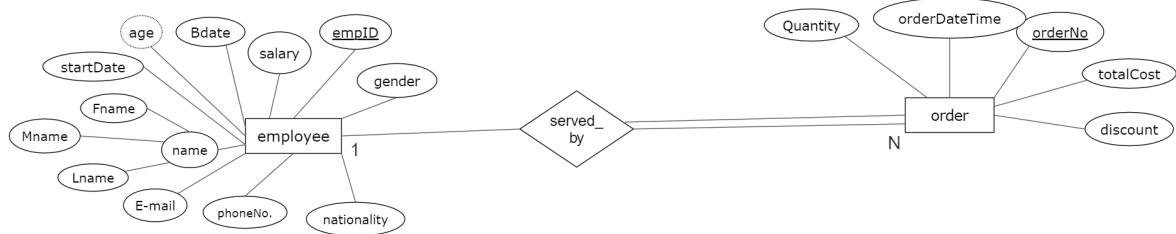
4- order SERVED_BY employee

Order

orderNo	date_time	Quantity	discount	totalCost	custID	branchNo	empID
---------	-----------	----------	----------	-----------	--------	----------	-------

Employee

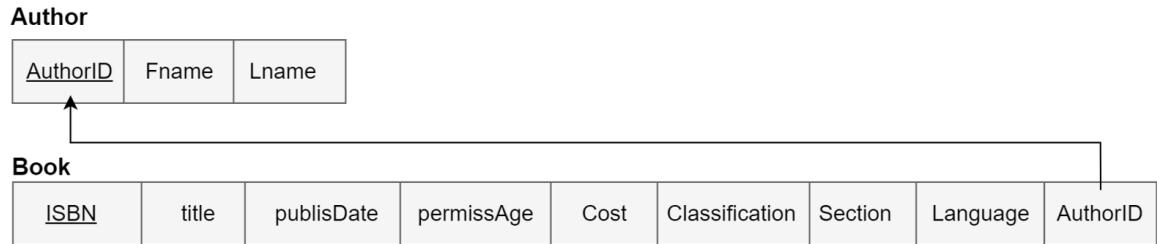
ID	Fname	Mname	Lname	Bdate	Nationality	start_date	Email	Gender	Salary	phNo.
----	-------	-------	-------	-------	-------------	------------	-------	--------	--------	-------



3.5 Mapping of binary M-N relationship types

There is one binary M-N relationship type:

1- book WRITTEN_BY author

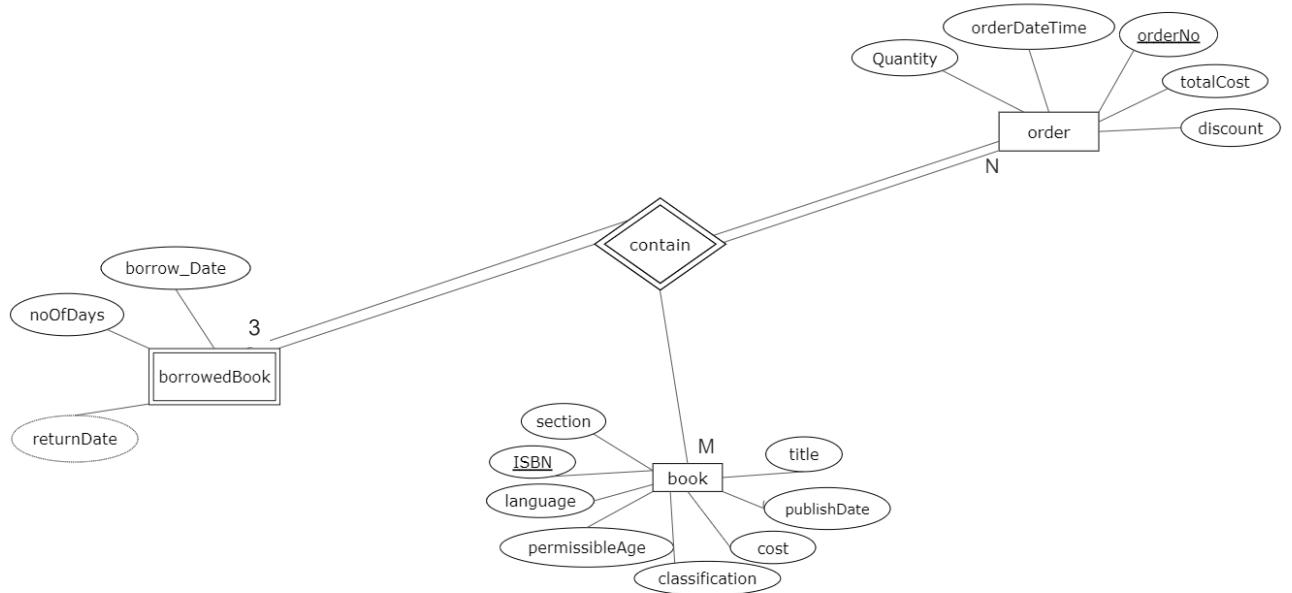
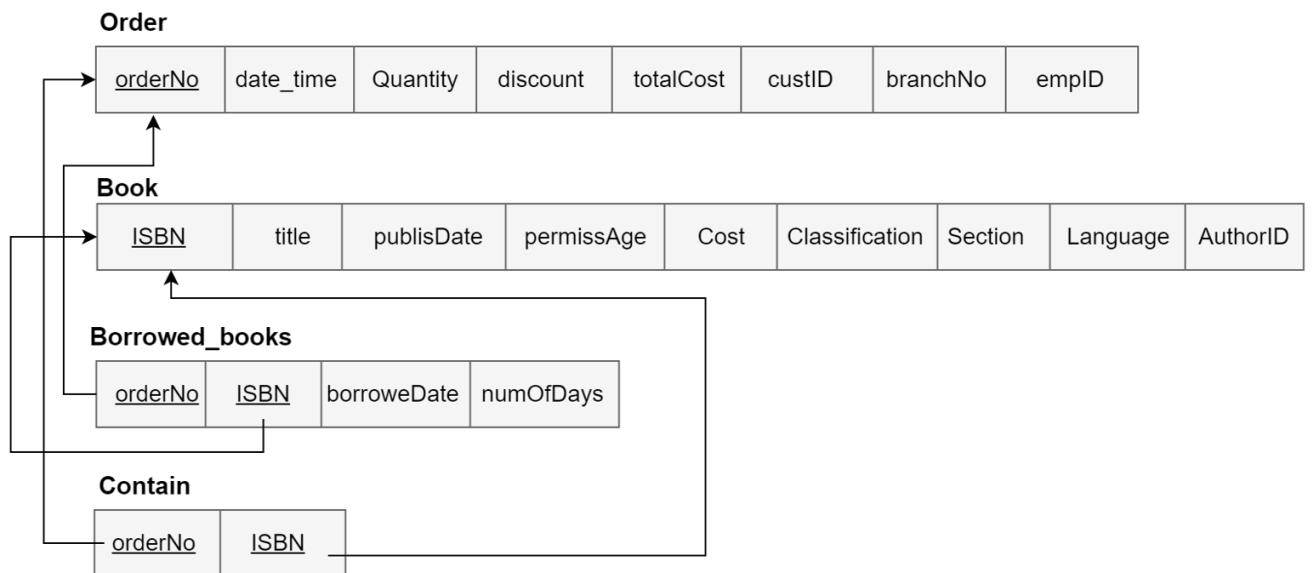


3.6 Mapping of multivalued attributes

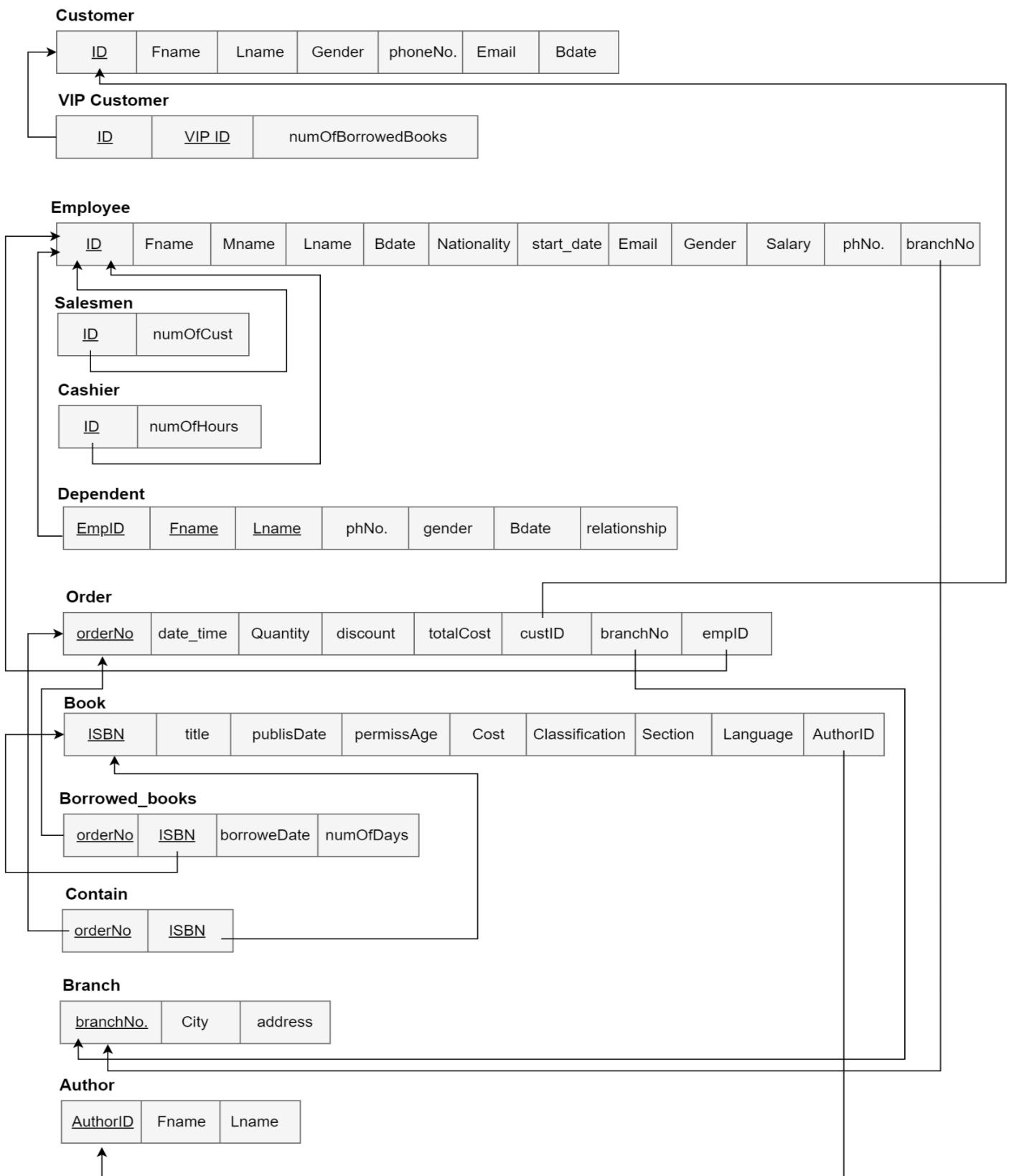
We don't have multi-valued attributes.

3.7 Mapping of n-ary relationship types

There is a ternary relationship type:



3.8 Schema Diagram



4 Normalization

4.1 First Normal Form

Since a 1NF schema means that no attribute is multivalued or composite, we have to normalise each table that contains such mistakes.

We have no multivalued attribute, but we do have a composite attribute “Name” in the Author, employee, costumer, and dependent entities; so we will add extra columns to each of the tables in order to have a single value for each attribute.

Employee

MName	<u>ID</u>	FName	LName	Email	Start Date	Gender	Birth Date	phone number	Salary	branchNo	Nationality
-------	-----------	-------	-------	-------	------------	--------	------------	--------------	--------	----------	-------------

Salesmen

<u>ID</u>	numOfCust	<u>ID</u>	numOfHours
-----------	-----------	-----------	------------

Branch

<u>branchNum</u>	City	Street	<u>Author ID</u>	FName	Lname
------------------	------	--------	------------------	-------	-------

Books

Author Name	publishYear	Permission Age	<u>ISBN</u>	Cost	Classification	Language	authID	bookTitle	Section
-------------	-------------	----------------	-------------	------	----------------	----------	--------	-----------	---------

Customer

<u>ID</u>	FName	LName	Age	Gender	Birth Date	phone number	Email
-----------	-------	-------	-----	--------	------------	--------------	-------

VIP Customer

<u>ID</u>	<u>VIP ID</u>	numOfBorrowedBooks
-----------	---------------	--------------------

Borrowed Books

<u>VIP ID</u>	Borrowed Date	branchNum	numOfDays	returnDate
---------------	---------------	-----------	-----------	------------

Order

Time	Discount	Order Date	Book ID	Emp ID	CustID	totalCost	branchNo	Quantity	<u>orderNum</u>
------	----------	------------	---------	--------	--------	-----------	----------	----------	-----------------

Dependent

FName	LName	birth date	phone number	Gender	<u>Emp ID</u>	Relation
-------	-------	------------	--------------	--------	---------------	----------

4.2 Second Normal Form

For the schema to be in the 2NF form, it should first be in the !NF form, and it shouldn't contain any Partial Dependency; which means all attributes must be functionally dependent on the primary key.

Employee

MName	ID	FName	LName	Email	StartDate	Gender	Birth Date	phone number	Salary	branchNo	Nationality
-------	----	-------	-------	-------	-----------	--------	------------	--------------	--------	----------	-------------

$\{ID\} \rightarrow FName, MName, LName, Email, StartDate, Gender, BirthDate, PhoneNumber, Salary, BranchNo, Nationality$. All are full FD on ID.

Salesmen

ID	numOfCust
----	-----------

$\{ID\} \rightarrow numOfCust$

Cashier

ID	numOfHours
----	------------

$\{ID\} \rightarrow numOfHours$

Branch

branchNum	City	Street
-----------	------	--------

$\{branchNum\} \rightarrow City, Street$

Author

AuthorID	FName	Lname
----------	-------	-------

$\{AuthorID\} \rightarrow FName, Lname$

Books

Author Name	publishYear	Permission Age	ISBN	Cost	Classification	Language	authID	bookTitle	Section
-------------	-------------	----------------	------	------	----------------	----------	--------	-----------	---------

$\{ISBN\} \rightarrow AuthorName, PermissionAge, PublishYear, Cost, Classification, Language, AuthID, bookTitle, Section$

Customer

ID	FName	LName	Age	Gender	Birth Date	phone number	Email
----	-------	-------	-----	--------	------------	--------------	-------

$\{ID\} \rightarrow FName, LName, Age, Gender, BirthDate, PhoneNumber, Email$

VIP Customer

ID	VIP ID	numOfBorrowedBooks
----	--------	--------------------

$\{ID, VIPID\} \rightarrow numOfBorrowedBooks$

Borrowed Books

VIP ID	Borrowed Date	branchNum	numOfDays	returnDate
--------	---------------	-----------	-----------	------------

$\{VIPID\} \rightarrow Borrowed Date, BranchNum, numOfDays, returnDate$

Order

Time	Discount	Order Date	Book ID	Emp ID	CustID	totalCost	branch	Discount	TotalCost
------	----------	------------	---------	--------	--------	-----------	--------	----------	-----------

$Discount \rightarrow TotalCost$

$\{orderNum\} \rightarrow Time, Discount, OrderDate, bookID, EmpID, CustID, totalCost, Quantity$

Dependent

FName	LName	Emp ID	phone number	Gender	BirthDate	Relation
-------	-------	--------	--------------	--------	-----------	----------

$\{FName, LName, EmpID\} \rightarrow PhoneNumber, Gender, BirthDate, Relation$

4.3 Third Normal Form

For the schema to be in 3NF, it must disallow Transitive Dependency.

In our system we have only one of this kind of dependency, which is in Customer between Age and the BirthDate; where BirthDate is dependent on Age, but since Age isn't primary key, we have to eliminate this relation:

Customer							
ID	FName	LName	Age	Gender	Birth Date	phone number	Email
↑	↑	↑	↑	↑	↑	↑	↑

↑
↓

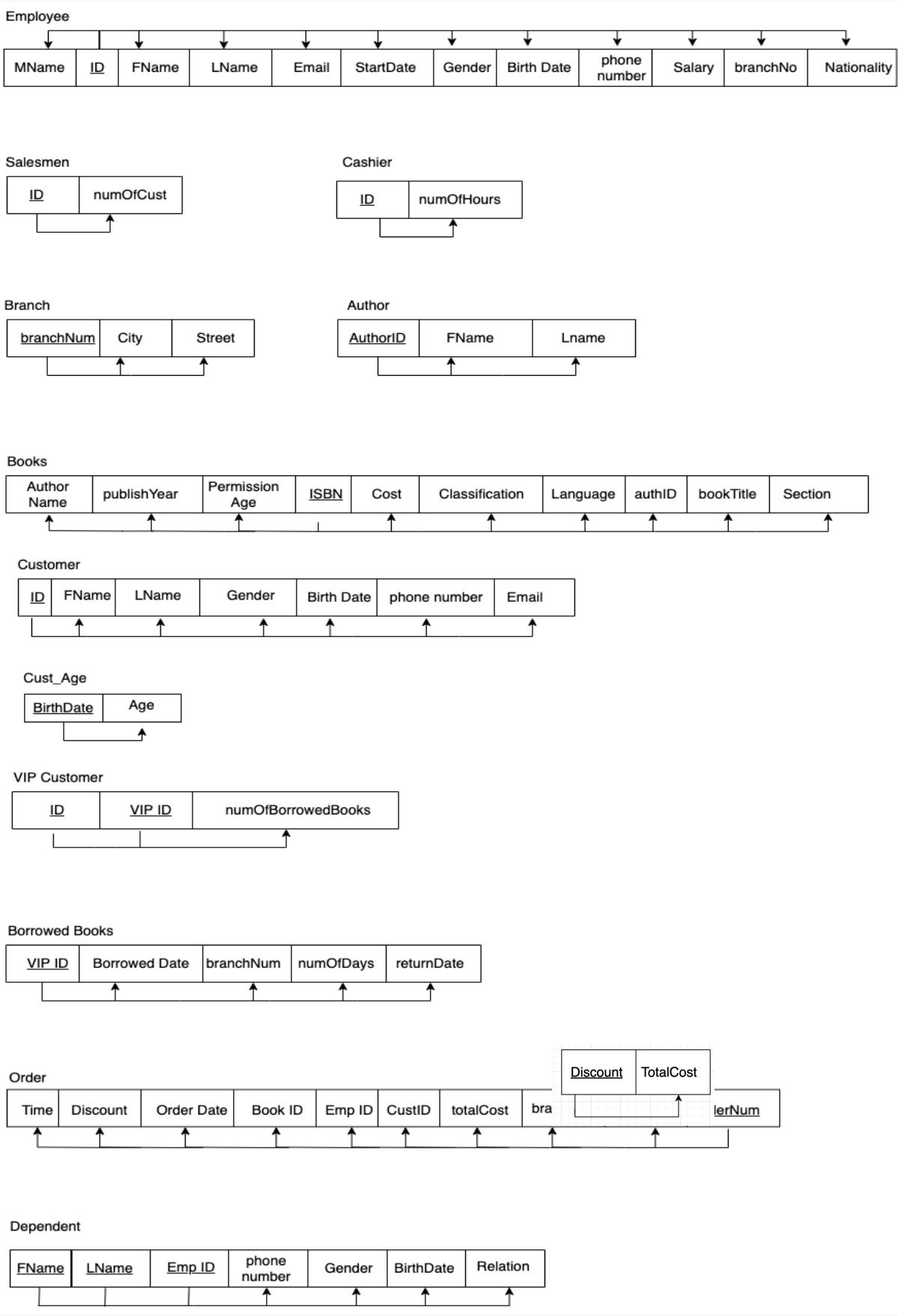
We will separate the relation and create new one, in order to prevent Transitive Dependency and fill the 3NF condition

Customer						
ID	FName	LName	Gender	Birth Date	phone number	Email
↑	↑	↑	↑	↑	↑	↑

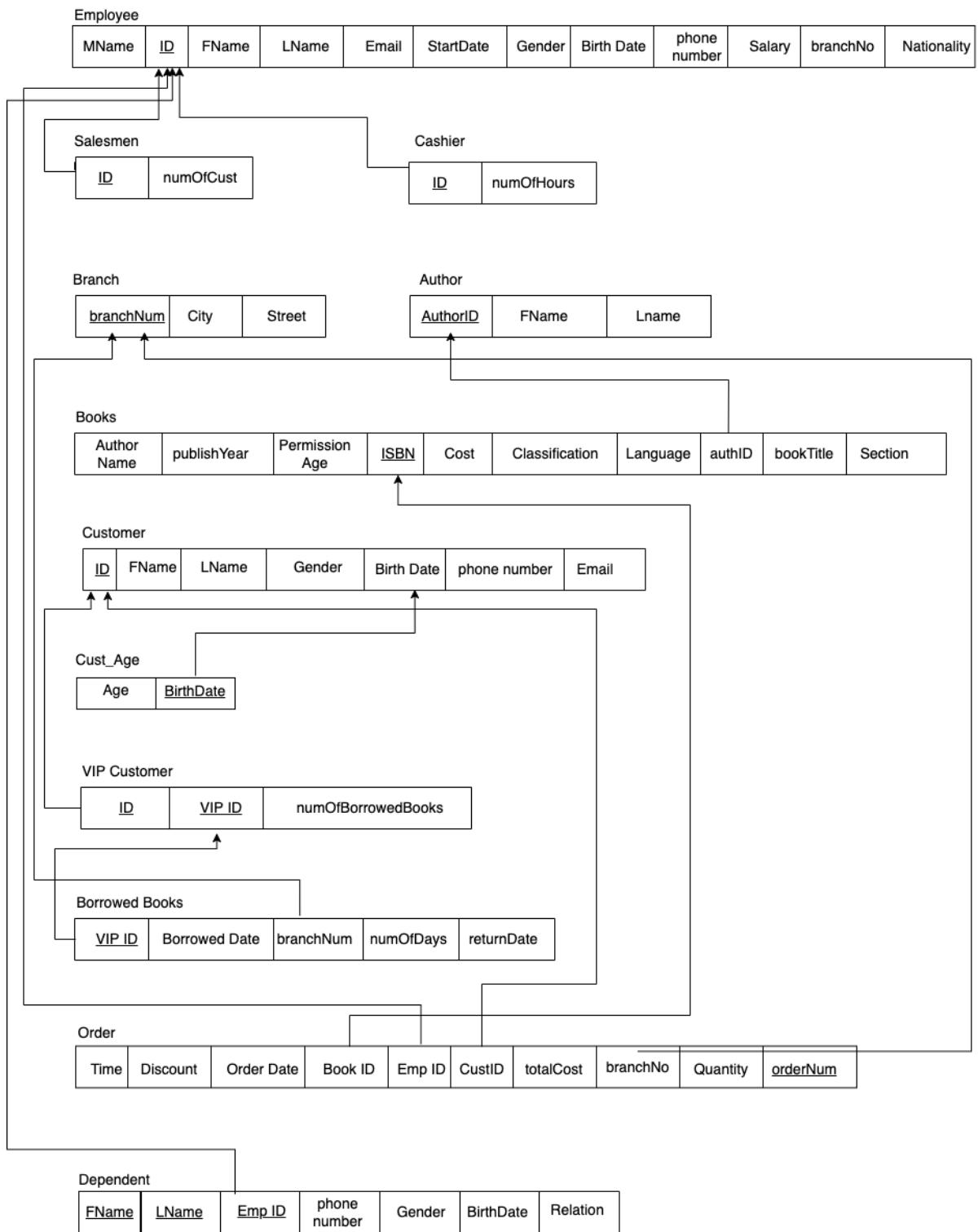
Cust_Age	
BirthDate	Age
↑	↑

After modification and decomposing we have: {ID} \rightarrow FName, LName, Age, Gender, PhoneNumber, Email.

And {Age} \rightarrow BirthDate



5 Final DB Schema Diagram



PART III: IMPLEMENTATION

6 Table Creation Script

6.1 <*Author*> TABLE

```
CREATE TABLE Author(  
    fname varchar2(50),  
    lname varchar2(50),  
    author_id number(8) Not Null,  
    Primary Key (author_id)  
);
```

6.2 <*Books*> TABLE

```
CREATE TABLE Books(  
    author_id number(8) Not Null,  
    ISBN number(15) Not Null,  
    book_title varchar2(300) Not Null,  
    section varchar2(70),  
    permissible_age number(2) Not Null,  
    book_language varchar2(15),  
    price number(4),  
    classification varchar2(50) Not Null,  
    publish_date date,  
    Primary Key(ISBN) ,  
    Foreign Key (author_id) References Author(author_id) ON DELETE CASCADE  
);
```

6.3 < Branch > TABLE

```
CREATE TABLE Branch(  
    b_number number(2) not null,  
    city varchar2(100) not null,  
    street varchar2(300) not null,  
    num_of_employees number(5),  
    Primary Key(b_number)  
);
```

6.4 < Customer > TABLE

```
CREATE TABLE Customer (  
    fname varchar2(50),  
    lname varchar2(50),  
    cust_id number(8) Not Null Primary Key,  
    email varchar(30) ,  
    age number(2) Not null ,  
    phone_num number(10),  
    Gender varchar2 (6),  
    birthDate date  
);
```

6.5 < Employee > TABLE

```
CREATE TABLE Employee (  
    empID number(10) Not null Primary Key,
```

```

        fname varchar2(50),
        mname varchar2(50),
        lname varchar2(50),
        gender varchar2(10),
        salary float(10),
        birthDate date,
        startDate date,
        email varchar2(30),
        age number(2) Not null,
        Nationality varchar2(50),
        branch_num number(2),
        phone number(10),
        Foreign Key (branch_num) References Branch(b_number) ON DELETE CASCADE
    );

```

6.6 < *Orders* > TABLE

```

CREATE TABLE Orders (
    orderDate date,
    OrderTime time,
    orderNo number(10) Not Null UNIQUE,
    cust_id number(8) Not null,
    book_id number(15) Not null,
    Quantity number(4),
    total_cost number(5),

```

```

branch_num number(2),
discount number(2),
empID number(7),
Foreign Key (cust_id) References Customer(cust_id) ON DELETE CASCADE,
Foreign Key (book_id) References Books(ISBN) ON DELETE CASCADE,
Foreign Key (branch_num) References Branch(b_number) ON DELETE CASCADE,
Foreign Key (empID ) References Employee(empID) ON DELETE CASCADE
);

```

6.7 < *Dependents* > TABLE

```

CREATE TABLE Dependents (
employeeID number(10) Not null,
fname varchar2(50),
lname varchar2(50),
birthDate date,
gender varchar2(10),
phone_num number(10),
Foreign Key (employeeID) References Employee(empID) ON DELETE CASCADE,
Primary Key (employeeID, fname, lname)
);

```

6.8 < *VIP Customer* > TABLE

```

CREATE TABLE VIP_Customer (
vip_id number(8) Not Null Primary Key,
num_of_borrowed_books number(1),

```

```
Foreign Key (vip_id) References Customer(cust_id) ON DELETE CASCADE,  
CHECK ( num_of_borrowed_books <= 3)  
);
```

6.9 <*Salesmen*> TABLE

```
CREATE TABLE Salesmen (  
    empID number(10) Not null Primary Key,  
    num_of_served_cust number(5),  
    Foreign Key (empID) References Employee(empID) ON DELETE CASCADE  
);
```

6.10 <*Cashiers*> TABLE

```
CREATE TABLE Cashiers (  
    empID number(10) Not null Primary Key,  
    work_hours number(5),  
    Foreign Key (empID) References Employee(empID) ON DELETE CASCADE  
);
```

6.11 <*Borrowed Books*> TABLE

```
CREATE TABLE BorrowedBooks(  
    ISBN number(8) Not Null,  
    borrowedDate date,  
    returnDate date,  
    num_of_days number(30),  
    orderNo number(7),
```

Foreign Key (ISBN) References Books(ISBN) ON DELETE CASCADE,
 Foreign Key (orderNo) References OrdersPJ(orderNo) ON DELETE CASCADE,
 Primary key (OrderNo, ISBN)
);

7 Constraints Script

<i>Business Rule</i>	<i>SQL Script</i>	<i>Table</i>
<i>Each customer, author and employee has a unique national ID</i>	<i>Cust_id number(8) Not Null Primary Key</i> <i>empID number(10) Not null Primary Key</i> <i>author_id number(8) Not Null</i>	<i>custmore</i> <i>employee</i> <i>author</i> <i>salesmen</i> <i>cashiers</i> <i>Dependents</i>
<i>Each book has a unique ISBN number and ISBN is foreign key</i>	<i>ISBN number(15) Not Null</i> <i>Primary Key(ISBN)</i>	<i>books</i>
<i>Book title should not be null</i>	<i>book_title varchar2(300) Not Null</i>	<i>books</i>
<i>Possible age should not be null</i>	<i>permissible_age number(2) Not Null</i>	<i>books</i>
<i>Book's classification should not be null</i>	<i>classification varchar2(50) Not Null</i>	<i>books</i>

<i>A branch has to have a specific number, city and street to be added</i>	<p><i>b_number number(2) not null</i></p> <p><i>city varchar2(100) not null,</i></p> <p><i>street varchar2(300) not null</i></p> <p><i>Primary Key(b_number)</i></p>	<i>Branch</i>
<i>Customer's and employee's age should be known</i>	<i>age number(2) Not null</i>	<i>customer</i> <i>employee</i>
<i>Vip customers should have a unique vip id</i>	<i>vip_id number(8) Not Null</i> <i>Primary Key</i>	<i>Vip_customer</i>
<i>Vip customer limit for borrowed books per month should be more than three</i>	<i>CHECK (num_of_borrowed_books <= 3)</i>	<i>Vip_customer</i>
<i>Specifc details about the order should be assigned (order number, customer id and book id)</i>	<p><i>orderNo number(10) Not Null</i></p> <p><i>cust_id number(8) Not null</i></p> <p><i>book_id number(15) Not null</i></p> <p><i>Foreign Key (cust_id)</i> <i>References</i> <i>Customer(cust_id)</i></p> <p><i>Foreign Key (book_id)</i> <i>References Books(ISBN)</i></p> <p><i>Foreign Key (branch_num)</i> <i>(branch_num) References</i> <i>Branch(b_number)</i></p>	<i>OrdersPJ</i>

	<i>Primary Key (orderNo, cust_id)</i>	
<i>To borrow a book they have to be a vip customer, and the book should be assigned to a specific branch</i>	<i>vip_id number(8) Not Null Primary Key</i> <i>branch_num number(2) not null</i>	<i>BorrowedBooks</i>

8 Queries and Transactions

8.1 <Specific Author's Books> Query:

Query in Natural Language (English)

The bookstore provides books of the most popular authors, including Ghazi Al Qusaibi, Ghada Al Samman, Sultan Almousa, and others.

This Query will show the books written by Ghazi Al Qusaibi, Ghada Al Samman only, by using their Author ID which are 1, 3 respectively.

Also, the output is sorted alphabetically.

SQL Script

SELECT B.book_title As Book, B.author_name As Author

FROM Books AS B JOIN Author AS A ON B.author_id = A.author_id
WHERE A.author_id IN (1, 3)
ORDER BY Book

Caption of the First Five Rows of the Output

SQL Statement:

```

SELECT B.book_title As Book, B.author_name As Author
FROM Books AS B JOIN Author AS A ON B.author_id = A.author_id
WHERE A.author_id IN (1, 3)
ORDER BY BOOK
    
```

Result:

Number of Records: 7

Book	Author
A Life in Administration	Ghazi Al Qusaibi
Al Jinneyah	Ghazi Al Qusaibi
Al Wazeer Al Muraffiq	Ghazi Al Qusaibi
Bay Bay Landan	Ghazi Al Qusaibi
Beirut Nightmares	Ghada Al Samman
The Night of the First Billion	Ghada Al Samman
The Square Moon	Ghada Al Samman

8.2 <Orders of a Month> Query:

Query in Natural Language (English)

This query will display the orders in April. Output is sorted by the latest order to the oldest.

SQL Script

```
SELECT fname||" "||lname AS Customer, orderDate AS Date  
FROM Customer AS C, Orders AS O  
WHERE C.cust_id = O.cust_id AND orderDate BETWEEN '2022-04-01' AND  
'2022-04-30'  
ORDER BY orderDate DESC
```

Caption of the First Five Rows of the Output

SQL Statement:

```
SELECT fname||" "||lname AS Customer, orderDate AS Date  
FROM Customer AS C, OrdersPJ AS O  
WHERE C.cust_id = O.cust_id AND orderDate > '2022-04-01'  
ORDER BY orderDate DESC
```

Result:

Number of Records: 5

Customer	Date
Yassin Ahmed	2022-04-13
Yassin Ahmed	2022-04-12
Yassin Ahmed	2022-04-08
Abdullah Almutairi	2022-04-08
Atheer Alsaidy	2022-04-07

8.3 <The Customer with The Highest Number of Orders> Query:

Query in Natural Language (English)

Since the bookstore have many customers who order frequently, this query will display full name and phone number of the customer who has the highest number of the orders.

Yassin Ahmed, ordered four times and he is the most customer ordered from the bookstore, his information is shown in the output below.

SQL Script

```
SELECT fname||" "||lname AS Name, O.cust_id AS ID, C.phone_num AS Phone  
FROM Customer AS C, OrdersPJ AS O  
WHERE C.cust_id = O.cust_id  
GROUP BY O.cust_id IN (  
    SELECT COUNT(*)  
    FROM OrdersPJ AS O  
    GROUP BY cust_id  
)
```

Caption of the First Five Rows of the Output

SQL Statement:

```
SELECT fname||" "||lname AS Name, O.cust_id AS ID, C.phone_num AS Phone  
FROM Customer AS C, OrdersPJ AS O  
WHERE C.cust_id = O.cust_id  
GROUP BY O.cust_id IN (  
    SELECT COUNT(*)  
    FROM OrdersPJ AS O  
    GROUP BY cust_id  
)
```

Number of Records: 1

Name	ID	Phone
Yassin Ahmed	12004	523832219

8.4 <Employee who Served The Most Number of Customers> Query:

Query in Natural Language (English)

Among many employees who work in the salesmen department and serve the customers of the bookstore and satisfy their requirements, this query will display the name of the employee who served the highest number of customers.

SQL Script

```
SELECT fname||" "||lname AS Employee, MAX(num_of_served_cust) AS  
Served_Customers  
  
FROM Employee AS E JOIN Salesmen AS S ON E.empID = S.empID
```

Caption of the First Five Rows of the Output

SQL Statement:

```
SELECT fname||" "||lname AS Employee, MAX(num_of_served_cust) AS Served_Customers  
FROM Employee AS E JOIN Salesmen AS S ON E.empID = S.empID
```

Number of Records: 1

Employee	Served_Customers
Nasser Al Shehri	50

8.5 <Customers with their Dependents> Query:

Query in Natural Language (English)

This query will display names of employees who have dependents in the bookstore, as well as displaying the number of dependents and the branch for each.

SQL Script

```
SELECT E.fname||" "||E.lname AS Employee, city AS Branch, COUNT(*) AS  
Dependents  
  
FROM Employee AS E, Dependents AS D, Branch AS B  
  
WHERE E.empID = D.employeeID  
  
GROUP BY D.employeeID
```

Caption of the First Five Rows of the Output

SQL Statement:

```
SELECT E.fname||" "||E.lname AS Employee, city AS Branch, COUNT(*) AS Dependents  
FROM Employee AS E, Dependents AS D, Branch AS B  
WHERE E.empID = D.employeeID  
GROUP BY D.employeeID
```

Number of Records: 5

Employee	Branch	Dependents
Rana Al Harbi	Jeddah	6
Omar Al Ahmadi	Jeddah	3
Marwa Al Otaibi	Jeddah	9
Khalid Alsuwailm	Jeddah	9
Alyas Alsalmi	Jeddah	3

8.6 Update Example

Update in Natural Language (English)

Since one of the customers got discount %10 in his order, this code will apply the discount to the cost of the order.

SQL Script

```
UPDATE Orders  
SET total_cost = total_cost * 0.9  
WHERE discount = 10
```

Caption of the Output

Update code:

SQL Statement:

```
UPDATE OrdersPJ  
SET total_cost = total_cost * 0.9  
WHERE discount = 10;
```

Before executing the code of update:

SQL Statement:

```
SELECT *  
FROM Orders  
WHERE discount = 10;
```

Result:

Number of Records: 1

orderDate	OrderTime	orderNo	cust_id	book_id	Quantity	total_cost	branch_num	discount
2022-04-13	15:39:08	3	12004	100011	1	19	1	10

After executing:

SQL Statement:

```
SELECT *
FROM Orders
WHERE discount = 10;
```

Result:

Number of Records: 1

orderDate	OrderTime	orderNo	cust_id	book_id	Quantity	total_cost	branch_num	discount
2022-04-13	15:39:08	3	12004	100011	1	17.1	1	10

8.7 Delete Example

Delete in Natural Language (English)

This query will delete the author “Nada Nassir” from the database, since the author does not have books to sold in the bookstore.

SQL Script

DELETE FROM Author

WHERE fname='Nada' AND lname = 'Nassir'

Caption of the Output

Author table before executing the code:

Number of Records: 10

fname	lname	author_id
Ghazi	Al Qussaibi	1
Sultan	Al Mousa	2
Ghada	Al Samman	3
Ahmad	Tawfeq	4
Abdulrahman	Monif	5
Abdullah	Al Qassimi	6
Ayidh	Al Qarni	7
Laila	Al Juhani	9
Nassir	Abdulkareem	10
Nada	Nassir	8

After executing code of delete:

SQL Statement:

```
DELETE FROM Author  
WHERE fname = 'Nada' AND lname = 'Nassir'
```

Number of Records: 9

fname	lname	author_id
Ghazi	Al Qussaibi	1
Sultan	Al Mousa	2
Ghada	Al Samman	3
Ahmad	Tawfeq	4
Abdulrahman	Monif	5
Abdullah	Al Qassimi	6
Ayidh	Al Qarni	7
Laila	Al Juhani	9
Nassir	Abdulkareem	10

APPENDIX

1. Author Table:

fname	Iname	author_id
Ghazi	Al Qussaibi	1
Sultan	Al Mousa	2
Ghada	Al Samman	3
Ahmad	Tawfeq	4
Abdulrahman	Monif	5
Abdullah	Al Qassimi	6
Ayidh	Al Qarni	7
Nada	Nassir	8
Laila	Al Juhani	9
Nassir	Abdulkareem	10

2. Booka Table:

author_id	ISBN	book_title	section	permissible_age	book_language	price	classification	publish_date
1	100001	A Life in Administration	Adults	18	Arabic	39	philosophy	1999-01-01
1	100002	Bay Bay Landan	Adults	18	Arabic	60	philosophy	2007-01-01
1	100003	Al Wazeer Al Muraffiq	Adults	18	Arabic	29	Novels	2005-01-01
1	100004	Al Jinneyah	Young Adults	15	Arabic	39	Novels	2007-01-01
2	100005	Tathreeb	Adults	20	Arabic	79	Religion	2016-03-07
2	100006	Aqwaamu Qeela	Young Adults	15	Arabic	59	philosophy	2015-04-02
3	100007	Beirut Nightmares	Young Adults	15	English	39	Novels	1984-01-02
3	100008	The Square Moon	Young Adults	15	English	39	Novels	1998-01-02
7	100010	Finally I discovered the happiness	Adults	15	Arabic	29	Religion	2016-01-01
7	100011	Because You Are The God	Children	10	Arabic	19	Religion	2018-01-01

3. Branch Table:

b_number	city	street	num_of_employees
1	Jeddah	Prince Sultan Street	6
3	Riyadh	Al Tahlia Street	7
2	Khobar	King Fahad Street	7

4. Customer Table:

fname	lname	cust_id	email	age	phone_num	Gender	birthDate
Atheer	Alsaify	12001	atheer9@hotmail.com	21	531966063	F	2001-02-17
Mohammad	Saleh	12002	moh12mad@hotmail.com	27	549912002	M	1995-07-10
Sara	Abdullah	12003	soso123@gmail.com	23	551280017	F	1999-12-20
Yassin	Ahmed	12004	yass@gmail.com	23	523832219	M	1999-06-04
Nouf	Alotaibi	12005	noofy@gmail.com	29	550162421	F	1993-01-26
Shahad	Abdulrahman	12006	shahoodi@hotmail.com	22	571246060	F	2000-04-21
Abdullah	Alharthi	12007	abood7@hotmail.com	22	504270802	M	2000-08-01
Hadi	Naif	12009	Hadinnnn@gmail.com	17	541121091	M	2005-10-12
Nassir	AlNassir	12010	nassoor12@hotmail.com	24	528810853	M	1997-02-22
Abdullah	Almutairi	12008	abdullahMtair@hotmail.com	26	502201772	M	1996-12-01
Ahmed	Hamad	12011	hamm@hotmail.com	24	528810004	M	1997-07-10
Sara	Omar	12012	sarah@hotmail.com	22	571712004	F	1999-08-10
Noorah	Sami	12013	nonili9@hotmail.com	22	501612504	F	1999-02-11
Ahad	Hamad	12014	ahad@hotmail.com	22	501630304	F	1999-03-11
Seham	Maher	12015	sehaam@hotmail.com	23	500030304	F	1998-04-21
Mansoor	Ahmed	12016	mansoor@hotmail.com	23	500070707	M	1998-11-11
Omair	Ghazi	12017	omair@hotmail.com	23	503535307	M	1998-07-23
Nasar	Omar	12018	nass@hotmail.com	24	5082733307	M	1997-01-23
Monther	Mansoor	12019	Mans@hotmail.com	24	5082742990	M	1997-12-01
Moath	Mansoor	12020	Mans@hotmail.com	24	5082742991	M	1997-12-01
Rakan	Salem	12021	rakooni@hotmail.com	23	5082742808	M	1998-03-23
Akram	Shaher	12022	koko@hotmail.com	23	5738742808	M	1998-04-22

5. Orders Table:

orderDate	OrderTime	orderNo	cust_id	book_id	Quantity	total_cost	branch_num	discount	empID
2022-03-10	12:23:01	1	12004	100002	1	60	1	0	15004
2022-04-12	23:19:38	2	12004	100010	1	29	1	0	15006
2022-04-13	15:39:08	3	12004	100011	1	19	1	10	15004
2022-03-13	22:12:43	4	12006	100009	2	198	3	0	119602
2022-03-14	09:11:09	5	12008	100009	1	99	3	0	119602
2022-03-14	10:27:09	6	12003	100009	1	99	3	0	119604
2022-03-14	15:17:57	7	12002	100009	1	99	2	0	27102
2022-04-07	22:09:43	8	12001	100010	1	29	3	0	27103
2022-04-08	11:38:01	9	12004	100010	1	29	3	0	27103
2022-04-08	11:38:01	10	12008	100004	1	39	1	0	15004
2022-03-11	11:34:09	11	12005	100003	1	null	1	0	15004
2022-03-13	21:01:00	12	12009	100003	1	null	1	0	15004
2022-03-22	22:01:00	13	12010	100002	1	null	1	0	15006
2022-03-21	09:11:30	14	12011	100002	1	null	3	0	119602
2022-03-21	11:15:30	15	12012	100002	1	null	3	0	119602
2022-03-21	12:55:30	16	12014	100009	1	null	3	0	119604
2022-03-01	12:57:20	17	12015	100009	1	null	1	0	27103
2022-03-07	14:23:10	18	12016	100009	1	null	1	0	15004
2022-03-07	22:23:10	19	12017	100009	1	null	1	0	15006
2022-03-04	18:06:39	20	12019	100009	1	null	3	0	27103

6. Employee Table:

empID	fname	mname	Iname	gender	salary	birthDate	startDate	email	age	Nationality	branch_num
119602	Khalid	Hasan	Alsuwailm	M	13000	1996-01-03	2017-06-11	khalidAls@gmail.com	25	Saudi	3
119603	Mays	Abdullah	Al Qahtani	F	14000	1999-10-01	2021-12-11	mays12@gmail.com	22	Saudi	3
119604	Alyas	Ahmed	Alsalmi	M	12550	1997-03-12	2019-06-06	aly30as@hotmail.com	24	Saudi	3
119605	Abdullah	Mohammad	Alotaibi	M	15750	1997-05-14	2022-01-27	aboodi123@hotmail.com	23	Saudi	3
15001	Rana	Hatim	Al Harbi	F	10300	1997-02-14	2018-03-28	RanaHHH@gmail.com	24	Saudi	1
15002	Omar	Abdullah	Al Ahmadi	M	15600	1997-05-18	2018-02-04	omarAbdullah@gmail.com	24	Saudi	1
15003	Nasser	Salem	Al Shehri	M	8900	1999-11-08	2022-02-23	nasser123@gmail.com	22	Saudi	1
27101	Marwa	Mohammad	Al Otaibi	F	17500	1996-05-11	2017-01-12	marwahMohammad@gmail.com	26	Saudi	2
27102	Raghad	Ali	Al Ahmadi	F	12670	1999-07-27	2019-04-20	raghoodi@hotmail.com	23	Saudi	2
27103	Maher	Mohammad	Alharith	M	18670	1993-05-22	2016-09-17	mahermaher@hotmail.com	29	Saudi	2
27104	Noha	Mohammad	Saleh	F	17670	1998-07-12	2016-09-17	noha@hotmail.com	29	Saudi	2

27105	Abdullah	Omar	Al Qumaizi	M	16670	1999-02-10	2017-01-17	abdullah@hotmail.com	23	Saudi	2
27106	Layal	Hamid	Al Ghamdi	F	11070	1998-04-10	2020-01-11	layal@hotmail.com	23	Saudi	2
27107	Dona	Abdulrahman	Al Shehri	F	10000	1997-03-10	2020-03-11	dona@hotmail.com	24	Saudi	2
119606	Sulaiman	Abdulrahman	Al Qassimi	M	10000	1997-04-10	2020-04-22	sosi@hotmail.com	24	Saudi	3
119607	Salman	Abdulkareem	Al Abdulkareem	M	12000	1997-06-22	2022-04-10	salman@hotmail.com	24	Saudi	3
119608	Abdulaziz	Hamid	Al Marri	M	19500	1996-09-22	2017-04-10	azooz@hotmail.com	25	Saudi	3
15005	Ghaith	Ahmed	Hamad	M	12500	1998-09-10	2018-05-11	ghaith@hotmail.com	23	Saudi	1
15004	Hashi,	Mohammad	Ahmed	M	10000	1998-10-10	2017-05-11	hashoom@hotmail.com	23	Saudi	1
15006	Noura,	Mohammad	Al Ghamdi	F	10000	1998-12-07	2017-05-11	noura@hotmail.com	23	Saudi	1

7. Dependents Table:

employeeID	fname	lname	birthDate	gender	phone_num
119602	Lana	Alsuwailm	2013-08-13	F	521716061
119602	Sarah	Alsuwailm	2015-04-22	F	521716061
119602	Lareen	Alsuwailm	2015-04-22	F	521716061
119604	Ayoob	Alsalmi	2010-03-21	M	52170713
15001	Noor	Aljedaani	2016-10-20	F	509902820
15001	Khalid	Aljedaani	2018-02-01	M	509902820
15002	Ammar	Al Ahmadi	2017-01-15	M	555451012
27101	Asmaa	Al Otaibi	2013-07-15	F	532238080
27101	Anwar	Al Otaibi	2013-07-15	M	532238080
27101	Ahmed	Al Otaibi	2015-11-17	M	532238080

8. Borrowed Books Table:

ISBN	borrowedDate	returnDate	num_of_days	orderNo
100010	2022-03-01	2022-03-07	7	8
100010	2022-03-02	2022-03-12	10	9
100003	2022-02-09	2022-02-12	3	12
100002	2022-03-09	2022-03-12	3	13
100002	2022-03-02	2022-03-14	12	14
100002	2022-03-02	2022-03-4	2	15
100009	2022-03-01	2022-03-4	3	16
100009	2022-03-01	2022-03-4	3	17
100009	2022-03-07	2022-03-12	5	18
100009	2022-03-07	2022-03-12	5	20

9. VIP Customer Table:

vip_id	num_of_borrowed_books
12001	1
12004	1
12009	1
12010	2
12005	2
12011	1
12012	2
12013	2
12014	1
12015	1
12018	2
12019	1
12020	3
12021	1

10. Salesmen Table:

empID	num_of_served_cust
119602	31
119605	48
15002	42
15003	50
27101	39
27106	32
27107	12
119608	23
15005	24
15006	37

11. Cashiers Tables

empID	work_hours
119603	11
119604	9
15001	11
27102	8
27103	10
27104	10
27105	7
119606	8
119607	12
15004	11