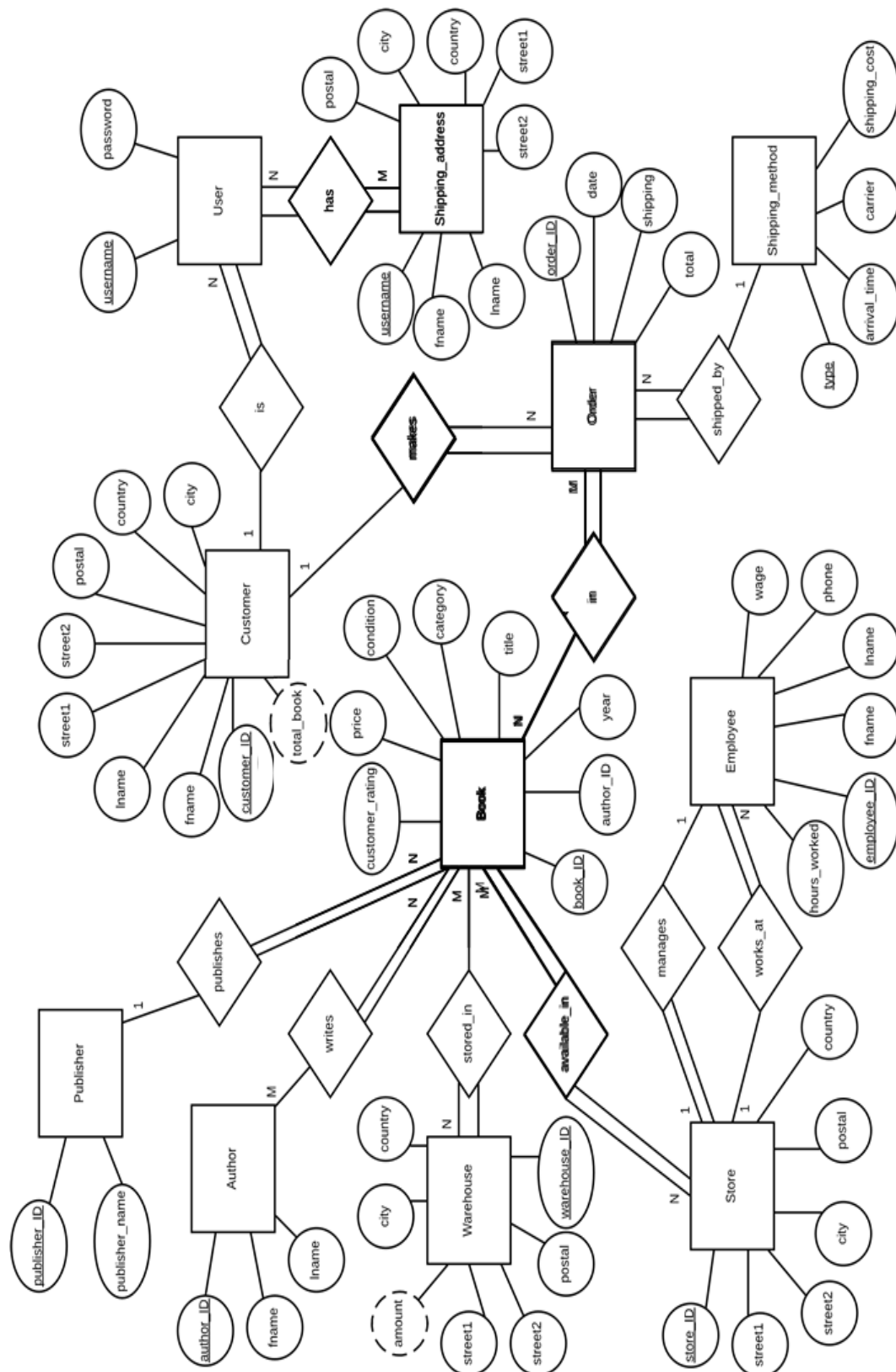Section 1 – Database Description
a) ER Diagram

b) Relational Schema

publisher(<u>publisher_ID</u>, publisher_name)
author(<u>author_ID</u>, fname, lname)
customer(<u>customer_ID</u>, Fname, Lname, street1, street2, city, country, postal)
user(<u>username</u>, password, customer_ID)
      Foreign key **customer_ID** references Customer
warehouse(<u>warehouse_ID</u>, street1, street2, city, country, postal)
      Foreign key **book_ID** references Book
book(<u>book_ID</u>, author_ID, publisher_ID, ISBN, customer_rating, price, condition, title)
      Foreign key **author_ID** references Author
      Foreign key **publisher_ID** references Publisher
store(<u>store_ID</u>, street1, street2, city, country, postal, manager_ID)
      Foreign key **manager_ID** references Employee
employee(<u>employee_ID</u>, store_ID, hours_worked, Fname, Lname, email, phone, wage)
      Foreign key **store_ID** references Store
order(<u>order_ID</u>, customer_ID, date, shipping, total)
      Foreign key **customer_ID** references Customer
shipping_address(<u>username</u>, fname, lname, street1, street2, city, country, postal)
      Foreign key **username** references User
shipping_method(<u>type</u>, arrival_time, carrier, shipping_cost)
writes(<u>publisher_ID</u>, <u>book_ID</u>)
      Foreign key **publisher_ID** references Publisher
      Foreign key **book_ID** references Book
stored_in(<u>warehouse_ID</u>, <u>book_ID</u>)
      Foreign key **warehouse_ID** references Warehouse
      Foreign key **book_ID** references Book
available_in(<u>store_ID</u>, <u>book_ID</u>)
      Foreign key **store_ID** references Store
      Foreign key **book_ID** references Book
in(<u>book_ID</u>, <u>order_ID</u>)
      Foreign key **book_ID** references Book
      Foreign key **order_ID** references Order
has(user_ID, username)
      Foreign key **user_ID** references User
      Foreign key **username** references Shipping_address

Table explanations

Publisher: a person or company who publishes books

publisher_ID: a unique identifier for each publisher. Primary key of publisher table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

publisher_name: publisher's name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Author: a person who writes a book

author_ID: a unique identifier for each author. Primary key of author table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Fname: author's first name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Lname: author's last name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Warehouse: a building for the storage of books

warehouse_ID: a unique identifier for each warehouse. Primary key of warehouse table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

street1: address line 1 of a warehouse. Data type: VARCHAR up to the maximum length of 30 characters. Can't be null.

street2: address line 2 of a warehouse. Data type: VARCHAR up to the maximum length of 30 characters.

city: city where a warehouse is located in. Data type: VARCHAR up to the maximum length of 20 characters. Can't be null.

country: country where a warehouse is located in. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

postal: postal code of a warehouse. Data type: VARCHAR up to the maximum length of 10 characters. Can't be null.

book_ID: a unique identifier for each book. Foreign key that references book table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Store: a retail establishment where customers go to shop books.

store_ID: a unique identifier for each store. Primary key of store table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

street1: address line 1 of a store. Data type: VARCHAR up to the maximum length of 30 characters. Can't be null.

street2: address line 2 of a store. Data type: VARCHAR up to the maximum length of 30 characters.

city: city where a store is located in. Data type: VARCHAR up to the maximum length of 20 characters. Can't be null.

country: country where a store is located in. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

postal: postal code of a store. Data type: VARCHAR up to the maximum length of 10 characters. Can't be null.

manager_ID: a unique identifier for each manager who manages the store. Foreign key that references employee table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Employee: a person employed by bookstore.

employee_ID: a unique identifier for each employee. Primary key of employee table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

fname: employee's first name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

lname: employee's last name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

phone: employee's phone number. Data type: VARCHAR up to the maximum length of 15 characters.

wage: employee's pay rate. Data type: DECIMAL with two decimal points. Can't be null.

hours_worked: number of hours worked by an employee. Data type: Real. Can't be null.

store_ID: a unique identifier for each store where the employee works at. Foreign key that references store table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Customer: a person who purchases books.

customer_ID: a unique identifier for each customer. Primary key of customer table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

fname: customer's first name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

lname: customer's last name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

street1: address line 1 of a customer. Data type: VARCHAR up to the maximum length of 30 characters. Can't be null.

street2: address line 2 of a customer. Data type: VARCHAR up to the maximum length of 30 characters.

city: city where a customer lives in. Data type: VARCHAR up to the maximum length of 20 characters. Can't be null.

country: country where a customer lives in. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

postal: postal code of a customer. Data type: VARCHAR up to the maximum length of 10 characters. Can't be null.

Book: an item in the physical store/warehouse or online.

book_ID: a unique identifier for each book. Primary key of book table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

author_ID: a unique identifier for each author who wrote the book. Foreign key that references author table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

customer_rating: a ranking given by customers based on the book's quality. Data type: Integer.

ISBN: International standard book number for each book. Data type: VARCHAR up to the maximum length of 13 characters.

price: the amount of money expected to buy a book. Data type: Decimal. Can't be null.

condition: the state of the usage of the book. Data type: VARCHAR up to the maximum length of 10 characters.

title: the name of the book. VARCHAR up to the maximum length of 50 characters. Can't be null.

category: the class of division of the book. VARCHAR up to the maximum length of 20 characters. Can't be null.

year: year when the book was published. Data type: INTEGER. Can't be null.

User: a person who creates online account

username: a unique sequence of characters used to identify a user and allow access to an online account. Primary key of user table. Data type: VARCHAR up to the maximum length of 20 characters. Can't be null.

password: a secret expression used to prove the right to access an account. Data type: VARCHAR up to the maximum length of 30 characters. Can't be null.

customer_ID: a unique identifier for each customer. Foreign key that references customer table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

Shipping_address: address where a user wants to receive his/her orders.

username: a unique sequence of characters used to identify the buyert. Primary key of shipping_address table. Foreign key that references user table. Data type: VARCHAR up to the maximum length of 20 characters. Can't be null.

fname: recipient's first name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

lname: recipient's last name. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

street1: address line 1 of a recipient. Data type: VARCHAR up to the maximum length of 30 characters. Can't be null.

street2: address line 2 of a recipient. Data type: VARCHAR up to the maximum length of 30 characters.

city: city where a recipient lives in. Data type: VARCHAR up to the maximum length of 20 characters. Can't be null.

country: country where a recipient lives in. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

postal: postal code of a recipient. Data type: VARCHAR up to the maximum length of 10 characters. Can't be null.

Shipping_method: the way a user wants to deliver his/her orders.

type: the shipping type. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

arrival_time: the delivery time of the orders. Data type:DATE. Can't be null.

carrier: the company undertakes the conveyance of orders. Data type:VARCHAR up to the maximum length of 15 characters. Can't be null.

shipping_cost: cost to ship an order to buyer's shipping address. Data type: DECIMAL with two decimal points. Can't be null.

Order: a list of books a customer purchased.

order_ID: a unique identifier for each order. Primary key of order table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

customer_ID: a unique identifier for each customer who placed the order. Foreign key that references customer table. Data type: VARCHAR up to the maximum length of 15 characters. Can't be null.

date: the date of order created. Data type: DATE. Can't be null.

shipping: shipping price. Data type: DECIMAL. Can't be null.
total: the total of the price. Data type: DECIMAL. Can't be null.