CPCS241-Database I-Spring2020-Project

[Supermarket]

DB Design

Group No: 6

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PART I: Analysis

1 Problem Definition and Data Requirements

1.1 Problem Description

Supermarket management system is the system where all things relating to proper supermarket management are handled. A salesperson faces a range of inefficiencies. Where important and irrelevant information needs to be kept, which is very untidy and sloppy operation, large records must be maintained. in every manual program there are also inherent issues. They usually lack quality. More quality has a huge effect on the profitability of any human being who needs the data to be up to date, in which our data base system Built with the intention of making it more effective, fast, and insightful. A more comprehensive specification is provided in the design document by describing in natural language , what a module is intended to do.The design stage at which the internal functionality of the modules can be assessed or whether the module specification can be fulfilled ,Such aspects include handling data on the different products, staff, supervisors, clients, billing etc. made super market great example of mini world in data base management system which shows the benefits of using database system over traditional approaches.

1.2 Data Requirements

1. each product has a unique serial number , name, expired data, production date, product validity (to check which product has an expiration date or not to remove it from its section) and price
2. Each employee has id that uniquely identify him/her ,name salary, enrolling time, sex and job title.
3. Each invoice has a unique invoice number, Total price and invoice date.
4. Each department has a unique number and name .
5. each section has a unique number and name .
6. Each cashier has a unique number and have maintenance date to check the when the last time the cashier was under maintenance .
7. Each manufactured company has a number ,name and phone number.
8. Each customer has id that uniquely identify him/her, name, phone number and membership(the total amount that the customer buy from the supermarket determine the type of the membership golden or silver)

1.3 Business Rules

1. Each employee works for only one department
2. Each department has one manager that manage the department(manager that manage a specific department such as personnel ,finance department)
3. Each product manufactured by many company(ex: milk can be from al maraie or nadek)
4. Each product belongs to a section(washing powders belongs to detergents section).
5. each cashier generate many invoices.
6. Each invoice include many products.
7. Each customer has many invoices.
8. Each section has one supervisor(that monitors the work of employees in specific section such as detergents section).

1.4 Intended Output of the system

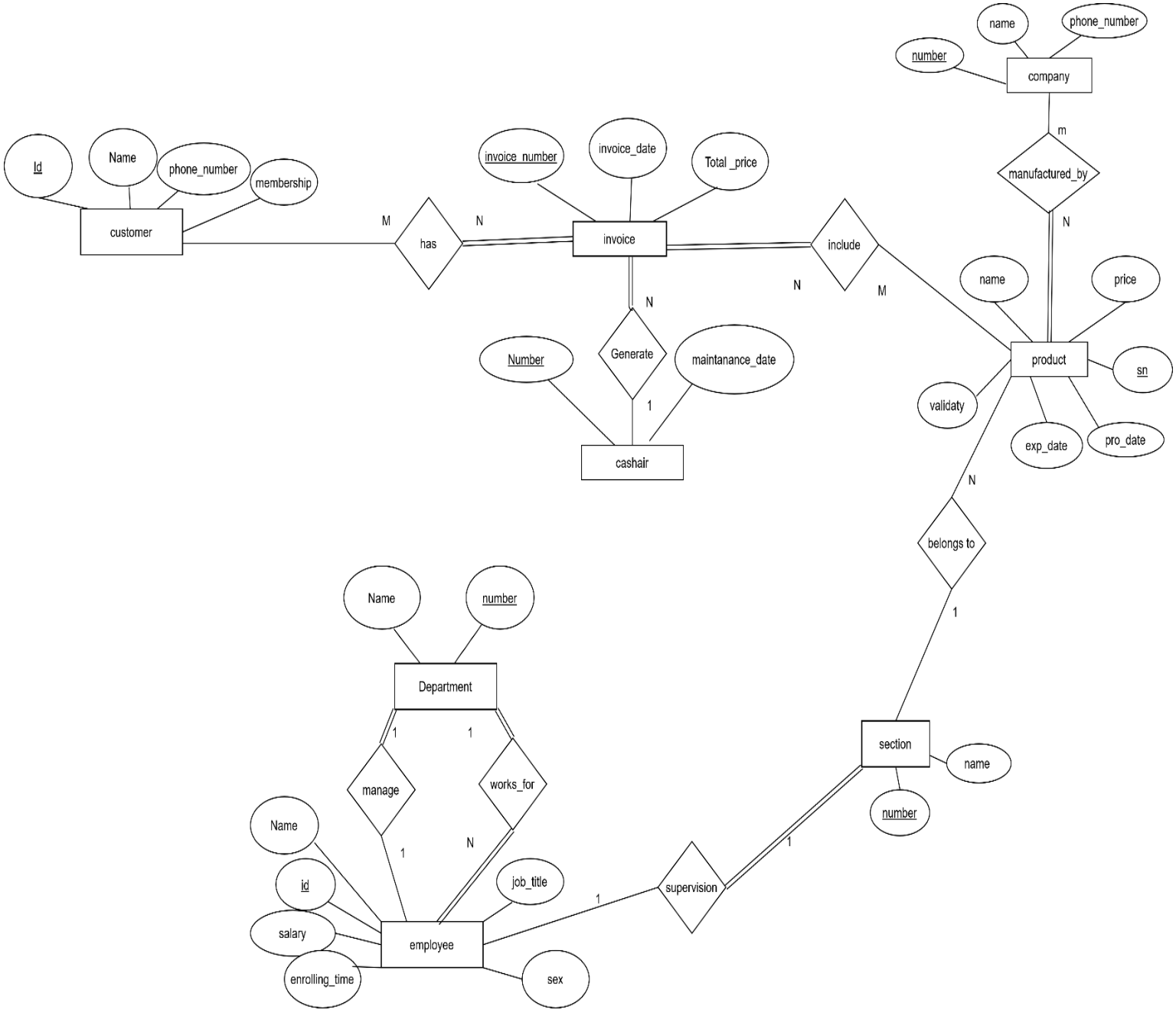
- report on product that has expired.
- report on monthly invoices.
- report on the periodic maintenance of cashier.
- calculating the discount of the customer through customer membership.
- calculating the total amounts spent by each department on the employees' salaries.
- count the number of employees for each department.
- determine the manufacturers of each product in order to provide alternatives when shortage.

PART II: DB DEISGN

2 ER Diagram Design

2.1 ER diagram

Insert your ER diagram here



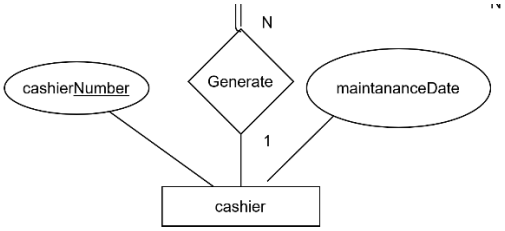
2.2 Design of Business Rules

Business Rule	Design Decisions	Justification (if any)
Each employee works for only one department	N-1 relation between employees and the department	Each employee must belong to a one specific department .

Each department has one manager that manage the department(manager that manage a specific department such as personnel ,finance department)	1-1 relation between employees and the department	Each employee manage only one department and each department has only one manager.
Each product manufactured by many company	M-N relation between employees and the department	A product like (milke,yogurt) May have more than one company that manufactures it And each company manufactures many products.
Each product belongs to a section(washing powders belongs to detergents section).	N-1 relation between employees and the department	Each product belong to one section (washing powders belongs to detergents section). Each section has many products
Each cashier generate many invoices.	N-1 relation between employees and the department	
Each invoice include many products.	N-1 relation between employees and the department	Each invoice include many product and each product exist in one invoice.
Each customer has many invoices.	M-N relation between employees and the department	
Each section has one supervisor(that monitors the work of employees in specific section such as detergents section).	1-1 relation between employees and the department	

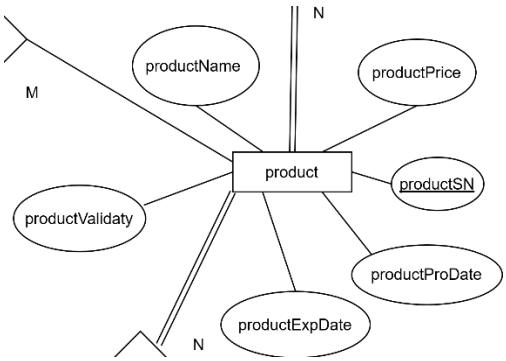
3 ER-to-logical schema mapping

3.1 Mapping of Regular Entity Types



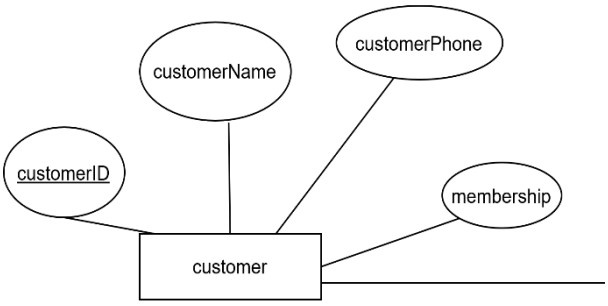
Cashier

cashierNumber	maintananceDate



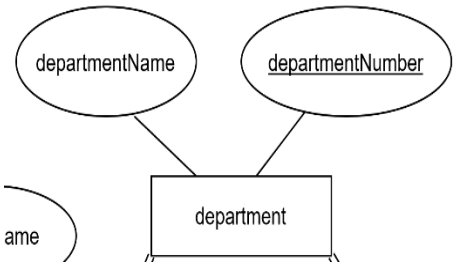
product

productName	productSN	productExpDate	productProDate	productValidity	productPrice



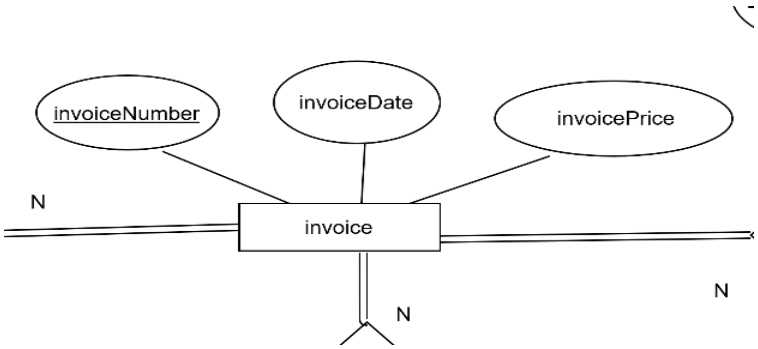
customer

customerID	customerName	customerPhone	Membership



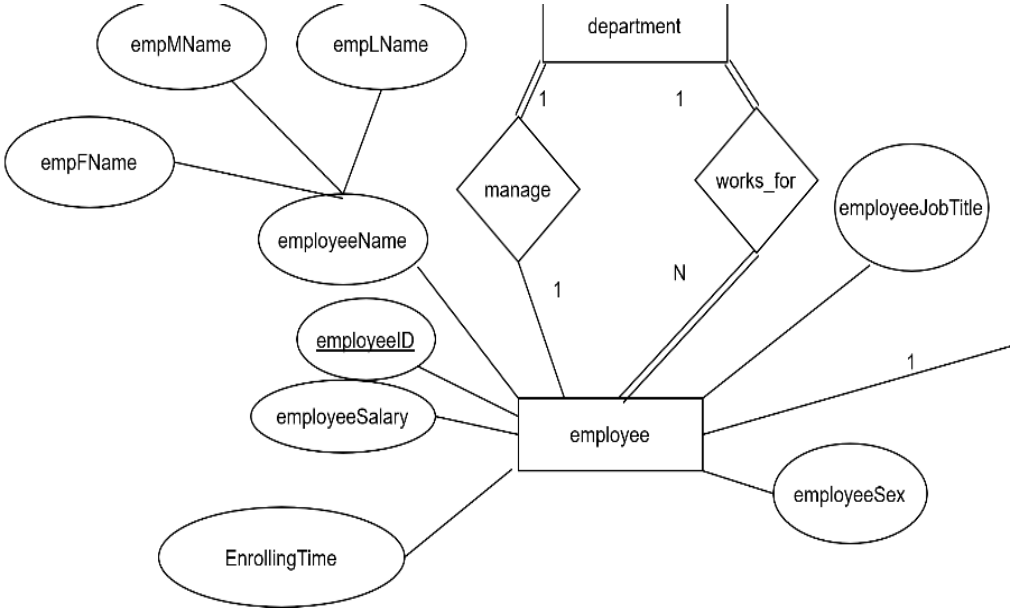
department

departmentID	departmentName



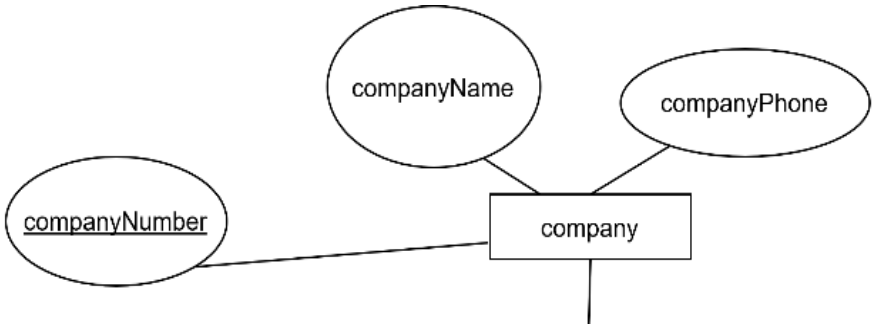
invoice

invoiceNumber	invoicePrice	invoiceDate



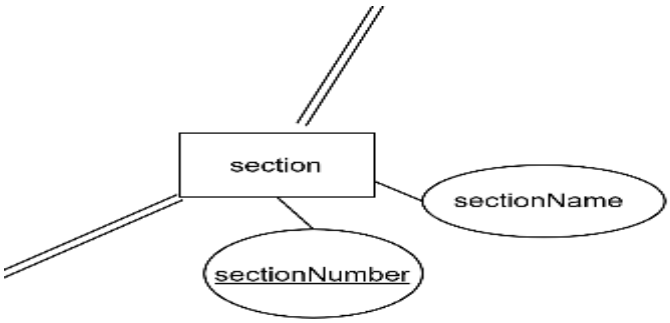
employee

empFName	empMName	empLName	employeeID	EnrollingTime	employeeSalary	employeeJobTitle	employeesex



Company

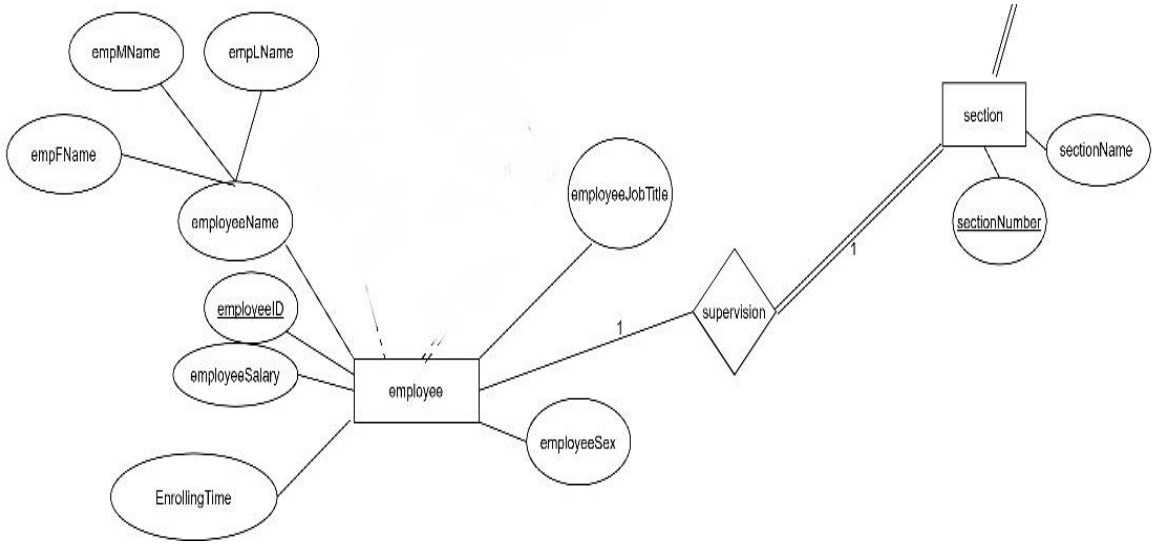
CompanyName	CompanyNumber	CompanyPhone



section

sectionName	sectionNumber

3.2 Mapping of binary 1-1 relationship types

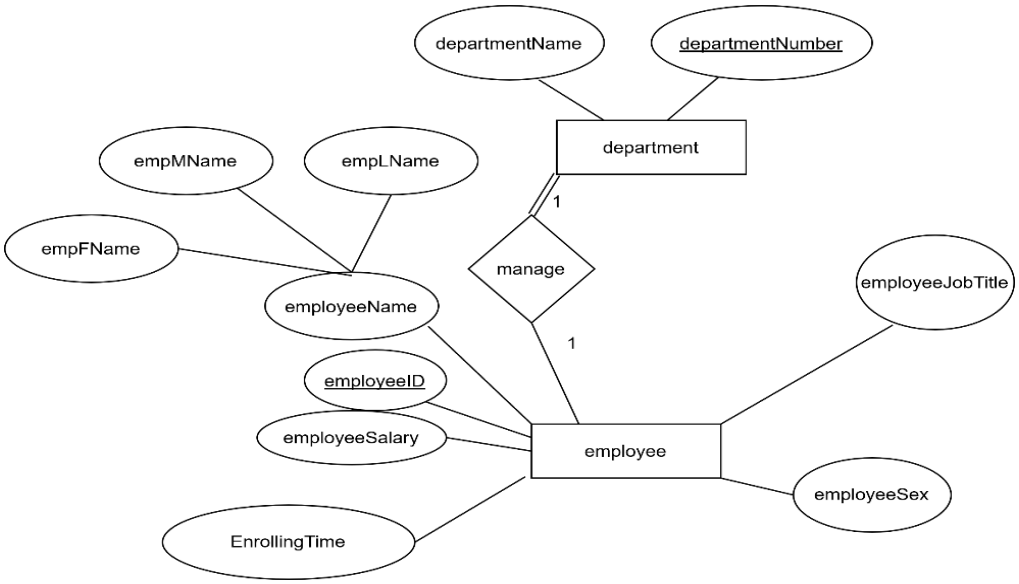


employee

empFName	empMName	empLName	employeeID	EnrollingTime	employeeSalary	employeeJobTitle	employeeSex

section

supervisorID	sectionName	sectionNumber



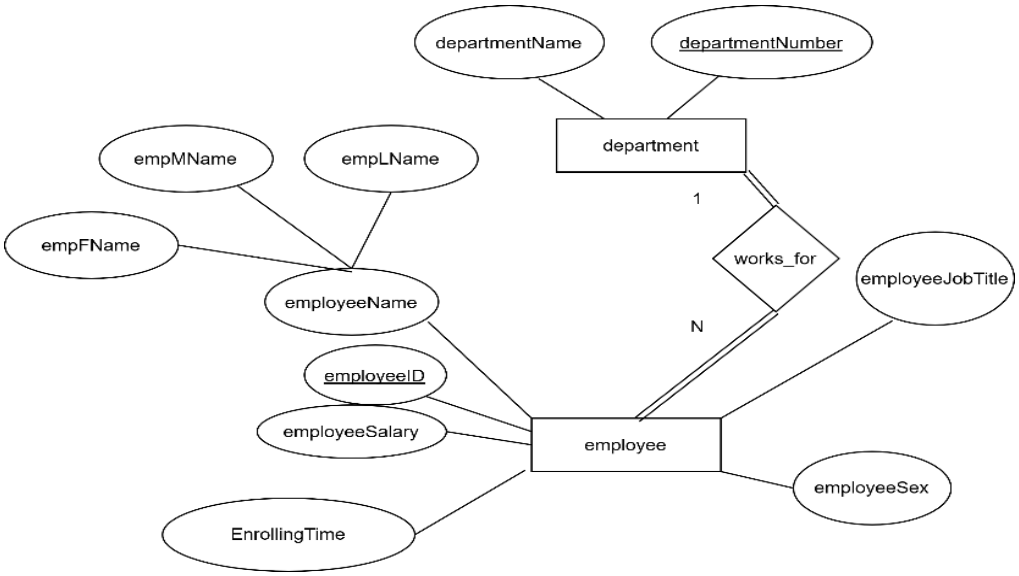
department

managerID	departmentID	departmentName

employee

empFName	empMName	empLName	employeeID	EnrollingTime	employeeSalary	employeeJobTitle	employeeSex

3.3 Mapping of binary 1-N relationship types

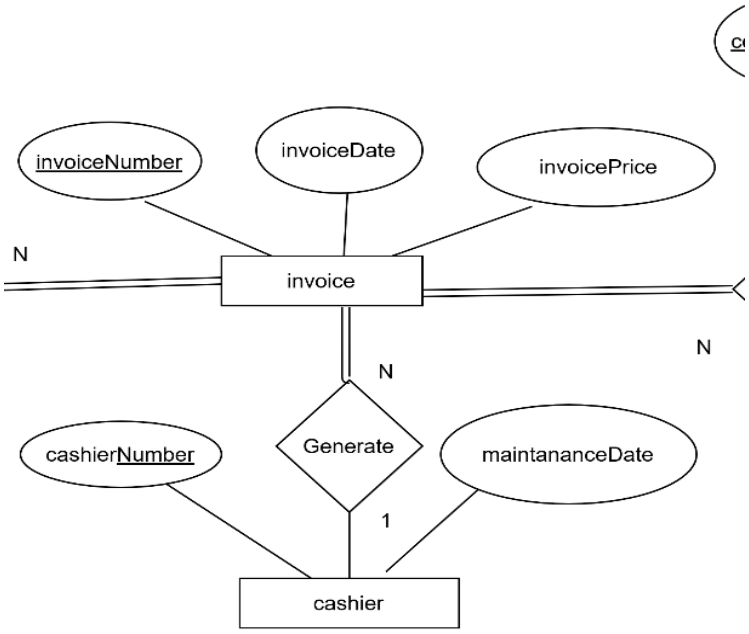


department

departmentID	departmentName	mangerID

employee

empFName	empMName	empLName	employeeID	EnrollingDate	employeeSalary	employeeJobTitle	employeesex	departmentNumber

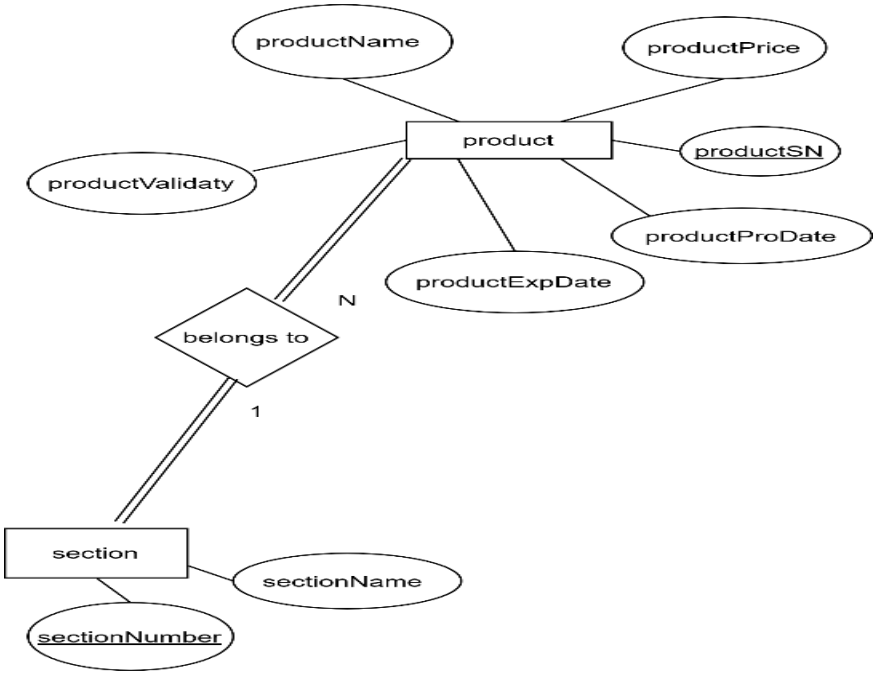


cashier

cashierNumber	MaintananceDate

invoice

invoiceNumber	invoicePrice	invoiceDate	cashierNumber



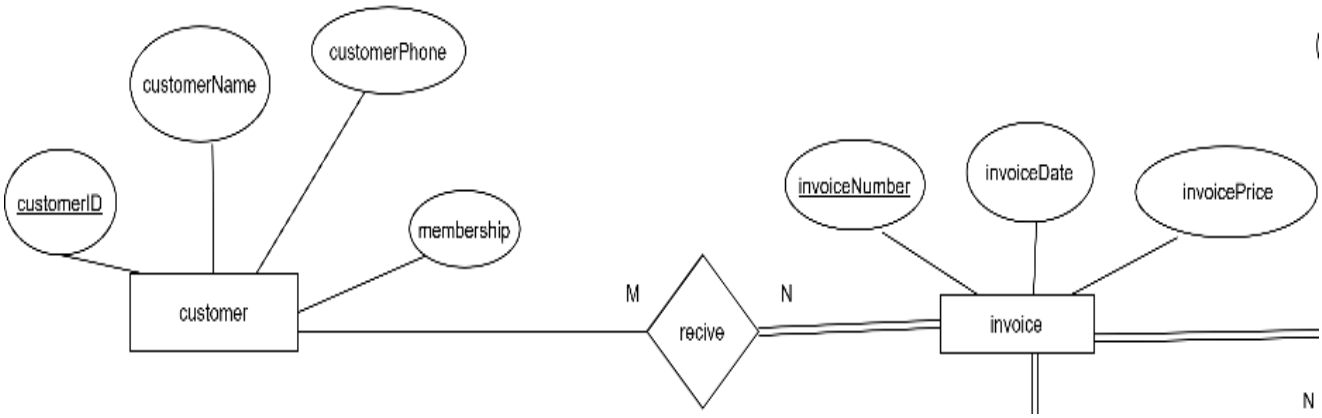
product

productName	productSN	productExpDate	productProDate	productValidity	productPrice	sectionNumber

section

sectionName	sectionNumber

3.4 Mapping of binary M-N relationship types



receive

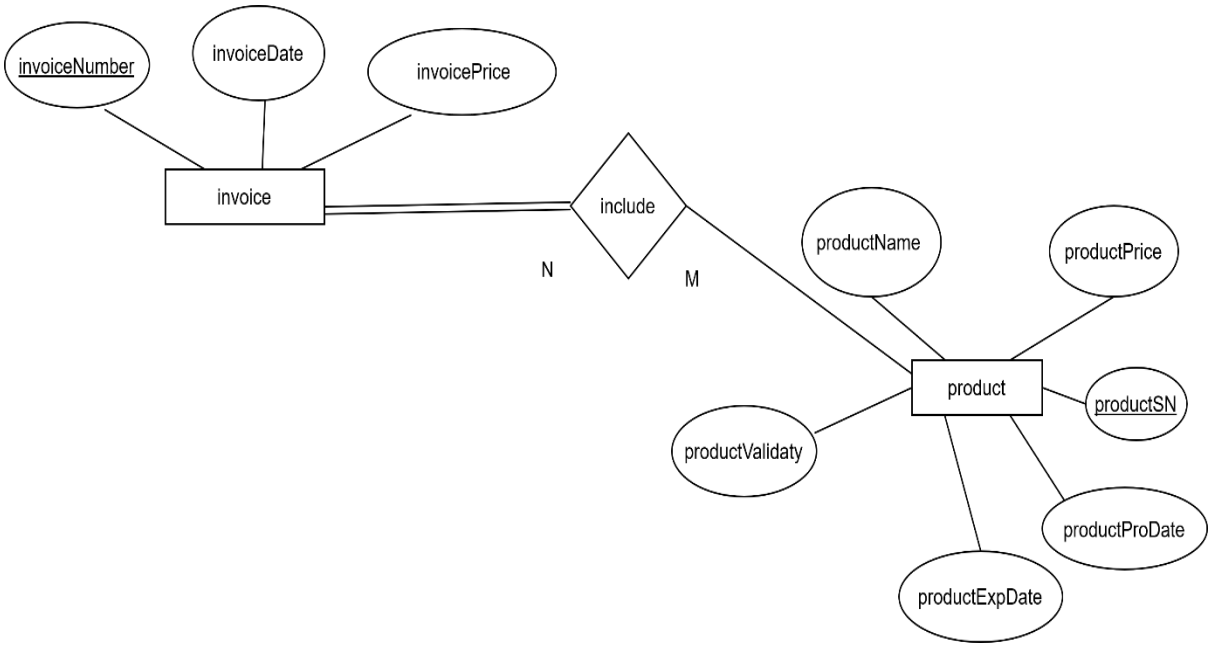
customerID	invoiceNumber

invoice

invoiceNumber	invoicePrice	invoiceDate	cashierNumber

customer

customerID	customerName	customerPhone	Membership



include

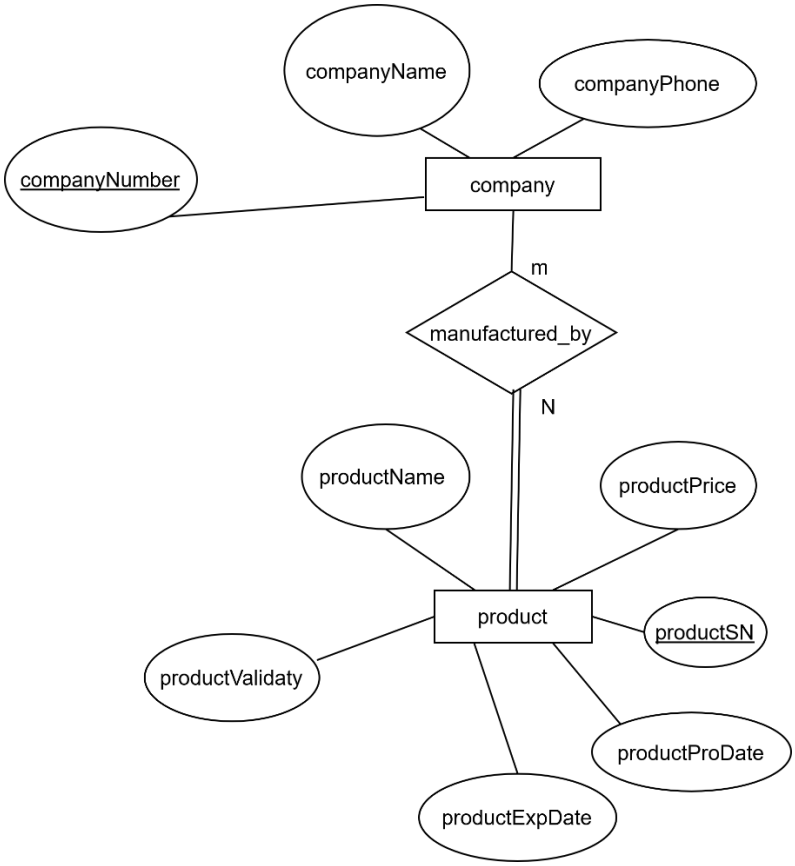
invoiceNumber	productSN

invoice

invoiceNumber	invoicePrice	invoiceDate	cashierNumber

product

productName	productSN	productExpDate	productPropDate	productValidity	productPrice	sectionNumber



manufactored_company

CompanyNumber	productSN

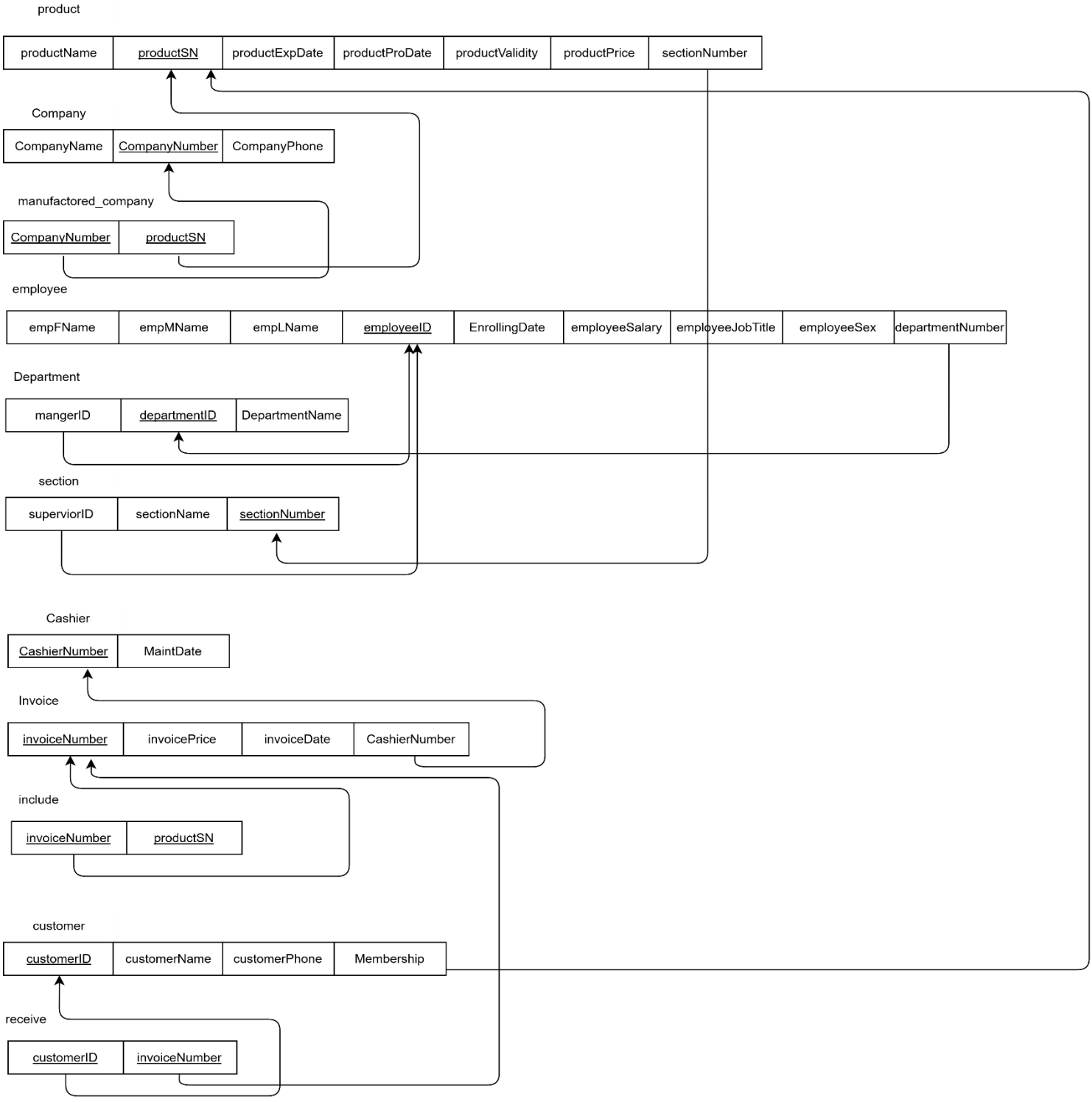
Company

CompanyName	CompanyNumber	CompanyPhone

product

productName	productSN	productExpDate	productPropDate	productValidity	productPrice	sectionNumber

3.5 Schema Diagram



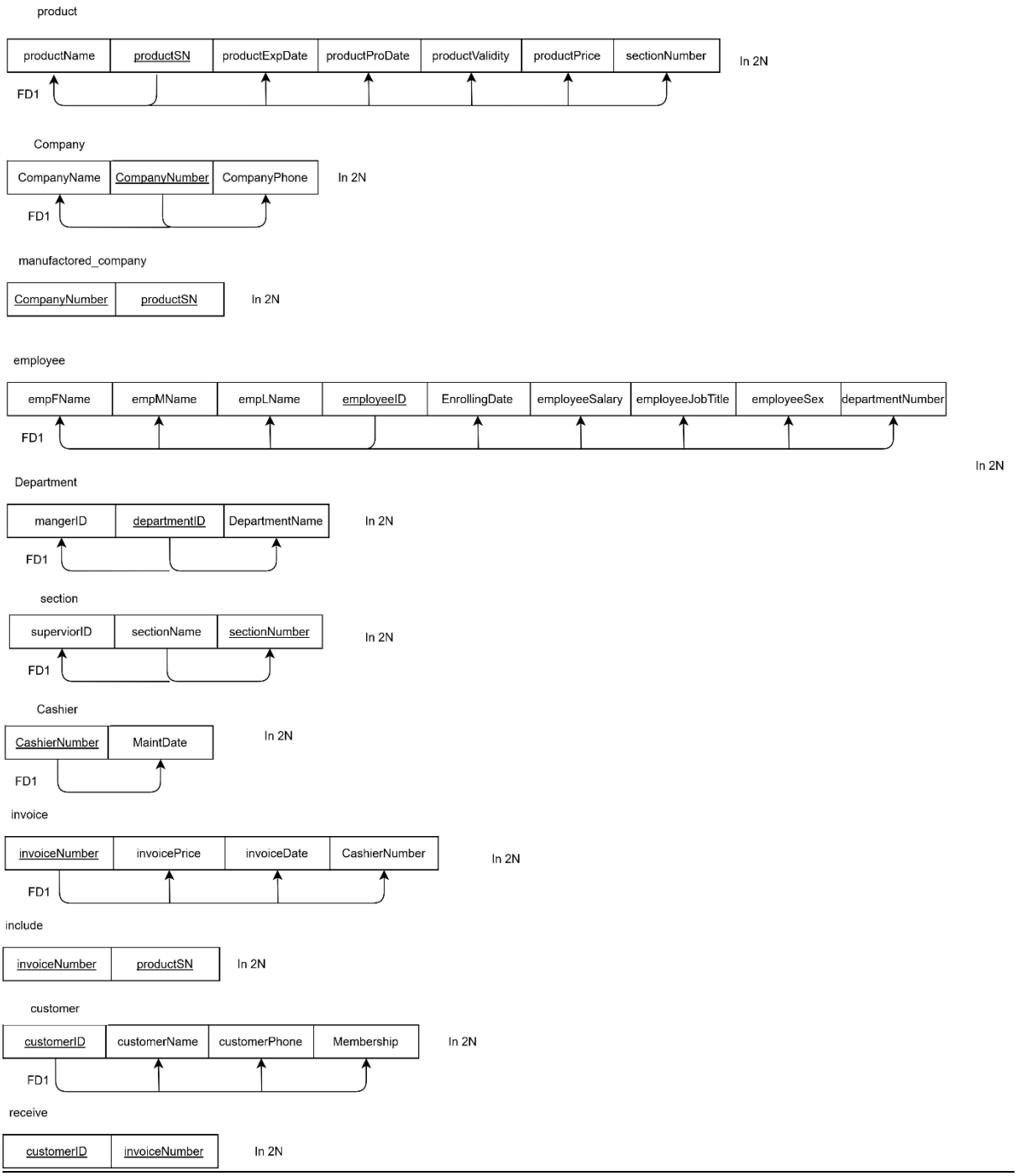
4 Normalization

4.1 First Normal Form

All relations in first normal form because we don’t have composite attributes ,multivalued attributes and no nested relations.

4.2 Second Normal Form

All relations if second normal form because we don’t have partial dependency.

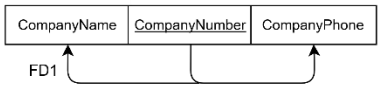


4.3 Third Normal Form

All relations in third normal form because no non-prime attribute in any of the relations is transitively dependent on the primary key.

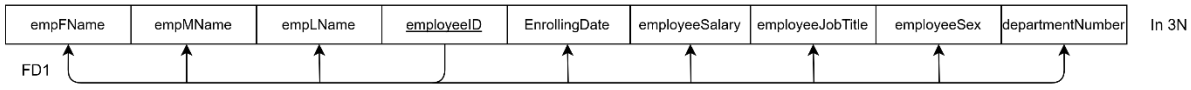
product

Company

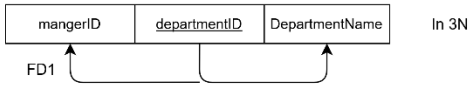


manufactored_company

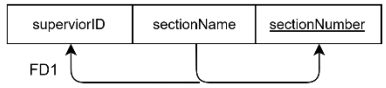
employee



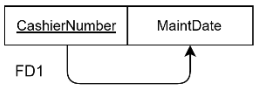
Department



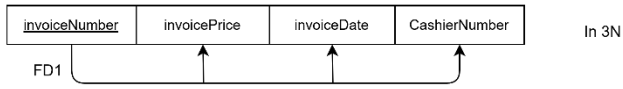
section



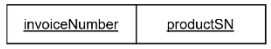
Cashier



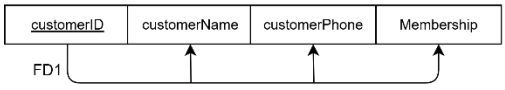
Invoice



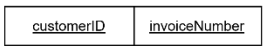
include



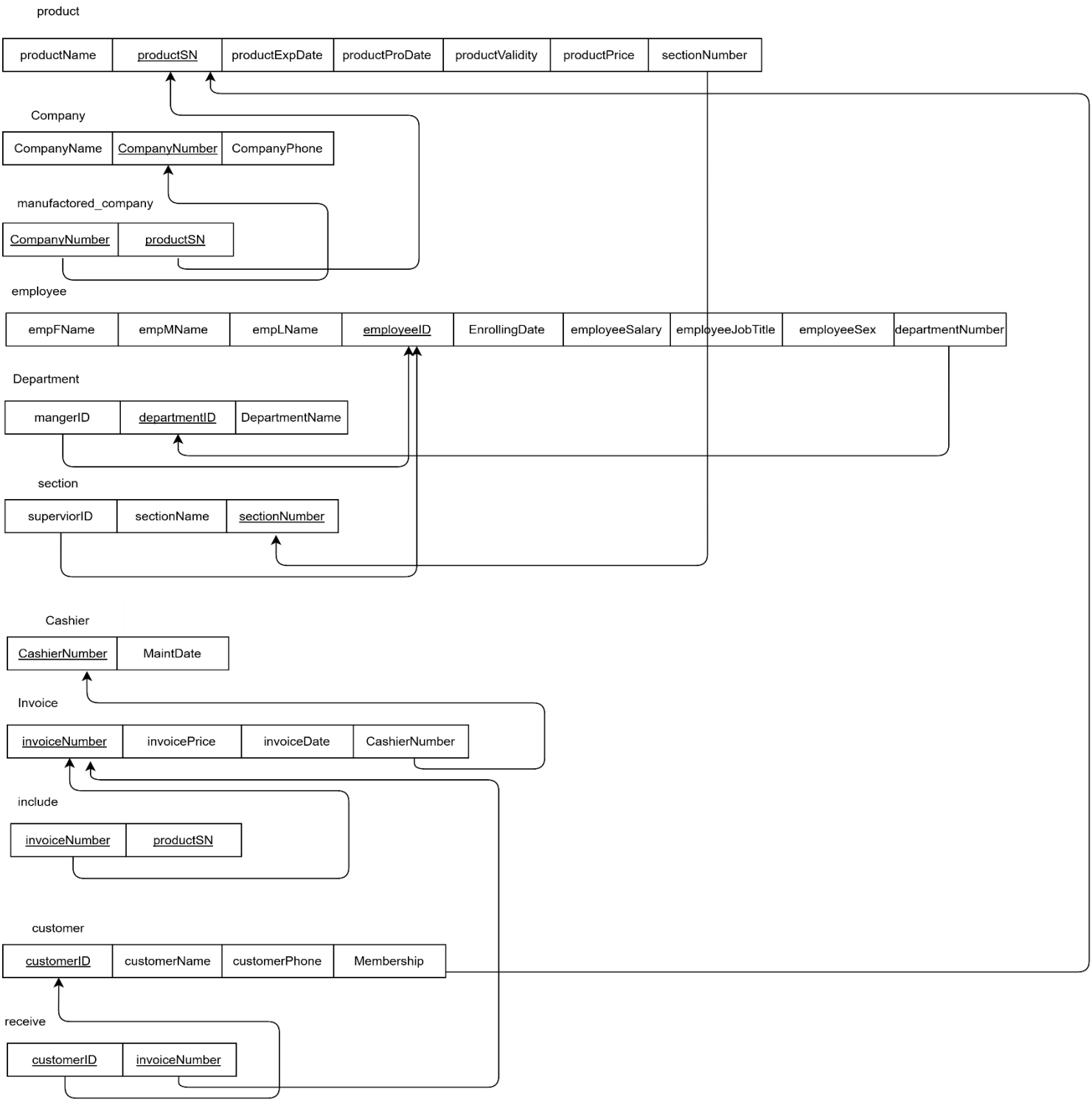
customer



receive



5 Final DB Schema Diagram


product
productName
productSN
productExpDate
productProDate
productValidity
productPrice
sectionNumber
Company
CompanyName
CompanyNumber
CompanyPhone
manufactored_company
CompanyNumber
productSN
employee
empFName
empMName
empLName
employeeID
EnrollingDate
employeeSalary
employeeJobTitle
employeeSex
departmentNumber
Department
mangerID
departmentID
DepartmentName
section
superviorID
sectionName
sectionNumber
Cashier
CashierNumber
MaintDate
Invoice
invoiceNumber
invoicePrice
invoiceDate
CashierNumber
include
invoiceNumber
productSN
customer
customerID
customerName
customerPhone
Membership
receive
customerID
invoiceNumber