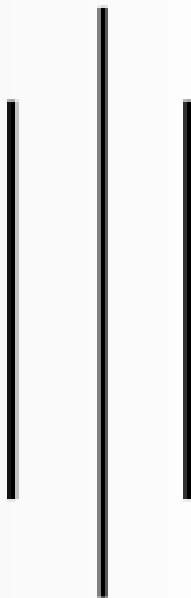


# **CSCI 3170**

Online Ordering System for Books



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### A. Overview of BookStore System

This Online Ordering System is implemented using JAVA and Oracle Database. It enables users to log in to the main menu with different roles to perform various actions in the BookStore System, such as admins, general users, employees, or managers (Figure A.1). Also, the current date and time are displayed in the main menu.

```
===== Welcome to Book Ordering Management System =====
The current date and time is 2023-04-08 14:12:07
----- Main Menu -----
Please select your user type:
1. Admins
2. General Users
3. Employees or Managers
4. Exit the program

Enter the number:
```

Figure A.1

Admins can modify the database by initializing the tables or records, dropping the tables and records, resetting all the tables and records, and generating the overview of all tables.

General users can search the book by ISBN, book title, author name to receive the information of the desired book. Also, they can order their desired books and check their history of book orders, as well as the shipping status and information of their orders.

Employees or managers can update the shipping status of the orders, view the orders grouped by different shipping status and view N most popular books.

For the Oracle Database, the system comprises four entities, namely BOOK, AUTHOR, CUSTOMERS, and ORDERS, as well as three relations, which are INCLUDE, PLACE, and WRITTENBY.

For the data source, there is a sample data file that consists of 50 rows of records, which includes 15 books, 5 customers, and 30 ordering records (Figure A.2). The first value in each row of the record indicates its corresponding storage type.

|    | source.csv   |
|----|--|
| 1  | Book; '9-8013-6859-1'; 'Effective Java'; 40; 10; 'Eric Freeman'; 'A001'; 'Elisabeth Robson'; 'A002'                                |
| 2  | Book; '9-8059-0092-5'; 'Head First Design Patterns'; 35; 12; 'Joshua Bloch'; 'A003'  |
| 3  | Book; '9-8013-3508-4'; 'Clean Code'; 30; 15; 'Robert Martin'; 'A004'; 'Elisabeth Robson'; 'A002'                                   |
| 4  | Book; '9-8149-9544-1'; 'Fluent Python'; 45; 8; 'Luciano Ramalho'; 'A005'   |
| 5  | Book; '9-8149-9120-8'; 'Python Cookbook'; 40; 10; 'Elisabeth Robson'; 'A002'; 'Luciano Ramalho'; 'A005'; 'Brian Kernighan'; 'A006' |
| 6  | Book; '9-8144-3694-5'; 'Learning Python'; 50; 7; 'Toby Sick'; 'A007'   |
| 7  | Book; '9-8013-0926-9'; 'Computer Systems: A Programmer's Perspective'; 100; 5; 'Randal Bryant'; 'A008'; 'Mark Lutz'; 'A009'        |
| 8  | Book; '9-8026-0338-8'; 'Introduction to Algorithms'; 90; 6; 'Thomas Cormen'; 'A010'; 'Charles Leiserson'; 'A011'                   |
| 9  | Book; '9-8013-1036-7'; 'The C Programming Language'; 50; 10; 'Brian Kernighan'; 'A006'; 'Dennis Ritchie'; 'A012'                   |
| 10 | Book; '9-8032-5638-2'; 'The C++ Programming Language'; 60; 9; 'Bjarne Stroustrup'; 'A013'  |
| 11 | Book; '9-8059-5177-8'; 'JavaScript: The Good Parts'; 25; 12; 'Douglas Crockford'; 'A014'   |
| 12 | Book; '9-8149-9502-6'; 'Eloquent JavaScript'; 30; 11; 'Marijn Haverbeke'; 'A015'   |
| 13 | Book; '9-8059-0071-6'; 'Head First Java'; 35; 10; 'Kathy Sierra'; 'A016'; 'Bert Bates'; 'A017'                                     |
| 14 | Book; '9-8032-8949-9'; 'Java: An Introduction to Problem Solving and Programming'; 100; 5; 'Walter Savitch'; 'A018'                |
| 15 | Book; '9-8013-1663-7'; 'Core Java Volume I--Fundamentals'; 50; 8; 'Cay Horstmann'; 'A019'; 'Kathy Sierra'; 'A016'                  |
| 16 | Customer; 'C001'; 'Alice Smith'; '2/F, 123 Main Street, The United States of America'  |
| 17 | Customer; 'C002'; 'Bob Jones'; '17/F, 456 Pine Avenue, China'  |
| 18 | Customer; 'C003'; 'Charlie Brown'; '10/F, 789 Maple Road, Canada'  |
| 19 | Customer; 'C004'; 'David Lee'; '17/F, 101 Elm Street, Germany'   |
| 20 | Customer; 'C005'; 'Emma Green'; '7/F, 234 Oak Lane, Hong Kong'   |
| 21 | ORDERS; '0001'; 'C001'; '2022-01-01'; '9-8013-6859-1'; 1; 'shipped'  |
| 22 | ORDERS; '0001'; 'C001'; '2022-01-01'; '9-8059-0092-5'; 1; 'shipped'  |
| 23 | ORDERS; '0002'; 'C002'; '2022-01-01'; '9-8059-0092-5'; 2; 'shipped'  |
| 24 | ORDERS; '0003'; 'C003'; '2022-01-03'; '9-8013-3508-4'; 3; 'shipped'  |
| 25 | ORDERS; '0004'; 'C004'; '2022-01-04'; '9-8149-9544-1'; 4; 'shipped'  |
| 26 | ORDERS; '0005'; 'C005'; '2022-01-05'; '9-8149-9120-8'; 5; 'shipped'  |
| 27 | ORDERS; '0006'; 'C001'; '2022-01-06'; '9-8144-3694-5'; 6; 'shipped'  |
| 28 | ORDERS; '0007'; 'C002'; '2022-01-07'; '9-8013-0926-9'; 7; 'shipped'  |
| 29 | ORDERS; '0008'; 'C003'; '2022-01-08'; '9-8026-0338-8'; 8; 'shipped'  |
| 30 | ORDERS; '0009'; 'C004'; '2022-01-09'; '9-8013-1036-7'; 9; 'shipped'  |
| 31 | ORDERS; '0010'; 'C005'; '2022-01-10'; '9-8032-5638-2'; 10; 'shipped'   |
| 32 | ORDERS; '0011'; 'C001'; '2022-01-11'; '9-8059-5177-8'; 1; 'ordered'  |
| 33 | ORDERS; '0012'; 'C002'; '2022-01-12'; '9-8149-9502-6'; 2; 'ordered'  |
| 34 | ORDERS; '0013'; 'C003'; '2022-01-13'; '9-8013-6859-1'; 3; 'ordered'  |
| 35 | ORDERS; '0014'; 'C004'; '2022-01-14'; '9-8059-0092-5'; 4; 'ordered'  |
| 36 | ORDERS; '0015'; 'C005'; '2022-01-15'; '9-8013-3508-4'; 5; 'ordered'  |
| 37 | ORDERS; '0016'; 'C001'; '2022-01-16'; '9-8149-9544-1'; 6; 'received'   |
| 38 | ORDERS; '0017'; 'C002'; '2022-01-17'; '9-8149-9120-8'; 7; 'received'   |
| 39 | ORDERS; '0018'; 'C003'; '2022-01-18'; '9-8144-3694-5'; 8; 'received'   |
| 40 | ORDERS; '0019'; 'C004'; '2022-01-19'; '9-8013-0926-9'; 9; 'received'   |
| 41 | ORDERS; '0020'; 'C005'; '2022-01-20'; '9-8026-0338-8'; 10; 'received'  |
| 42 | ORDERS; '0021'; 'C005'; '2022-01-21'; '9-8026-0338-8'; 10; 'received'  |
| 43 | ORDERS; '0022'; 'C002'; '2022-01-22'; '9-8032-5638-2'; 2; 'received'   |
| 44 | ORDERS; '0023'; 'C003'; '2022-01-23'; '9-8059-5177-8'; 3; 'shipped'  |
| 45 | ORDERS; '0024'; 'C004'; '2022-01-24'; '9-8013-6859-1'; 4; 'received'   |
| 46 | ORDERS; '0025'; 'C005'; '2022-01-25'; '9-8013-1663-7'; 5; 'received'   |
| 47 | ORDERS; '0026'; 'C001'; '2022-01-26'; '9-8032-8949-9'; 6; 'received'   |
| 48 | ORDERS; '0027'; 'C002'; '2022-01-27'; '9-8059-0071-6'; 7; 'received'   |
| 49 | ORDERS; '0028'; 'C003'; '2022-01-28'; '9-8144-3694-5'; 8; 'received'   |
| 50 | ORDERS; '0029'; 'C004'; '2022-01-29'; '9-8013-3508-4'; 9; 'received'   |

Figure A.2

## B. Users

### 1. Admins

#### (1) Admins Page

When users enter the admin Page (Figure B.1), they can choose different actions: the first is to initialize the database by creating the tables, the second is to load initial records from local files into the database, the third is to reset all the existing tables and records, the fourth is to drop all the existing records, the fifth is to have an overview of all the tables and records. Meanwhile, the page will also print out the current date and time for user reference. If they want to leave this page, they can enter 6 to return to the main menu.

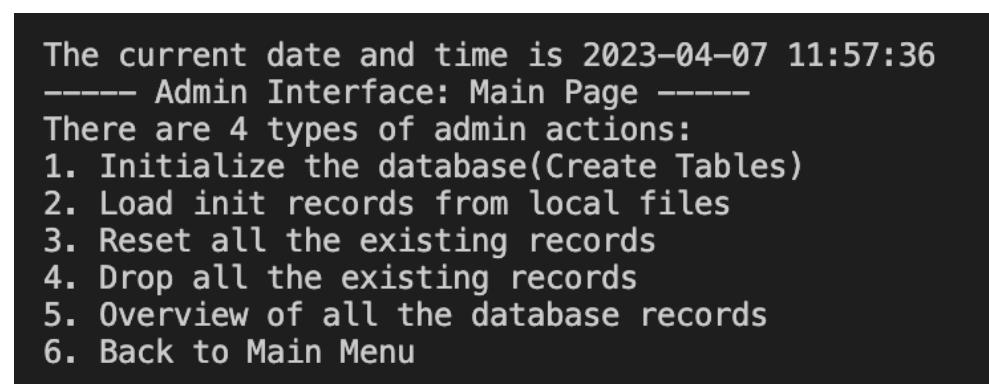


Figure B.1

#### **(1) Function 1: Initialize the database (Create Tables)**

Before any action, admins need to initialize the database by creating the tables of the entities and relations, such as BOOK, AUTHOR, CUSTOMERS, ORDERS, INCLUDE, PLACE, WRITTENBY. The entities and relations are based on our designed ER diagram and schema.

As for BOOK, it contains the primary key ISBN with 13 characters, attributes of Title with 100 characters, Price with a non-negative number, and Inventory Quantity with a non-negative number.

As for CUSTOMER, it contains the primary key CID with 10 characters, attributes of Name with 50 characters, and address with 200 characters.

As for ORDERS, it contains the primary key Order OID with 10 characters together with ISBN with 13 characters, attributes of CID with 10 characters, Order Date with the type of DATE, Order Quantity with a non-negative number, Shipping Status with 10 characters. CID is the foreign key referencing the CID from CUSTOMER. Order ISBN is the foreign key referencing the ISBN from BOOK.

As for AUTHORS, it contains the primary key AID with 10 characters and the attribute of the author name with 50 characters.

As for the PLACE, which is the relation of “customer places an order”. It contains the primary key CID with 10 characters together with Order ISBN with 13 characters, and attributes of OID with 10 characters. CID is the foreign key referencing the CID from CUSTOMER. Order ISBN is the foreign key referencing the ISBN from BOOK.

As for the INCLUDE, which is the relation of “Books are included in an order”. It contains a primary key of OID with 10 characters together with ISBN with 13 characters, attributes of Quantity of ordered book with a non-negative number. ISBN is the foreign key referencing the ISBN from BOOK.

As for the WRITTENBY, which is the relation of “Book was written by the author”. It contains a primary key of ISBN with 13 characters together with AID with 10 characters. ISBN is the foreign key referencing the ISBN from BOOK. AID is the foreign key referencing the ISBN from AUTHORS.

As some of the relations in the database refer to other entities, it is necessary to create the entities first in the sequence specified above. If all tables are created successfully, a success message will be printed (Figure 1.1.1). If the tables have already been created, a notification message will be displayed to inform the user that the tables already exist (Figure 1.1.2). Otherwise, a message of exception will be printed and return the user to the admin page again.

```
Select your action: 1
Table BOOK created successfully.
Table CUSTOMER created successfully.
Table ORDERS created successfully.
Table AUTHORS created successfully.
Table PLACE created successfully.
Table INCLUDE created successfully.
Table WRITTENBY created successfully.
Tables created successfully.
```

Figure 1.1.1

```
Select your action: 1
Table BOOK is created already.
Table CUSTOMER is created already.
Table ORDERS is created already.
Table AUTHORS is created already.
Table PLACE is created already.
Table INCLUDE is created already.
Table WRITTENBY is created already.
Tables created successfully.
```

Figure 1.1.2

## (2) Function 2: Load initial records from local files

After creating the tables, admins can load the records into the tables with the file “source.csv”. This file should contain types of records, such as books, customers, orders, and their corresponding values. If the format of the input file is valid, the records will be inserted one by one into the database of corresponding tables and a success message will be printed (Figure 1.2.1). Otherwise, if the inserted records are invalid or conflict with the current records, an exception message will be printed (Figure 1.2.2) and the user will be redirected to the admin page.

```
Select your action: 2
BOOK inserted successfully.
CUSTOMER inserted successfully.
ORDERS inserted successfully.
AUTHORS inserted successfully.
INCLUDE inserted successfully.
PLACE inserted successfully.
WRITTENBY inserted successfully.
```

Figure 1.2.1

```
Select your action: 2
Message of Exception: ORA-00001: unique constraint (H050.SYS_C0063875) violated
Message of Exception: ORA-00001: unique constraint (H050.SYS_C0063878) violated
Message of Exception: ORA-00001: unique constraint (H050.SYS_C0063886) violated
Message of Exception: ORA-00001: unique constraint (H050.SYS_C0063890) violated
Message of Exception: ORA-00001: unique constraint (H050.SYS_C0063901) violated
Message of Exception: ORA-00001: unique constraint (H050.SYS_C0063894) violated
Message of Exception: ORA-00001: unique constraint (H050.SYS_C0063905) violated
```

Figure 1.2.2

To avoid the program from shutdown, we force the admin to initial the table in the database before inserting the table record (Figure 1.2.3).

```
The current date and time is 2023-04-14 23:29:56
----- Admin Interface: Main Page -----
There are 4 types of admin actions:
1. Initialize the database(Create Tables)
2. Load init records from local files
3. Reset all the existing records
4. Drop all the existing records
5. Overview of all the database records
6. Back to Main Menu

Select your action: 2
Tables are not existed. Please create the table before inserting the table record!
```

Figure 1.2.3

**(3) Function 3: Reset all the existing records**

Admins can reset all the existing records and tables. If the tables do not exist, the system will detect them and initialize the database by creating tables and loading the records from local files (Figure 1.3.1). If there are already some tables and records, the system will drop all tables and records first, then again initialize the database by creating tables and loading the records from local files. After the reset of all tables and records, a success message will be printed (Figure 1.3.2).

```
Select your action: 3
Table INCLUDE dropped successfully.
Table WRITTENBY dropped successfully.
Table PLACE dropped successfully.
Table ORDERS dropped successfully.
Table CUSTOMER dropped successfully.
Table BOOK dropped successfully.
Table AUTHORS dropped successfully.

Table BOOK Created successfully.
Table CUSTOMER Created successfully.
Table ORDERS Created successfully.
Table AUTHORS Created successfully.
Table PLACE Created successfully.
Table INCLUDE Created successfully.
Table WRITTENBY Created successfully.

BOOK inserted successfully.
CUSTOMER inserted successfully.
ORDERS inserted successfully.
AUTHORS inserted successfully.
INCLUDE inserted successfully.
PLACE inserted successfully.
WRITTENBY inserted successfully.
Tables and Records reset successfully.
```

Figure 1.3.1

```
Select your action: 3
Table BOOK Created successfully.
Table CUSTOMER Created successfully.
Table ORDERS Created successfully.
Table AUTHORS Created successfully.
Table PLACE Created successfully.
Table INCLUDE Created successfully.
Table WRITTENBY Created successfully.

BOOK inserted successfully.
CUSTOMER inserted successfully.
ORDERS inserted successfully.
AUTHORS inserted successfully.
INCLUDE inserted successfully.
PLACE inserted successfully.
WRITTENBY inserted successfully.
Tables and Records reset successfully.
```

Figure 1.3.2

#### (4) Function 4: Drop all the existing records

Admins can drop all the existing records and tables from this function. The order of deletion is as follows: INCLUDE, WRITTENBY, PLACE, ORDERS, CUSTOMER, BOOK, AUTHORS. As some of the relations in the database refer to other entities, it is necessary to first drop the relations, which contain foreign keys referencing the other entities. If all tables are dropped successfully, a success message will be printed (Figure 1.4.1). If the tables have already been dropped, a notification message will be displayed to inform the user that the tables do not exist (Figure 1.4.2).

```
Select your action: 4
Table INCLUDE dropped successfully.
Table WRITTENBY dropped successfully.
Table PLACE dropped successfully.
Table ORDERS dropped successfully.
Table CUSTOMER dropped successfully.
Table BOOK dropped successfully.
Table AUTHORS dropped successfully.
Records dropped successfully.
```

Figure 1.4.1

```
Select your action: 4
Table INCLUDE is dropped already.
Table WRITTENBY is dropped already.
Table PLACE is dropped already.
Table ORDERS is dropped already.
Table CUSTOMER is dropped already.
Table BOOK is dropped already.
Table AUTHORS is dropped already.
Records dropped successfully.
```

Figure 1.4.2

To avoid the program from shutdown, we force the admin to initial the table in the database before deleting the table record (Figure 1.4.3).

```
The current date and time is 2023-04-14 23:30:03
----- Admin Interface: Main Page -----
There are 4 types of admin actions:
1. Initialize the database(Create Tables)
2. Load init records from local files
3. Reset all the existing records
4. Drop all the existing records
5. Overview of all the database records
6. Back to Main Menu

Select your action: 4
Tables are not existed. Please create the table first before dropping the table record!
```

Figure 1.4.3

## (5) Function 5: Overview of all the database records

Admins can print out a comprehensive overview of all database records in the form of a table (Figure 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.5), which is designed for easy readability.

| Select your action: 5     |  |       |                    |
|---------------------------|--|-------|--------------------|
| Records in Book Database: |  |       |                    |
| ISBN                      | Title  | Price | Inventory Quantity |
| 9-8013-6859-1             | Effective Java   | 40    | 10                 |
| 9-8059-0092-5             | Head First Design Patterns                               | 35    | 12                 |
| 9-8013-3508-4             | Clean Code   | 30    | 15                 |
| 9-8149-0544-1             | Fluent Python  | 45    | 8                  |
| 9-8149-0120-8             | Python Cookbook  | 40    | 10                 |
| 9-8144-3694-5             | Learning Python  | 50    | 7                  |
| 9-8013-0926-9             | Computer Systems: A Programmer's Perspective             | 100   | 5                  |
| 9-8026-0338-8             | Introduction to Algorithms                               | 90    | 6                  |
| 9-8013-1036-7             | The C Programming Language                               | 50    | 10                 |
| 9-8032-5638-2             | The C++ Programming Language                             | 60    | 9                  |
| 9-8059-5177-8             | JavaScript: The Good Parts                               | 25    | 12                 |
| 9-8149-0502-6             | Eloquent JavaScript                                      | 30    | 11                 |
| 9-8059-0071-6             | Head First Java  | 35    | 10                 |
| 9-8032-8949-9             | Java: An Introduction to Problem Solving and Programming | 100   | 5                  |
| 9-8013-1663-7             | Core Java Volume I--Fundamentals                         | 50    | 8                  |

| Records in Author Database: |                   |
|-----------------------------|-------------------|
| AID                         | Author Name       |
| A001                        | Eric Freeman      |
| A002                        | Elisabeth Robson  |
| A003                        | Joshua Bloch      |
| A004                        | Robert Martin     |
| A005                        | Luciano Ramalho   |
| A006                        | Brian Kernighan   |
| A007                        | Toby Sick         |
| A008                        | Randal Bryant     |
| A009                        | Mark Lutz         |
| A010                        | Thomas Cormen     |
| A011                        | Charles Leiserson |
| A012                        | Dennis Ritchie    |
| A013                        | Bjarne Stroustrup |
| A014                        | Douglas Crockford |
| A015                        | Marijn Haverbeke  |
| A016                        | Kathy Sierra      |
| A017                        | Bert Bates        |
| A018                        | Walter Savitch    |
| A019                        | Cay Horstmann     |

Figure 1.5.1

| Records in Customers Database: |               |  |
|--------------------------------|---------------|--|
| CID                            | Customer Name | Address  |
| C001                           | Alice Smith   | 2/F, 123 Main Street, The United States of America |
| C002                           | Bob Jones     | 17/F, 456 Pine Avenue, China                       |
| C003                           | Charlie Brown | 10/F, 789 Maple Road, Canada                       |
| C004                           | David Lee     | 17/F, 101 Elm Street, Germany                      |
| C005                           | Emma Green    | 7/F, 234 Oak Lane, Hong Kong                       |

| Records in Orders Database: |      |            |               |                |                 |
|-----------------------------|------|------------|---------------|----------------|-----------------|
| OID                         | CID  | Order Date | Order ISBN    | Order Quantity | Shipping Status |
| 0001                        | C001 | 2022-01-01 | 9-8013-6859-1 | 1              | shipped         |
| 0001                        | C001 | 2022-01-01 | 9-8059-0092-5 | 1              | shipped         |
| 0002                        | C002 | 2022-01-01 | 9-8059-0092-5 | 2              | shipped         |
| 0003                        | C003 | 2022-01-03 | 9-8013-3508-4 | 3              | shipped         |
| 0004                        | C004 | 2022-01-04 | 9-8149-9544-1 | 4              | shipped         |
| 0005                        | C005 | 2022-01-05 | 9-8149-9120-8 | 5              | shipped         |
| 0006                        | C001 | 2022-01-06 | 9-8144-3694-5 | 6              | shipped         |
| 0007                        | C002 | 2022-01-07 | 9-8013-0926-9 | 7              | shipped         |
| 0008                        | C003 | 2022-01-08 | 9-8026-0338-8 | 8              | shipped         |
| 0009                        | C004 | 2022-01-09 | 9-8013-1036-7 | 9              | shipped         |
| 0010                        | C005 | 2022-01-10 | 9-8032-5638-2 | 10             | shipped         |
| 0011                        | C001 | 2022-01-11 | 9-8059-5177-8 | 1              | ordered         |
| 0012                        | C002 | 2022-01-12 | 9-8149-9502-6 | 2              | ordered         |
| 0013                        | C003 | 2022-01-13 | 9-8013-6859-1 | 3              | ordered         |
| 0014                        | C004 | 2022-01-14 | 9-8059-0092-5 | 4              | ordered         |
| 0015                        | C005 | 2022-01-15 | 9-8013-3508-4 | 5              | ordered         |
| 0016                        | C001 | 2022-01-16 | 9-8149-9544-1 | 6              | received        |
| 0017                        | C002 | 2022-01-17 | 9-8149-9120-8 | 7              | received        |
| 0018                        | C003 | 2022-01-18 | 9-8144-3694-5 | 8              | received        |
| 0019                        | C004 | 2022-01-19 | 9-8013-0926-9 | 9              | received        |
| 0020                        | C005 | 2022-01-20 | 9-8026-0338-8 | 10             | received        |
| 0021                        | C005 | 2022-01-21 | 9-8026-0338-8 | 10             | received        |
| 0022                        | C002 | 2022-01-22 | 9-8032-5638-2 | 2              | received        |
| 0023                        | C003 | 2022-01-23 | 9-8059-5177-8 | 3              | shipped         |
| 0024                        | C004 | 2022-01-24 | 9-8013-6859-1 | 4              | received        |
| 0025                        | C005 | 2022-01-25 | 9-8013-1663-7 | 5              | received        |
| 0026                        | C001 | 2022-01-26 | 9-8032-8949-9 | 6              | received        |
| 0027                        | C002 | 2022-01-27 | 9-8059-0071-6 | 7              | received        |
| 0028                        | C003 | 2022-01-28 | 9-8144-3694-5 | 8              | received        |
| 0029                        | C004 | 2022-01-29 | 9-8013-3508-4 | 9              | received        |

Figure 1.5.2

| Records in Include Database: |               |                |
|------------------------------|---------------|----------------|
| OID                          | ISBN          | Order Quantity |
| 0001                         | 9-8013-6859-1 | 1              |
| 0001                         | 9-8059-0092-5 | 1              |
| 0002                         | 9-8059-0092-5 | 2              |
| 0003                         | 9-8013-3508-4 | 3              |
| 0004                         | 9-8149-9544-1 | 4              |
| 0005                         | 9-8149-9120-8 | 5              |
| 0006                         | 9-8144-3694-5 | 6              |
| 0007                         | 9-8013-0926-9 | 7              |
| 0008                         | 9-8026-0338-8 | 8              |
| 0009                         | 9-8013-1036-7 | 9              |
| 0010                         | 9-8032-5638-2 | 10             |
| 0011                         | 9-8059-5177-8 | 1              |
| 0012                         | 9-8149-9502-6 | 2              |
| 0013                         | 9-8013-6859-1 | 3              |
| 0014                         | 9-8059-0092-5 | 4              |
| 0015                         | 9-8013-3508-4 | 5              |
| 0016                         | 9-8149-9544-1 | 6              |
| 0017                         | 9-8149-9120-8 | 7              |
| 0018                         | 9-8144-3694-5 | 8              |
| 0019                         | 9-8013-0926-9 | 9              |
| 0020                         | 9-8026-0338-8 | 10             |
| 0021                         | 9-8026-0338-8 | 10             |
| 0022                         | 9-8032-5638-2 | 2              |
| 0023                         | 9-8059-5177-8 | 3              |
| 0024                         | 9-8013-6859-1 | 4              |
| 0025                         | 9-8013-1663-7 | 5              |
| 0026                         | 9-8032-8949-9 | 6              |
| 0027                         | 9-8059-0071-6 | 7              |
| 0028                         | 9-8144-3694-5 | 8              |
| 0029                         | 9-8013-3508-4 | 9              |

Figure 1.5.3

| Records in Place Database: |      |               |
|----------------------------|------|---------------|
| CID                        | OID  | Order ISBN    |
| C001                       | 0001 | 9-8013-6859-1 |
| C001                       | 0001 | 9-8059-0092-5 |
| C002                       | 0002 | 9-8059-0092-5 |
| C003                       | 0003 | 9-8013-3508-4 |
| C004                       | 0004 | 9-8149-9544-1 |
| C005                       | 0005 | 9-8149-9120-8 |
| C001                       | 0006 | 9-8144-3694-5 |
| C002                       | 0007 | 9-8013-0926-9 |
| C003                       | 0008 | 9-8026-0338-8 |
| C004                       | 0009 | 9-8013-1036-7 |
| C005                       | 0010 | 9-8032-5638-2 |
| C001                       | 0011 | 9-8059-5177-8 |
| C002                       | 0012 | 9-8149-9502-6 |
| C003                       | 0013 | 9-8013-6859-1 |
| C004                       | 0014 | 9-8059-0092-5 |
| C005                       | 0015 | 9-8013-3508-4 |
| C001                       | 0016 | 9-8149-9544-1 |
| C002                       | 0017 | 9-8149-9120-8 |
| C003                       | 0018 | 9-8144-3694-5 |
| C004                       | 0019 | 9-8013-0926-9 |
| C005                       | 0020 | 9-8026-0338-8 |
| C005                       | 0021 | 9-8026-0338-8 |
| C002                       | 0022 | 9-8032-5638-2 |
| C003                       | 0023 | 9-8059-5177-8 |
| C004                       | 0024 | 9-8013-6859-1 |
| C005                       | 0025 | 9-8013-1663-7 |
| C001                       | 0026 | 9-8032-8949-9 |
| C002                       | 0027 | 9-8059-0071-6 |
| C003                       | 0028 | 9-8144-3694-5 |
| C004                       | 0029 | 9-8013-3508-4 |

Figure 1.5.4

| Records in Writtenby Database: |      |  |
|--------------------------------|------|--|
| ISBN                           | AID  |  |
| 9-8013-0926-9                  | A008 |  |
| 9-8013-0926-9                  | A009 |  |
| 9-8013-1036-7                  | A006 |  |
| 9-8013-1036-7                  | A012 |  |
| 9-8013-1663-7                  | A016 |  |
| 9-8013-1663-7                  | A019 |  |
| 9-8013-3508-4                  | A002 |  |
| 9-8013-3508-4                  | A004 |  |
| 9-8013-6859-1                  | A001 |  |
| 9-8013-6859-1                  | A002 |  |
| 9-8026-0338-8                  | A010 |  |
| 9-8026-0338-8                  | A011 |  |
| 9-8032-5638-2                  | A013 |  |
| 9-8032-8949-9                  | A018 |  |
| 9-8059-0071-6                  | A016 |  |
| 9-8059-0071-6                  | A017 |  |
| 9-8059-0092-5                  | A003 |  |
| 9-8059-5177-8                  | A014 |  |
| 9-8144-3694-5                  | A007 |  |
| 9-8149-9120-8                  | A002 |  |
| 9-8149-9120-8                  | A005 |  |
| 9-8149-9502-6                  | A006 |  |
| 9-8149-9502-6                  | A015 |  |
| 9-8149-9544-1                  | A005 |  |

Figure 1.5.5

To avoid the program from shutdown, we force the admin to initial the table in the database before showing the table record (Figure 1.5.6).

```
The current date and time is 2023-04-14 23:31:55
----- Admin Interface: Main Page -----
There are 4 types of admin actions:
1. Initialize the database(Create Tables)
2. Load init records from local files
3. Reset all the existing records
4. Drop all the existing records
5. Overview of all the database records
6. Back to Main Menu

Select your action: 5
Tables are not existed. Please create the table first before showing the table record!
```

Figure 1.5.6

## 2. General Users

### (1) General User Main Page

```
The current date and time is 2023-04-05 21:09:11
----- General User Main Page -----
There are 4 types of general actions:
1. Book Search
2. Place an Order
3. Check History Orders
4. Back to Main Menu

Select your action: []
```

Figure 2.1.1

When users enter the general User Main Page (Figure 2.1.1), they can choose different actions: the first is to search the book, the second is to place an order, the third is to check the user's order history. Meanwhile, the page will also print out the current date and time for user reference. If they want to leave this page, they can enter 4 to return to the main menu.

```
The current date and time is 2023-04-05 21:09:11
----- General User Main Page -----
There are 4 types of general actions:
1. Book Search
2. Place an Order
3. Check History Orders
4. Back to Main Menu

Select your action: 5
Invalid input. Please enter an integer 1-4.
```

Figure 2.1.2

```
The current date and time is 2023-04-05 21:12:41
----- General User Main Page -----
There are 4 types of general actions:
1. Book Search
2. Place an Order
3. Check History Orders
4. Back to Main Menu

Select your action: -1
Invalid input. Please enter an integer 1-4.
```

Figure 2.1.3

```
The current date and time is 2023-04-05 21:12:50
----- General User Main Page -----
There are 4 types of general actions:
1. Book Search
2. Place an Order
3. Check History Orders
4. Back to Main Menu

Select your action: -1000000000000000
Message of Exception: Invalid input/Overflow occurs. Please enter an integer 1-4.
```

Figure 2.1.4

```
The current date and time is 2023-04-05 21:16:18
----- General User Main Page -----
There are 4 types of general actions:
1. Book Search
2. Place an Order
3. Check History Orders
4. Back to Main Menu

Select your action: 10000000000000000000000000
Message of Exception: Invalid input/Overflow occurs. Please enter an integer 1-4.
```

Figure 2.1.5

```
// Check if the input is correct.
if(scanner.hasNextInt()){
    field2 = scanner.nextInt();
    if (field2 >= 1 && field2 <= 4)
        break;
    else
        System.out.println("Invalid input. Please enter an integer 1-4.");//Input is integer but not in [1,4]
}
else{
    // Not an integer
    scanner.next();
    System.err.println("Message of Exception: Invalid input/Overflow occurs. Please enter an integer 1-4.");
}
```

Figure 2.1.6: Code Fragment

The program will check the validation of the user input (Figure 2.1.6). When the user input is out-of-bounds<sup>1</sup> (Figure 2.1.2, 2.1.3, 2.1.4, 2.1.5), the program will send the error message to remind the user and allow him/her to re-enter their action. When it passes, the program will drive the user to the corresponding function.

## (2) Function 1: Search a Book

```
Which field would you like to search?
1. Book ISBN
2. Book Title
3. Author Name
4. Back to General User Main Page

Enter your search field: []
```

Figure 2.2.1

When the users enter the book search function, they can search the book by 3 conditions: the first is using the book ISBN; the second is using the book title; the third is using the author name(s). If they want to leave this page, they can enter 4 to return to the main menu.

---

<sup>1</sup> We only regard the inputs as out-of-bounds when the value of input is not between 1 and 4, and also it exceeds the maximum or the minimum value of integer data type, also known as numerical data overflow.

Similarly the program will check the validation of the user input (Figure 2.1.6). A similar error message will be displayed when the user input is out-of-bounds(Figure 2.1.2, 2.1.3, 2.1.4, 2.1.5).

```
Note: Complete book ISBN is required. For example, you should enter X-XXXX-XXXX-X where X are digits.  
Please enter the complete book ISBN (including the hyphen '-'): []
```

Figure 2.2.2

When the users choose to search by the book ISBN, an instruction message will be displayed (Figure 2.2.2). Since each book has a unique ISBN, they need to enter the complete ISBN to search for the book they are really looking for.

```
Please enter the complete book ISBN: 0  
  
Error Message: Invalid ISBN. Please enter again.  
  
Action:  
1. Return to select the search fields.  
2. Changing input: Book ISBN  
  
Input your action: []
```

Figure 2.2.3

```
Input your action: 7842156321452  
  
Message of Exception: Invalid input/Overflow occurs. Please enter an integer 1 or 2.
```

Figure 2.2.4

Also, entering 13 digits will also be considered as wrong input.

```
Please enter the complete book ISBN: 0  
  
Error Message: Invalid ISBN. Please enter again.  
  
Action:  
1. Return to select the search fields.  
2. Changing input: Book ISBN  
  
Input your action: []
```

Figure 2.2.5

If the users enter an incomplete or empty ISBN, they are not forced to leave the searching function. They can choose to select the search fields again or change the current input to satisfy the search requirement.

| Search Results:   |                |   |
|---|----------------|---|
| (Note that if a book is written by more than 1 authors, the author names will be shown in (#)AuthorName.) |                |   |
| ISBN  | Title          | Price   Inventory Quantity   Authors              |
| 9-8013-6859-1   | Effective Java | 40   9   (1) Elisabeth Robson<br>(2) Eric Freeman |
|   |                |   |

Figure 2.2.6

Please enter the complete book ISBN: 9-8013-6859-0  
No book is found. Please search again.

Figure 2.2.7

If the users enter a valid ISBN, the program will pass the input ISBN to the *searchbook* function. Once the book exists in the database, the terminal will display a table containing all book information that matches the input ISBN (Figure 2.2.5). However, if the book does not exist in the database, it will display a “*No book is found. Please search again*” (Figure 2.2.7). After searching the book by ISBN, the program will return to the search page and the users can choose whether they still stay on the search page.

| Enter your search field: 2   |  |       |                    |  |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
|--|--|-------|--------------------|--|---------|---------------|----------------------------------|----|---|---------------------------------------|---------------|----------------|----|---|--|---------------|--|-----|---|----------------|---------------|-----------------|----|----|------------------------------------|---------------|----------------------------|----|----|-------------------|---------------|---------------------|----|----|------------------|
| Enter Book Title: Java   |  |       |                    |  |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| Search Results:  |  |       |                    |  |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| (Note that if a book is written by more than 1 authors, the author names will be shown in (#)AuthorName.)  |  |       |                    |  |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| <table border="1"> <thead> <tr> <th>ISBN</th> <th>Title</th> <th>Price</th> <th>Inventory Quantity</th> <th>Authors</th> </tr> </thead> <tbody> <tr> <td>9-8013-1663-7</td> <td>Core Java Volume I--Fundamentals</td> <td>50</td> <td>8</td> <td>(1) Cay Horstmann<br/>(2) Kathy Sierra</td> </tr> <tr> <td>9-8013-6859-1</td> <td>Effective Java</td> <td>40</td> <td>9</td> <td>(1) Elisabeth Robson<br/>(2) Eric Freeman</td> </tr> <tr> <td>9-8032-8949-0</td> <td>Java: An Introduction to Problem Solving and Programming</td> <td>100</td> <td>5</td> <td>Walter Savitch</td> </tr> <tr> <td>9-8059-0071-6</td> <td>Head First Java</td> <td>35</td> <td>10</td> <td>(1) Bert Bates<br/>(2) Kathy Sierra</td> </tr> <tr> <td>9-8059-5177-8</td> <td>JavaScript: The Good Parts</td> <td>25</td> <td>12</td> <td>Douglas Crockford</td> </tr> <tr> <td>9-8149-9502-6</td> <td>Eloquent JavaScript</td> <td>30</td> <td>11</td> <td>Marijn Haverbeke</td> </tr> </tbody> </table> | ISBN   | Title | Price              | Inventory Quantity                       | Authors | 9-8013-1663-7 | Core Java Volume I--Fundamentals | 50 | 8 | (1) Cay Horstmann<br>(2) Kathy Sierra | 9-8013-6859-1 | Effective Java | 40 | 9 | (1) Elisabeth Robson<br>(2) Eric Freeman | 9-8032-8949-0 | Java: An Introduction to Problem Solving and Programming | 100 | 5 | Walter Savitch | 9-8059-0071-6 | Head First Java | 35 | 10 | (1) Bert Bates<br>(2) Kathy Sierra | 9-8059-5177-8 | JavaScript: The Good Parts | 25 | 12 | Douglas Crockford | 9-8149-9502-6 | Eloquent JavaScript | 30 | 11 | Marijn Haverbeke |
| ISBN   | Title  | Price | Inventory Quantity | Authors                                  |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| 9-8013-1663-7  | Core Java Volume I--Fundamentals                         | 50    | 8                  | (1) Cay Horstmann<br>(2) Kathy Sierra    |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| 9-8013-6859-1  | Effective Java   | 40    | 9                  | (1) Elisabeth Robson<br>(2) Eric Freeman |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| 9-8032-8949-0  | Java: An Introduction to Problem Solving and Programming | 100   | 5                  | Walter Savitch                           |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| 9-8059-0071-6  | Head First Java  | 35    | 10                 | (1) Bert Bates<br>(2) Kathy Sierra       |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| 9-8059-5177-8  | JavaScript: The Good Parts                               | 25    | 12                 | Douglas Crockford                        |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |
| 9-8149-9502-6  | Eloquent JavaScript                                      | 30    | 11                 | Marijn Haverbeke                         |         |               |                                  |    |   |                                       |               |                |    |   |  |               |  |     |   |                |               |                 |    |    |                                    |               |                            |    |    |                   |               |                     |    |    |                  |

Figure 2.2.8

Besides, the users can search for a book by its title. In this case, we do not require users to input the complete book title as they may want to find the books that match the keywords. Here is an illustration: after the user entered the keywords in the selected search field, the program will invoke *searchbook* function. After retrieving the matched book information from the oracle database, the terminal will display a table containing all book information that matches the keywords (Figure 2.2.8). If no book is found, a similar message will be displayed (Figure 2.2.7).

Enter your search field: 3  
Note: Please enter one author name for each searching. (No complete name is required.)  
Enter Author Name:

Figure 2.2.9

Apart from the above, the users can search for a book by its author name(s). In this case, we also do not require users to input a complete author name. However, we set a constraint that users can search a book by an author name only. To avoid overwhelming the users by many unnecessary book results, we tend to implement in this way making our system more user-friendly.

|  |                 |       |                            |
|--|-----------------|-------|----------------------------|
| Note: Please enter one author name for each searching. (No complete name is required.) |                 |       |                            |
| Enter Author Name: Toby  |                 |       |                            |
| Search Results:  |                 |       |                            |
| ISBN   | Title           | Price | Inventory Quantity Authors |
| 9-80144-3694-5   | Learning Python | 50    | 7 Toby Sick                |

Figure 2.2.10

|   |                            |       |  |
|---|----------------------------|-------|--|
| Note: Please enter one author name for each searching. (No complete name is required.)                    |                            |       |  |
| Enter Author Name: Brian  |                            |       |  |
| Search Results:   |                            |       |  |
| (Note that if a book is written by more than 1 authors, the author names will be shown in (#)AuthorName.) |                            |       |  |
| ISBN  | Title                      | Price | Inventory Quantity Authors   |
| 9-8013-1036-7   | The C Programming Language | 50    | 10 (1) Brian Kernighan<br>(2) Dennis Ritchie   |
| 9-8149-9120-8   | Python Cookbook            | 40    | 10 (1) Brian Kernighan<br>(2) Dennis Ritchie (3) Elisabeth Robson<br>(4) Luciano Ramalho |

Figure 2.2.11

after the user entered the keywords in the selected search field, the program will invoke *searchbook* function. After retrieving the matched book information from the oracle database, the terminal will display a table containing all book information that matches the keywords (Figure 2.2.10, 2.2.11). If no book is found, a similar message will be displayed (Figure 2.2.7).

After the function is performed, the program will drive the users to the search page. If they want to leave this page, they can enter 4 to return to the main menu.

### **(3) Function 2: Place an Order**

#### Single Book Order Example

```
Select your action: 2

----- Welcome to Shopping Cart -----
In order to place an order, you need to enter (1) your User ID and (2) Book ISBN.

Enter your user ID: []
```

Figure 2.3.1

```
Enter your user ID: 123

Error Message: User ID is invalid. Please enter the user ID again.

Action:
1. Return to Shopping Cart Page
2. Changing input

Input your action: []
```

Figure 2.3.2

If the users want to place a book order, they can enter the shopping cart by entering value 2 on the general User Main Page (Figure 2.1.1). After the user enters their ID, the program will invoke the *checkUserID* function. If the ID is invalid, they are not forced to shut down the program (Figure 2.3.2).

```
Enter your user ID: C001
Success Message: User ID is valid. Please enter the book ISBN below.
How many different books you would like to order?
Enter the number: 
```

Figure 2.3.3

```
do {
    while (true) {
        System.out.print(s:"How many different books you would like to order?\n");
        System.out.print(s:"Enter the number: ");

        //check if the input is an integer
        if(scanner.hasNextInt()){
            counter = scanner.nextInt();
            break;
        }
        else{
            scanner.next();
            System.err.println(x:"Message of Exception: Invalid input/Overflow occurs. Please enter a positive integer.");
        }
    }
    // Check if the order quantity is positive integer
    if (counter > 0) { // Yes
        countercheck = true;
        if (counter == 1) // an order with only 1 book
            System.out.println(x:"\nNote: You want to order 1 book.");
        else if (counter > 1) // an order with more than 1 book (some of them can be duplicated)
            System.out.printf(format:"\nNote: You want to order %d different books. (It can be duplicated.)\n", counter);
    }
}
```

Figure 2.3.4 Code Fragment

```
How many different books you would like to order?
Enter the number: 1

Note: You want to order 1 book.

Note: You are entering the data of 1st order
Enter your book ISBN: 
```

Figure 2.3.5

Once the user ID is valid, the user can enter their desired order quantities. The program will only accept positive numbers and detect if there is numerical data overflow (Figure 2.3.4). An error message will be shown if the above requirements are not satisfied. Then, the users can enter the book ISBN. After receiving the user input ISBN, the program will invoke the *checkbookISBN* function, which is a boolean return type function. Only when the ISBN exists in our database, the function will return true, and allow users to enter the quantities of the requested book (Figure 2.3.6).

```
Note: You are entering the data of 1st order
Enter your book ISBN: 9-8013-6859-1

Success Message: The book ISBN 9-8013-6859-1 is valid.

Enter your request book Quantity: []
```

Figure 2.3.6

```
Error Message: Book ISBN is invalid. Please enter the Book ISBN again.

Action:
1. Return to Shopping Cart Page
2. Changing input

Input your action: []
```

Figure 2.3.7

However, when the input ISBN does not exist in our database, the function will return false, and allow users to return to the Shopping Cart Page or enter the ISBN again (Figure 2.3.7).

```
Success Message: The book ISBN 9-8013-6859-1 is valid.

Enter your request book Quantity: 0

Error Message: Book Quantity is invalid. Please enter the Book ISBN again.

Action:
1. Return to Shopping Cart Page
2. Changing input

Input your action: []
```

Figure 2.3.8

```
Success Message: The book ISBN 9-8013-6859-1 is valid.

Enter your request book Quantity: 3

Success Message: The book ISBN 9-8013-6859-1 are still available for ordering.
The order is processing.
```

Figure 2.3.9

Users can enter the quantities of the requested book after they input a ISBN that exists in our database. Once users enter the quantities, the program will check for integer overflow. If not, the program will invoke the checkbookQuantity function, which is a boolean return type function. If the input quantity is valid and we have enough for ordering, the program will display a success message to users (Figure 2.3.9). Suppose there is integer overflow or invalid quantities, including exceeding the inventory quantities and non-positive quantities. In

that case, the program will display an error message to users (Figure 2.3.8, note that the wording may change due to different situations).

```

Book Inventory Quantity updated successfully.

Success Message: Order has been placed.
Thank you for ordering books.

Your order details:
Your order ID is: 46542417
User ID: C001
Total number of orders: 1
The order date is: 2023-04-06 23:30:39

Order Book Details:
|Book ISBN      | Book Quantity    |
|9-8013-6859-1 | 3               |

You may:
1. Stay at this page
2. Return to the General User Main Page

Enter your choice: []

```

Figure 2.3.10

If all are satisfied, the program will invoke the *updateDatabase* function and followed by the *printOrderDetail* function to display the above order details. In the *updateDatabase* function, the program will execute the SQL query to insert the corresponding order information to the Orders and Place tables respectively. When both the Order and Place tables have been updated (Figure 2.3.11, 2.3.12), the inventory quantities of the corresponding ordered book will be adjusted in the database (Figure 2.3.13). Then, the program will display the order details by calling the *printOrderDetail* function. Afterward, Users can stay on this page(Shopping Cart) or return to the general user main page (Figure 2.3.10).

| ISBN          | TITLE          | PRICE | INVENTORY_QUANTITY |
|---------------|----------------|-------|--------------------|
| 9-8013-6859-1 | Effective Java | 40    | 4                  |

Figure 2.3.11 Updated Book Table in Database

| OID      | CID  | ORDER_DATE          | ORDER_ISBN    | ORDER_QUANTITY | SHIPPING_STATUS |
|----------|------|---------------------|---------------|----------------|-----------------|
| 46542417 | C001 | 2023-04-06 23:30:39 | 9-8013-6859-1 | 3              | Ordered         |

Figure 2.3.12 Updated Orders Table in Database

| CID  | OID      | ORDER_ISBN    |
|------|----------|---------------|
| C001 | 96064854 | 9-8013-6859-1 |
| C001 | 90751596 | 9-8013-6859-1 |
| C001 | 46542417 | 9-8013-6859-1 |

Figure 2.3.13 Updated Place Table in Database

Note that there are some design features in this function, place an order.

- i. Due to the limitation of the Oracle database, our ORDER\_DATE will be stored in the format of “yyyy-MM-dd HH24:MI:SS”. It is useful for users to check the exact date and time of an order.

```
// Generate order ID
private static String orderID() {
    String str = "";
    Random randomnum = new Random();
    int count = 1;
    while(count <=8){
        str += randomnum.nextInt(bound:10);
        count += 1;
    }
    return str;
}
```

Figure 2.3.14 Code Fragment

- ii. We implement two functions to generate a unique order ID, called *orderID* (Figure 2.3.14), and check if the generated order ID exists in our database, called *checkUniqueOID*, (Figure 2.3.15) respectively, so no duplicated order ID will be inserted in the database.

```
// Check if the generated order ID is unique
private static boolean checkUniqueOID(String str, Connection conn) throws SQLException {

    String sql = "Select * " +
                "From Orders " +
                "Where Orders.OID = ?";
    ResultSet rs1 = null;
    try {
        PreparedStatement pstmt1 = conn.prepareStatement(sql);
        pstmt1.setString(parameterIndex:1, str);
        rs1 = pstmt1.executeQuery();
        if (rs1.next()) {
            return false;
        } else {
            return true;
        }
    } catch (Exception error) {
        error.printStackTrace();
        return false;
    } finally {
        if (rs1 != null) {
            try {
                rs1.close();
            } catch (Exception error) {
                error.printStackTrace();
            }
        }
    }
}
```

Figure 2.3.15 Code Fragment

The unique order ID will be generated and checked after the users input a valid user ID and their desired quantities of books to be ordered (or before entering the ISBN and quantities of the desired books).

These features can still apply in the example of multiple books order.

#### Multiple Books Order Example (With Duplication)

```
----- Welcome to Shopping Cart -----
In order to place an order, you need to enter (1) your User ID and (2) Book ISBN.

Enter your user ID: C001

Success Message: User ID is valid. Please enter the book ISBN below.

How many different books you would like to order?
Enter the number: 3

Note: You want to order 3 different books. (It can be duplicated.)

Note: You are entering the data of 1st order
Enter your book ISBN: [ ]
```

Figure 2.3.16

Users can order multiple books. In our program, we do not require users to order distinct books. As users may forget which ISBN they enter initially, entering the duplicated ISBN within the same order is workable. Note that the duplicated ISBN will also be counted as one book but the program will automatically add the quantity to the previous one. Thus, only the sum will be inserted into and deducted from the Orders and Book tables.

The detailed example is shown below:

| ISBN          | TITLE                      | PRICE | INVENTORY_QUANTITY |
|---------------|----------------------------|-------|--------------------|
| 9-8013-6859-1 | Effective Java             | 40    | 4                  |
| 9-8059-0092-5 | Head First Design Patterns | 35    | 7                  |

Figure 2.3.17 The original Book Table

```
Note: You are entering the data of 1st order
Enter your book ISBN: 9-8013-6859-1
```

Figure 2.3.17 Entering the ISBN of the first book



if the ISBN exists, a success message will display.

```
Success Message: The book ISBN 9-8013-6859-1 is valid.  
Enter your request book Quantity: 2  
Success Message: The book ISBN 9-8013-6859-1 are still available for ordering.
```

Figure 2.3.18 Entering the quantity of the first book

↓  
if the quantity is valid, a success message will display.

```
Success Message: The book ISBN 9-8013-6859-1 are still available for ordering.  
Note: You are entering the data of 2nd order  
Enter your book ISBN: 9-8013-6859-1
```

Figure 2.3.19 Enter the ISBN of the second book

↓  
if ISBN is duplicated

```
Note: You are entering the data of 2nd order  
Enter your book ISBN: 9-8013-6859-1  
  
Success Message: The book ISBN 9-8013-6859-1 is valid.  
  
Note: Book ISBN is duplicated. After you enter the order book quantity, we will help you combine the order.
```

Figure 2.3.20 Duplication message will displayed



```
Enter your request book Quantity: 2  
  
Success Message: The book ISBN 9-8013-6859-1 are still available for ordering.  
  
Success Message: Input of the quantity of duplicated order is finished.
```

Figure 2.3.21 Enter the quantity of the second book



```
Note: You are entering the data of 3rd order  
Enter your book ISBN: 9-8059-0092-5  
  
Success Message: The book ISBN 9-8059-0092-5 is valid.
```

Figure 2.3.22 Enter the ISBN of the third book



```
Success Message: Book ISBN is valid.  
  
Enter your request book Quantity: 4  
  
Success Message: The book ISBN 9-8059-0092-5 are still available for ordering.  
  
Success Message: Book Quantity input is valid.
```

Figure 2.3.23 Enter the quantity of the third book

```
Book Inventory Quantity updated successfully.  
  
Book Inventory Quantity updated successfully.  
  
Success Message: Order has been placed.  
Thank you for ordering books.
```

Figure 2.3.24 Order placed Successfully

(Two repeated statements show that the complete insertion and update in the Oracle database.)

```
The order is processing.  
Success Message: Order has been placed.  
Thank you for ordering books.  
  
Your order details:  
Your order ID is: 73772613  
User ID: C001  
Total number of orders: 2  
(Total number of duplicated orders: 1)  
The order date is: 2023-04-07 00:41:19  
  
Order Book Details:  
|Book ISBN      | Book Quantity    |  
|9-8013-6859-1 | 4                |  
|9-8059-0092-5 | 4                |  
  
You may:  
1. Stay at this page  
2. Return to the General User Main Page  
  
Enter your choice: []
```

Figure 2.3.25 Display of the order details

Note that the error handlings of the multiple books order example are similar to that of the single book order. The details of the error handling of this part will be omitted.

After placing an order, we can see

| ISBN          | TITLE                      | PRICE | INVENTORY_QUANTITY |
|---------------|----------------------------|-------|--------------------|
| 9-8013-6859-1 | Effective Java             | 40    | 0                  |
| 9-8059-0092-5 | Head First Design Patterns | 35    | 3                  |

Figure 2.3.26 Updated Book table in the Oracle database

| CID  | OID      | ORDER_ISBN    |
|------|----------|---------------|
| C001 | 41075073 | 9-8013-6859-1 |
| C001 | 41075073 | 9-8059-0092-5 |

Figure 2.3.27 Updated Place table in the Oracle database

| OID      | CID  | ORDER_DATE          | ORDER_ISBN    | ORDER_QUANTITY | SHIPPING_STATUS |
|----------|------|---------------------|---------------|----------------|-----------------|
| 41075073 | C001 | 2023-04-06 22:24:01 | 9-8013-6859-1 | 5              | Ordered         |
| 41075073 | C001 | 2023-04-06 22:24:01 | 9-8059-0092-5 | 5              | Ordered         |

Figure 2.3.28 Updated Orders table in the Oracle database

**(4) Function 3: Check Order History**

```
The current date and time is 2023-04-06 16:38:39
----- General User Main Page -----
There are 4 types of general actions:
1. Book Search
2. Place an Order
3. Check History Orders
4. Back to Main Menu

Select your action: 3

----- Welcome to check your history orders -----
In order to check your history orders, you need to enter your user ID below.

Enter your user ID: []
```

Figure 2.4.1

Users can check their order history by entering their user ID (Figure 2.4.1). In this function, the program will check whether the user inputs a valid user ID but will not check the existence of the user ID in our database (Figure 2.4.2).

```
String userID = "";
boolean flagID = false;
do {
    System.out.print(s:"Enter your user ID: ");
    try {
        userID = scanner.nextLine();
    } catch (Exception error) {
        error.printStackTrace();
        System.err.println("Message of Exception: " + error.getMessage());
        continue;
    }

    if (userID != "" && userID != null && userID.length() <= 10) {
        flagID = true;
    } else {
        System.out.println(x:"\nInvalid user ID. Please enter again.\n");
    }
} while (flagID == false);
```

Figure 2.4.2 Code Fragment

```

Enter your user ID: C001
Successfully enter the function

Order History:
Your User ID: C001
| OID      | Order Date          | Order ISBN        | Order Quantity | Shipping Status |
| 0001     | 2022-01-01 00:00:00  | 9-8013-6859-1   | 1              | shipped         |
| 0006     | 2022-01-06 00:00:00  | 9-8144-3694-5   | 6              | shipped         |
| 0011     | 2022-01-11 00:00:00  | 9-8059-5177-8   | 1              | ordered         |
| 0016     | 2022-01-16 00:00:00  | 9-8149-9544-1   | 6              | received        |
| 0026     | 2022-01-26 00:00:00  | 9-8032-8949-9   | 6              | received        |

You may:
1. Stay at this page
2. Return to the General User Main Page

Enter your choice: []

```

Figure 2.4.3

According to the code fragment (Figure 2.4.2), only when the user input satisfies all three cases, the input user ID is said to be valid. Then the program will invoke the *checkOrderHistory* function to retrieve the user order history from the database. Once the data is ready, a table of order history will be displayed (Figure 2.4.3). After that, the users can choose to stay or leave the page (Figure 2.4.3).

```

----- Welcome to check your history orders -----
In order to check your history orders, you need to enter your user ID below.

Enter your user ID: C000000000000000001

Invalid user ID. Please enter again.

You may:
1. Enter the input again
2. Return to the General User Main Page

Enter your choice: []

```

Figure 2.4.4

However, if any of them is violated, for example, if it is an empty input or its length exceeds 10, it will be regarded as invalid and an error message will be displayed (Figure 2.4.4). To enhance the user-friendliness of our program, we will not force the users to enter the user ID until it is valid. They can choose to enter again or leave this page. Therefore, they will not stay in a loop if they do not have a user ID.

## (5) Special Error Handling

```
===== Welcome to Book Ordering Management System =====
The current date and time is 2023-04-14 21:15:10
----- Main Menu -----
Please select your user type:
1. Admins
2. General Users
3. Employees or Managers
4. Exit the program

Enter the number: 2

Database is not available. Please contact the admin.
You will be redirected to the Main Menu

The current date and time is 2023-04-14 21:15:12
----- Main Menu -----
Please select your user type:
1. Admins
2. General Users
3. Employees or Managers
4. Exit the program

Enter the number:
```

Figure 2.5.1

If the tables are not initialized by the admins in the database, the users are not allowed to enter the general user main page (Figure 2.5.1). It helps reduce the errors or even avoid the shutdown of the program.

### 3. Employees and Managers

(1) Employees and Managers Main Page:

```
----- Employees and Managers Interface: Main Page -----
There are 4 types of employees and managers actions:
1. Order Update
2. Order Query
3. N Most Popular Books
4. Overview of all the database records
5. Back to Main Menu
```

Figure 3.1.1: Interface of Employee and Managers Main page

After entering the employees main page, the employees could have 3 functions to choose, (1) order update, (2) order query, (3) N most popular books and (4) Overview of all the database records. The employee could also choose to return back to the main menu.

(2) Function 1: Order Update

| Select your action: 1 |      |      |                     |                 |  |
|-----------------------|------|------|---------------------|-----------------|--|
| No.                   | OID  | CID  | ORDER_DATE          | SHIPPING_STATUS | Book_List (format:Book_ISBN(Quantity)) |
| 1                     | 0001 | C001 | 2022-01-01 00:00:00 | shipped         | 9-8013-6859-1 (1), 9-8059-0092-5 (1)   |
| 2                     | 0002 | C002 | 2022-01-01 00:00:00 | shipped         | 9-8059-0092-5 (2)                      |
| 3                     | 0003 | C003 | 2022-01-03 00:00:00 | shipped         | 9-8013-3508-4 (3)                      |
| 4                     | 0004 | C004 | 2022-01-04 00:00:00 | shipped         | 9-8149-9544-1 (4)                      |
| 5                     | 0005 | C005 | 2022-01-05 00:00:00 | shipped         | 9-8149-9120-8 (5)                      |
| 6                     | 0006 | C001 | 2022-01-06 00:00:00 | shipped         | 9-8144-3694-5 (6)                      |
| 7                     | 0007 | C002 | 2022-01-07 00:00:00 | shipped         | 9-8013-0926-9 (7)                      |
| 8                     | 0008 | C003 | 2022-01-08 00:00:00 | shipped         | 9-8026-0338-8 (8)                      |
| 9                     | 0009 | C004 | 2022-01-09 00:00:00 | shipped         | 9-8013-1036-7 (9)                      |
| 10                    | 0010 | C005 | 2022-01-10 00:00:00 | shipped         | 9-8032-5638-2 (10)                     |
| 11                    | 0011 | C001 | 2022-01-11 00:00:00 | ordered         | 9-8059-5177-8 (1)                      |
| 12                    | 0012 | C002 | 2022-01-12 00:00:00 | ordered         | 9-8149-9582-6 (2)                      |
| 13                    | 0013 | C003 | 2022-01-13 00:00:00 | ordered         | 9-8013-6859-1 (3)                      |
| 14                    | 0014 | C004 | 2022-01-14 00:00:00 | ordered         | 9-8059-0092-5 (4)                      |
| 15                    | 0015 | C005 | 2022-01-15 00:00:00 | ordered         | 9-8013-3508-4 (5)                      |
| 16                    | 0016 | C001 | 2022-01-16 00:00:00 | received        | 9-8149-9544-1 (6)                      |
| 17                    | 0017 | C002 | 2022-01-17 00:00:00 | received        | 9-8149-9120-8 (7)                      |
| 18                    | 0018 | C003 | 2022-01-18 00:00:00 | received        | 9-8144-3694-5 (8)                      |
| 19                    | 0019 | C004 | 2022-01-19 00:00:00 | received        | 9-8013-0926-9 (9)                      |
| 20                    | 0020 | C005 | 2022-01-20 00:00:00 | received        | 9-8026-0338-8 (10)                     |
| 21                    | 0021 | C005 | 2022-01-21 00:00:00 | received        | 9-8026-0338-8 (10)                     |
| 22                    | 0022 | C002 | 2022-01-22 00:00:00 | received        | 9-8032-5638-2 (2)                      |
| 23                    | 0023 | C003 | 2022-01-23 00:00:00 | shipped         | 9-8059-5177-8 (3)                      |
| 24                    | 0024 | C004 | 2022-01-24 00:00:00 | received        | 9-8013-6859-1 (4)                      |
| 25                    | 0025 | C005 | 2022-01-25 00:00:00 | received        | 9-8013-1663-7 (5)                      |
| 26                    | 0026 | C001 | 2022-01-26 00:00:00 | received        | 9-8032-8949-9 (6)                      |
| 27                    | 0027 | C002 | 2022-01-27 00:00:00 | received        | 9-8059-0071-6 (7)                      |
| 28                    | 0028 | C003 | 2022-01-28 00:00:00 | received        | 9-8144-3694-5 (8)                      |
| 29                    | 0029 | C004 | 2022-01-29 00:00:00 | received        | 9-8013-3508-4 (9)                      |

Enter the order ID to be updated:

Figure 3.2.1: Initial Interface of Function 1 (Order Update)

The order update function allows the employees to update the shipping status of the order. When the user enters “1” in the employee main page, the system will automatically print all the order records with their shipping status and the ISBN and quantity of the ordered book. The system then requires the user to enter the order ID of the order to be updated.

```
Enter the order ID to be updated: 0001
Error Message: Order ID is invalid. Please enter the order ID again.
Enter the order ID to be updated: 0001
Success Message: Order ID is valid. Please choose the new shipping status below.

Which shipping status would you like to update?(Input an integer 1-5)
1. ordered
2. shipped
3. received
4. Re-enter orderID
5. Return to employee main page
Enter your choice: 1
```

Figure 3.2.2: Enter of the Order ID to be updated

The inputted order ID will be verified with the order database in the *checkOrderID* function. If the inputted order ID does not exist in the order database, the system will produce an error message and ask the employee to enter the valid order ID; otherwise, the system will ask the user to choose the shipping status to be updated or re-enter the order ID again. (Figure 3.2.2) There are 3 shipping status to be chosen, (1) ordered (2) shipped and (3) received. For the better user experience, the employee could return to employee page by entering “5” if he/she do not want to update the order.

```
Which shipping status would you like to update?(Input an integer 1-5)
1. ordered
2. shipped
3. received
4. Re-enter orderID
5. Return to employee main page
Enter your choice: 3
2 row(s) updated.
Update successfully! The ordered is already received!
Do you want to update another order?
1. Yes
2. No
Enter your choice: 1
```

Figure 3.2.3: The Possible Cases of Update of Shipping Status (Success)

```
Which shipping status would you like to update?(Input an integer 1-5)
1. ordered
2. shipped
3. received
4. Re-enter orderID
5. Return to employee main page
Enter your choice: 2
Fail to update! The ordered is already shipped!
Do you want to update another order?
1. Yes
2. No
Enter your choice: 
```

Figure 3.2.4: The Possible Cases of Update of Shipping Status (Fail)

If the employee selects the shipping status which is different from the original status of the order, the system will return a successful message and specify the new shipping status of the updated order (Figure 3.2.3); otherwise, the error message will be returned and there is no update of the shipping status. (Figure 3.2.4) Our design allows employees to either update another order or exit the function 1 interface for their convenience.

```
Which shipping status would you like to update?(Input an integer 1-5)
1. ordered
2. shipped
3. received
4. Re-enter orderID
5. Return to employee main page
Enter your choice: 4
Enter the order ID to be updated: 
```

Figure 3.2.5: Re-enter the Order ID for the 4th choice

To handle the mistake of inputting the order ID, the employee could choose to re-enter the correct order ID he/she want to update. The after steps will be followed and same with the Figure 3.2.2.

### (3) Function 2: Order Query

| Select your action: 2   |      |      |                     |                 |  |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
|---|------|------|---------------------|-----------------|--|-----|-----|-----|------------|-----------------|--|---|------|------|---------------------|----------|--------------------------------------|---|------|------|---------------------|----------|-------------------|---|------|------|---------------------|----------|-------------------|---|------|------|---------------------|----------|-------------------|---|------|------|---------------------|----------|-------------------|---|------|------|---------------------|----------|--------------------|---|------|------|---------------------|----------|--------------------|---|------|------|---------------------|----------|-------------------|---|------|------|---------------------|----------|--------------------|----|------|------|---------------------|----------|-------------------|----|------|------|---------------------|----------|-------------------|----|------|------|---------------------|----------|-------------------|----|------|------|---------------------|----------|-------------------|----|------|------|---------------------|----------|-------------------|
| Not Shipped Orders :  |      |      |                     |                 |  |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| <table border="1"> <thead> <tr><th>No.</th><th>OID</th><th>CID</th><th>ORDER_DATE</th><th>SHIPPING_STATUS</th><th>Book_List (format:Book_ISBN(Quantity))</th></tr> </thead> <tbody> <tr><td>1</td><td>0011</td><td>C001</td><td>2022-01-11 00:00:00</td><td>ordered</td><td>9-8059-5177-8 (1)</td></tr> <tr><td>2</td><td>0012</td><td>C002</td><td>2022-01-12 00:00:00</td><td>ordered</td><td>9-8149-9502-6 (2)</td></tr> <tr><td>3</td><td>0013</td><td>C003</td><td>2022-01-13 00:00:00</td><td>ordered</td><td>9-8013-6859-1 (3)</td></tr> <tr><td>4</td><td>0014</td><td>C004</td><td>2022-01-14 00:00:00</td><td>ordered</td><td>9-8059-0092-5 (4)</td></tr> <tr><td>5</td><td>0015</td><td>C005</td><td>2022-01-15 00:00:00</td><td>ordered</td><td>9-8013-3508-4 (5)</td></tr> </tbody> </table>   |      |      |                     |                 |  | No. | OID | CID | ORDER_DATE | SHIPPING_STATUS | Book_List (format:Book_ISBN(Quantity)) | 1 | 0011 | C001 | 2022-01-11 00:00:00 | ordered  | 9-8059-5177-8 (1)                    | 2 | 0012 | C002 | 2022-01-12 00:00:00 | ordered  | 9-8149-9502-6 (2) | 3 | 0013 | C003 | 2022-01-13 00:00:00 | ordered  | 9-8013-6859-1 (3) | 4 | 0014 | C004 | 2022-01-14 00:00:00 | ordered  | 9-8059-0092-5 (4) | 5 | 0015 | C005 | 2022-01-15 00:00:00 | ordered  | 9-8013-3508-4 (5) |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| No.   | OID  | CID  | ORDER_DATE          | SHIPPING_STATUS | Book_List (format:Book_ISBN(Quantity)) |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 1   | 0011 | C001 | 2022-01-11 00:00:00 | ordered         | 9-8059-5177-8 (1)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 2   | 0012 | C002 | 2022-01-12 00:00:00 | ordered         | 9-8149-9502-6 (2)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 3   | 0013 | C003 | 2022-01-13 00:00:00 | ordered         | 9-8013-6859-1 (3)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 4   | 0014 | C004 | 2022-01-14 00:00:00 | ordered         | 9-8059-0092-5 (4)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 5   | 0015 | C005 | 2022-01-15 00:00:00 | ordered         | 9-8013-3508-4 (5)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| Shipped Orders :  |      |      |                     |                 |  |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| <table border="1"> <thead> <tr><th>No.</th><th>OID</th><th>CID</th><th>ORDER_DATE</th><th>SHIPPING_STATUS</th><th>Book_List (format:Book_ISBN(Quantity))</th></tr> </thead> <tbody> <tr><td>1</td><td>0002</td><td>C002</td><td>2022-01-01 00:00:00</td><td>shipped</td><td>9-8059-0092-5 (2)</td></tr> <tr><td>2</td><td>0003</td><td>C003</td><td>2022-01-03 00:00:00</td><td>shipped</td><td>9-8013-3508-4 (3)</td></tr> <tr><td>3</td><td>0004</td><td>C004</td><td>2022-01-04 00:00:00</td><td>shipped</td><td>9-8149-9544-1 (4)</td></tr> <tr><td>4</td><td>0005</td><td>C005</td><td>2022-01-05 00:00:00</td><td>shipped</td><td>9-8149-9120-8 (5)</td></tr> <tr><td>5</td><td>0006</td><td>C001</td><td>2022-01-06 00:00:00</td><td>shipped</td><td>9-8144-3694-5 (6)</td></tr> <tr><td>6</td><td>0007</td><td>C002</td><td>2022-01-07 00:00:00</td><td>shipped</td><td>9-8013-0926-9 (7)</td></tr> <tr><td>7</td><td>0008</td><td>C003</td><td>2022-01-08 00:00:00</td><td>shipped</td><td>9-8026-0338-8 (8)</td></tr> <tr><td>8</td><td>0009</td><td>C004</td><td>2022-01-09 00:00:00</td><td>shipped</td><td>9-8013-1036-7 (9)</td></tr> <tr><td>9</td><td>0010</td><td>C005</td><td>2022-01-10 00:00:00</td><td>shipped</td><td>9-8032-5638-2 (10)</td></tr> <tr><td>10</td><td>0023</td><td>C003</td><td>2022-01-23 00:00:00</td><td>shipped</td><td>9-8059-5177-8 (3)</td></tr> </tbody> </table>   |      |      |                     |                 |  | No. | OID | CID | ORDER_DATE | SHIPPING_STATUS | Book_List (format:Book_ISBN(Quantity)) | 1 | 0002 | C002 | 2022-01-01 00:00:00 | shipped  | 9-8059-0092-5 (2)                    | 2 | 0003 | C003 | 2022-01-03 00:00:00 | shipped  | 9-8013-3508-4 (3) | 3 | 0004 | C004 | 2022-01-04 00:00:00 | shipped  | 9-8149-9544-1 (4) | 4 | 0005 | C005 | 2022-01-05 00:00:00 | shipped  | 9-8149-9120-8 (5) | 5 | 0006 | C001 | 2022-01-06 00:00:00 | shipped  | 9-8144-3694-5 (6) | 6 | 0007 | C002 | 2022-01-07 00:00:00 | shipped  | 9-8013-0926-9 (7)  | 7 | 0008 | C003 | 2022-01-08 00:00:00 | shipped  | 9-8026-0338-8 (8)  | 8 | 0009 | C004 | 2022-01-09 00:00:00 | shipped  | 9-8013-1036-7 (9) | 9 | 0010 | C005 | 2022-01-10 00:00:00 | shipped  | 9-8032-5638-2 (10) | 10 | 0023 | C003 | 2022-01-23 00:00:00 | shipped  | 9-8059-5177-8 (3) |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| No.   | OID  | CID  | ORDER_DATE          | SHIPPING_STATUS | Book_List (format:Book_ISBN(Quantity)) |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 1   | 0002 | C002 | 2022-01-01 00:00:00 | shipped         | 9-8059-0092-5 (2)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 2   | 0003 | C003 | 2022-01-03 00:00:00 | shipped         | 9-8013-3508-4 (3)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 3   | 0004 | C004 | 2022-01-04 00:00:00 | shipped         | 9-8149-9544-1 (4)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 4   | 0005 | C005 | 2022-01-05 00:00:00 | shipped         | 9-8149-9120-8 (5)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 5   | 0006 | C001 | 2022-01-06 00:00:00 | shipped         | 9-8144-3694-5 (6)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 6   | 0007 | C002 | 2022-01-07 00:00:00 | shipped         | 9-8013-0926-9 (7)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 7   | 0008 | C003 | 2022-01-08 00:00:00 | shipped         | 9-8026-0338-8 (8)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 8   | 0009 | C004 | 2022-01-09 00:00:00 | shipped         | 9-8013-1036-7 (9)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 9   | 0010 | C005 | 2022-01-10 00:00:00 | shipped         | 9-8032-5638-2 (10)                     |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 10  | 0023 | C003 | 2022-01-23 00:00:00 | shipped         | 9-8059-5177-8 (3)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| Received Orders :   |      |      |                     |                 |  |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| <table border="1"> <thead> <tr><th>No.</th><th>OID</th><th>CID</th><th>ORDER_DATE</th><th>SHIPPING_STATUS</th><th>Book_List (format:Book_ISBN(Quantity))</th></tr> </thead> <tbody> <tr><td>1</td><td>0001</td><td>C001</td><td>2022-01-01 00:00:00</td><td>received</td><td>9-8013-6859-1 (1), 9-8059-0092-5 (1)</td></tr> <tr><td>2</td><td>0016</td><td>C001</td><td>2022-01-16 00:00:00</td><td>received</td><td>9-8149-9544-1 (6)</td></tr> <tr><td>3</td><td>0017</td><td>C002</td><td>2022-01-17 00:00:00</td><td>received</td><td>9-8149-9120-8 (7)</td></tr> <tr><td>4</td><td>0018</td><td>C003</td><td>2022-01-18 00:00:00</td><td>received</td><td>9-8144-3694-5 (8)</td></tr> <tr><td>5</td><td>0019</td><td>C004</td><td>2022-01-19 00:00:00</td><td>received</td><td>9-8013-0926-9 (9)</td></tr> <tr><td>6</td><td>0020</td><td>C005</td><td>2022-01-20 00:00:00</td><td>received</td><td>9-8026-0338-8 (10)</td></tr> <tr><td>7</td><td>0021</td><td>C005</td><td>2022-01-21 00:00:00</td><td>received</td><td>9-8026-0338-8 (10)</td></tr> <tr><td>8</td><td>0022</td><td>C002</td><td>2022-01-22 00:00:00</td><td>received</td><td>9-8032-5638-2 (2)</td></tr> <tr><td>9</td><td>0024</td><td>C004</td><td>2022-01-24 00:00:00</td><td>received</td><td>9-8013-6859-1 (4)</td></tr> <tr><td>10</td><td>0025</td><td>C005</td><td>2022-01-25 00:00:00</td><td>received</td><td>9-8013-1663-7 (5)</td></tr> <tr><td>11</td><td>0026</td><td>C001</td><td>2022-01-26 00:00:00</td><td>received</td><td>9-8032-8949-9 (6)</td></tr> <tr><td>12</td><td>0027</td><td>C002</td><td>2022-01-27 00:00:00</td><td>received</td><td>9-8059-0071-6 (7)</td></tr> <tr><td>13</td><td>0028</td><td>C003</td><td>2022-01-28 00:00:00</td><td>received</td><td>9-8144-3694-5 (8)</td></tr> <tr><td>14</td><td>0029</td><td>C004</td><td>2022-01-29 00:00:00</td><td>received</td><td>9-8013-3508-4 (9)</td></tr> </tbody> </table> |      |      |                     |                 |  | No. | OID | CID | ORDER_DATE | SHIPPING_STATUS | Book_List (format:Book_ISBN(Quantity)) | 1 | 0001 | C001 | 2022-01-01 00:00:00 | received | 9-8013-6859-1 (1), 9-8059-0092-5 (1) | 2 | 0016 | C001 | 2022-01-16 00:00:00 | received | 9-8149-9544-1 (6) | 3 | 0017 | C002 | 2022-01-17 00:00:00 | received | 9-8149-9120-8 (7) | 4 | 0018 | C003 | 2022-01-18 00:00:00 | received | 9-8144-3694-5 (8) | 5 | 0019 | C004 | 2022-01-19 00:00:00 | received | 9-8013-0926-9 (9) | 6 | 0020 | C005 | 2022-01-20 00:00:00 | received | 9-8026-0338-8 (10) | 7 | 0021 | C005 | 2022-01-21 00:00:00 | received | 9-8026-0338-8 (10) | 8 | 0022 | C002 | 2022-01-22 00:00:00 | received | 9-8032-5638-2 (2) | 9 | 0024 | C004 | 2022-01-24 00:00:00 | received | 9-8013-6859-1 (4)  | 10 | 0025 | C005 | 2022-01-25 00:00:00 | received | 9-8013-1663-7 (5) | 11 | 0026 | C001 | 2022-01-26 00:00:00 | received | 9-8032-8949-9 (6) | 12 | 0027 | C002 | 2022-01-27 00:00:00 | received | 9-8059-0071-6 (7) | 13 | 0028 | C003 | 2022-01-28 00:00:00 | received | 9-8144-3694-5 (8) | 14 | 0029 | C004 | 2022-01-29 00:00:00 | received | 9-8013-3508-4 (9) |
| No.   | OID  | CID  | ORDER_DATE          | SHIPPING_STATUS | Book_List (format:Book_ISBN(Quantity)) |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 1   | 0001 | C001 | 2022-01-01 00:00:00 | received        | 9-8013-6859-1 (1), 9-8059-0092-5 (1)   |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 2   | 0016 | C001 | 2022-01-16 00:00:00 | received        | 9-8149-9544-1 (6)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 3   | 0017 | C002 | 2022-01-17 00:00:00 | received        | 9-8149-9120-8 (7)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 4   | 0018 | C003 | 2022-01-18 00:00:00 | received        | 9-8144-3694-5 (8)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 5   | 0019 | C004 | 2022-01-19 00:00:00 | received        | 9-8013-0926-9 (9)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 6   | 0020 | C005 | 2022-01-20 00:00:00 | received        | 9-8026-0338-8 (10)                     |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 7   | 0021 | C005 | 2022-01-21 00:00:00 | received        | 9-8026-0338-8 (10)                     |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 8   | 0022 | C002 | 2022-01-22 00:00:00 | received        | 9-8032-5638-2 (2)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 9   | 0024 | C004 | 2022-01-24 00:00:00 | received        | 9-8013-6859-1 (4)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 10  | 0025 | C005 | 2022-01-25 00:00:00 | received        | 9-8013-1663-7 (5)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 11  | 0026 | C001 | 2022-01-26 00:00:00 | received        | 9-8032-8949-9 (6)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 12  | 0027 | C002 | 2022-01-27 00:00:00 | received        | 9-8059-0071-6 (7)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 13  | 0028 | C003 | 2022-01-28 00:00:00 | received        | 9-8144-3694-5 (8)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |
| 14  | 0029 | C004 | 2022-01-29 00:00:00 | received        | 9-8013-3508-4 (9)                      |     |     |     |            |                 |  |   |      |      |                     |          |                                      |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                   |   |      |      |                     |          |                    |   |      |      |                     |          |                    |   |      |      |                     |          |                   |   |      |      |                     |          |                    |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |    |      |      |                     |          |                   |

Figure 3.3.1: Interface of Function 2 (Order Query)

```
Select your action: 2
Not Shipped Orders :

There is no order that is still not shipped.

Shipped Orders :

There is no order that is shipped.

Received Orders :

There is no order that is received.
```

Figure 3.3.2: For Empty Order Record

When the user input “2” in the employee main page, he/she will enter the order query interface which lists all the orders grouped by the shipping status (ordered, shipped and received). The table of each group will be printed when there is at least one order belonging to that group, and the format of the printed table will be similar to Figure 3.3.1. Otherwise, no

table will be printed for that group and the message will be returned for reference. (Figure 3.3.2)

#### (4) Function 3: N most popular books

The employee could query the most popular books in order to import more popular books before the popular books run out. In order to let the employee easily retrieve and determine which popular books need to prepare more, the book details, inventory quantity and total sales of the book will be printed.

```
----- Employees and Managers Interface: Main Page -----
There are 3 types of employees and managers actions:
1. Order Update
2. Order Query
3. N Most Popular Books
4. Overview of all the database records
5. Back to Main Menu

Select your action: 3
Enter the number of most popular books to retrieve: 
```

Figure 3.4.1: Interface of Function 3 (N Most Popular Books)

The procedure of retrieving the most popular book is easy for the employee. First of all, he/she should select ‘3’ in the employee main page and enter into the N most Popular Book function. Figure 3.4.1 shows the screen shot after entering the function, the employee then enters the number of most popular books that wants to view.

```
Select your action: 3
Enter the number of most popular books to retrieve: -1
Invalid input. Please enter a non-negative integer.
Enter the number of most popular books to retrieve: 1.5
Invalid input/Overflow occurs. Please enter a non-negative integer.
Enter the number of most popular books to retrieve: 100000000000000000000000
Invalid input/Overflow occurs. Please enter a non-negative integer.
Enter the number of most popular books to retrieve: wwwwwww
Invalid input/Overflow occurs. Please enter a non-negative integer.
Enter the number of most popular books to retrieve: 1 2 3
Invalid input/Overflow occurs. Please enter a non-negative integer.
Enter the number of most popular books to retrieve: 
```

Figure 3.4.2: Example of inputting invalid or overflow input

```

else if(field3 == 3){
    while (true) {
        System.out.print(s;"Enter the number of most popular books to retrieve: ");
        String input = scanner.nextLine();
        // Check if the input N is an integer.
        try {
            int n = Integer.parseInt(input);
            if (n == 0) {
                System.out.println(x;"The result is an empty.");
                break;
            } else if (n > 0) {
                System.out.println("Retrieving " + n + " most popular books...");
                nMostPopularBook(n, conn);
                break;
            } else {
                System.out.println(x;"Invalid input. Please enter a non-negative integer.");
            }
        } catch (NumberFormatException e) {
            System.out.println(x;"Invalid input/Overflow occurs. Please enter a non-negative integer.");
        }
    }
}

```

Figure 3.4.3: Code for input checking

Input checking will be done in the input value of the number of books, which only allows the non-negative integer input. (Figure 3.4.2, 3.4.3) Other input will not be accepted and the error message “Invalid input” or “Overflow occurs” will be printed and remind the employee to enter the number again until the input is valid. There are 3 possible cases of the accepted input:

- (1) Input ‘0’ and output an empty result

```

Enter the number of most popular books to retrieve: 0
The result is an empty.

The current date and time is 2023-04-07 18:14:35

```

Figure 3.4.4: Case of Input of Zero

In this function, the system allows the zero input which will directly return a message of empty result without going to the *nMostPopularBook* function to execute the SQL query. It could allow the employee to quit the function in the fastest way if he/she does not want to know the information of the most popular book.

- (2) Input correct integer and output N most popular books

| Select your action: 3<br>Enter the number of most popular books to retrieve: 5<br>Retrieving 5 most popular books... |               |  |  |       |                    |             |
|--|---------------|--|--|-------|--------------------|-------------|
| RANK   | ISBN          | TITLE  | AUTHORS  | PRICE | INVENTORY_QUANTITY | TOTAL_SALES |
| 1  | 9-8026-0338-8 | Introduction to Algorithms                   | Charles Leiserson, Thomas Cormen                   | 90    | 6                  | 56          |
| 2  | 9-8149-9120-8 | Python Cookbook                              | Brian Kernighan, Elisabeth Robson, Luciano Ramalho | 40    | 10                 | 36          |
| 3  | 9-8013-3508-4 | Clean Code                                   | Elisabeth Robson, Robert Martin                    | 30    | 15                 | 34          |
| 4  | 9-8013-0926-9 | Computer Systems: A Programmer's Perspective | Mark Lutz, Randal Bryant                           | 100   | 5                  | 32          |
| 5  | 9-8144-3694-5 | Learning Python                              | Toby Sick  | 50    | 7                  | 22          |

Figure 3.4.5: Possible Cases of N most popular books (Success)

The nMostPopularBook function retrieves n books based on the highest total sales of the books. The total sales of each book is calculated by the sum of the quantity of each book in all the order records. After retrieving all N popular books, the table with 7 columns (rank, ISBN, Title, Authors, Price, Inventory quantity and total sales) will be printed for the employee to learn the details of popular books which could be useful for the employee to make strategy decisions. For example, it helps the employee to decide whether the inventory quantity is enough for the future supply, or whether it is necessary to adjust the price of books. It is great that there are N books retrieved from the database (N = the number of most popular books = the user input). According to figure 3.4.5, the input is 5 and the number of books printed is also 5.

### (3) Input correct integer but cannot output N most popular books

However, it is possible that there are not enough books to be retrieved from the database. There are two possible reasons: (1) The input value N is larger than the number of books in the store (2) Some books have not been ordered by any customer. Since the popular books are retrieved based on the order sales, the books that no one ordered before will not be retrieved and shown in the table.

| Select your action: 3<br>Enter the number of most popular books to retrieve: 20<br>Retrieving 20 most popular books... |               |  |  |       |                    |             |
|--|---------------|--|--|-------|--------------------|-------------|
| RANK   | ISBN          | TITLE  | AUTHORS  | PRICE | INVENTORY_QUANTITY | TOTAL_SALES |
| 1  | 9-8026-0338-8 | Introduction to Algorithms                               | Charles Leiserson, Thomas Cormen                   | 90    | 6                  | 56          |
| 2  | 9-8149-9120-8 | Python Cookbook  | Brian Kernighan, Elisabeth Robson, Luciano Ramalho | 40    | 10                 | 36          |
| 3  | 9-8013-3508-4 | Clean Code   | Elisabeth Robson, Robert Martin                    | 30    | 15                 | 34          |
| 4  | 9-8013-0926-9 | Computer Systems: A Programmer's Perspective             | Mark Lutz, Randal Bryant                           | 100   | 5                  | 32          |
| 5  | 9-8144-3694-5 | Learning Python  | Toby Sick  | 50    | 7                  | 22          |
| 6  | 9-8013-1036-7 | The C Programming Language                               | Brian Kernighan, Dennis Ritchie                    | 50    | 10                 | 18          |
| 7  | 9-8013-6859-1 | Effective Java   | Elisabeth Robson, Eric Freeman                     | 40    | 10                 | 16          |
| 8  | 9-8059-0071-6 | Head First Java  | Bert Bates, Kathy Sierra                           | 35    | 10                 | 14          |
| 9  | 9-8032-5638-2 | The C++ Programming Language                             | Bjarne Stroustrup                                  | 60    | 9                  | 12          |
| 10   | 9-8013-1663-7 | Core Java Volume I--Fundamentals                         | Cay Horstmann, Kathy Sierra                        | 50    | 8                  | 10          |
| 11   | 9-8149-9544-1 | Fluent Python  | Luciano Ramalho                                    | 45    | 8                  | 10          |
| 12   | 9-8059-0092-5 | Head First Design Patterns                               | Joshua Bloch                                       | 35    | 12                 | 7           |
| 13   | 9-8032-8949-9 | Java: An Introduction to Problem Solving and Programming | Walter Savitch                                     | 100   | 5                  | 6           |
| 14   | 9-8059-5177-8 | JavaScript: The Good Parts                               | Douglas Crockford                                  | 25    | 12                 | 4           |
| 15   | 9-8149-9502-6 | Eloquent JavaScript                                      | Marijn Haverbeke                                   | 30    | 11                 | 2           |

Figure 3.4.6: Possible Cases of N most popular books (Success with Comment)

Under this case, the system will print the maximum number of popular books in the store in the same table format and return the comment with the maximum number of popular books that could be retrieved from the database. (Figure 3.4.6)

## (5) Special Error Handling

```
The current date and time is 2023-04-14 21:23:32
----- Main Menu -----
Please select your user type:
1. Admins
2. General Users
3. Employees or Managers
4. Exit the program

Enter the number: 3

Database is not available. Please contact the admin.
You will be redirected to the Main Menu

The current date and time is 2023-04-14 21:23:33
----- Main Menu -----
Please select your user type:
1. Admins
2. General Users
3. Employees or Managers
4. Exit the program
```

Figure 3.5.1

Similar to the user case, if the tables are not initialized by the admins in the database, the employees or managers are not allowed to enter their main page (Figure 3.5.1). It helps reduce the errors or even avoid the shutdown of the program.