Building Electronic Commerce System

CSCI7795.81

Online DK Bookstore

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by

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Online DK Bookstore System

1. Introduction

Online DK Book Store is a website that sells books online using Java Servlet, JSP and Hibernate framework. DK Book Store has a web application where the customer can purchase books online. For creating this website I choose Eclipse, which is an integrated development environment(IDE) in this I used web dynamic project with the most widely used java IDE. I used Java Servlet, Hibernate Framework with JPA, MySQL database, J UNIT testing on back-end side and JSP, JSTL, HTML, CSS, JavaScript and j Query, Bootstrap 3, Lucid-chart on front-end side. I used tomcat server to run the website over the browser and also using MySQL database for storing data in database. I used Lucid-chart for drawing the UML diagrams.

When customers enter the website URL on browser then home page will be loaded, where customer can see all listings of books in DK Book store. Customers can search for a book by its title, author and description, customer can view the book details from the view book detail page. Customer can add book to the shopping cart and finally purchase using credit card payment transaction. An e- mail notification is sent to the customer email address. The customer can login using his account details or new a customer can register very quickly. They should give the details of their name, contact number and shipping address. The customer can also give feedback to a book by giving rating on a rating system from zero to five. The books are divided into many categories based on subjects like Java Programming, Software Engineering, or Database Systems etc.

On employee side, Employees are able to login with their employee ID via sign up functionality. They are able to add books, update/delete books and manage order status. They also can manage order page where they can search the order by id, order date or order status.

Before coding I used J UNIT test framework to write and run tests for testing data. Unit testing is an important part in Test Driven Development (TDD) as it helps finding problems in the code as early as possible, especially when you make changes to the existing code, you can run unit tests again to make sure that the changes do not break the application.

It has following functionalities: **Sign Up** (customers and employees can register in the DK Bookstore system, **Login** (customers or employees can go to pages with respective functionalities on the DK Bookstore system website), **Manage Payment** (Customers can add multiple payments to their account), **Search Books**(customers can search for specific books by title, author, description), **View Books** (customers can view detail about a specific book), **Add To Cart**(customers can add one or multiple items to the cart), **Update Cart** (customers can modifies the sub quantity of a book or can remove item from shopping cart), **Write Review**

(customers can create reviews for the each book), **Checkout** (customers can checkout and place the orders), **Add Book**(Employees can add the books),**Update book** (Employees can update the book information),**Delete Book**(Employee can delete book),**Clear Cart**(Customer can clear cart from shopping cart if they don't want to buy any book), **View Order**(Customer can view order details which customer already ordered books from DK bookstore system),**Manage Order** (Employees can manage orders by order id or Dates or status),**Logout** (customers and employees can log out of the system).

2. Requirements of the e-Commerce Project

2.1 Application requirements: Describe all the functionalities for employees and customers.

Functionalities for Customers:

1. SignUp (Customer)
2. Login (Customer)
3. ManagePayment (Customer)
4. SearchBooks (Book)
5. ViewBook (Book)
6. AddToCart (Shopping Cart)
7. UpdateCart (Shopping Cart)
8. ViewCart (Shopping Cart)
9.ClearCart(Shopping Cart)
10. Checkout (Shopping Cart, Order)
11.viewOrder(Shopping Cart, Order)
12. WriteReview (Review)
13. Logout (Customer)

Functionalities for Employees:

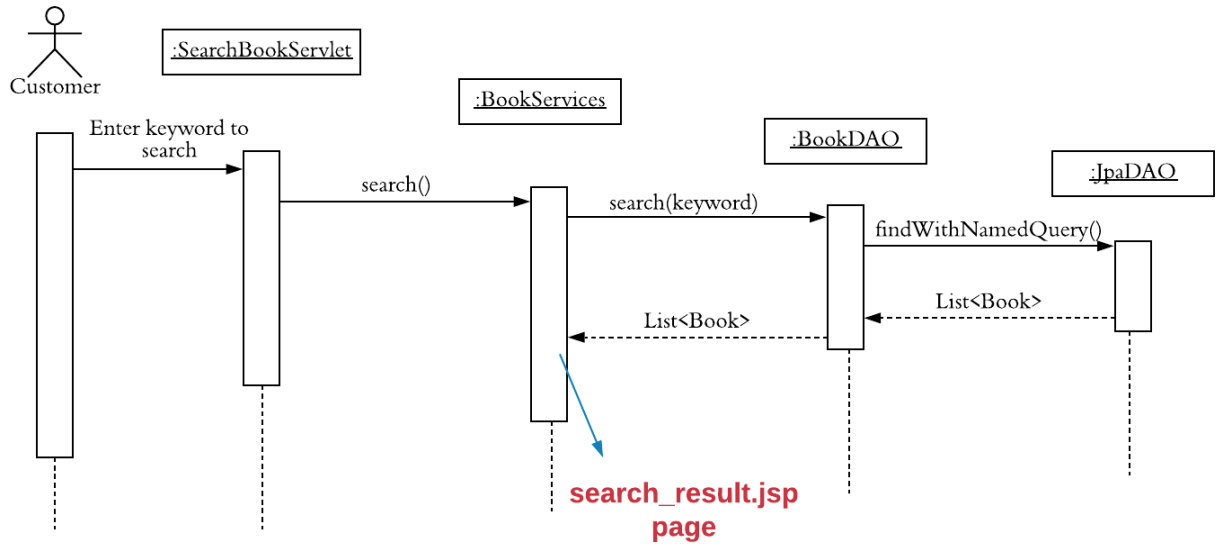
1. SignUp (Employee)
2. Login (Employee)
3. AddBook (Book)
4. UpdateBook (Book)
5. DeleteBook(Book)
6. ManageOrderStatus (Order)
7. Logout (Employee)

2.2 Refine Use Case of all Functionalities

2.2.1 A customer is able to do search books.

Dynamic Model:

Sequence Diagram of Search Book



[Fig 1: Sequence diagram of Search Book]

Functionality: Customers search the books.

Functionality Name: **Search Books**

Functional Model:

Refine Use Cases

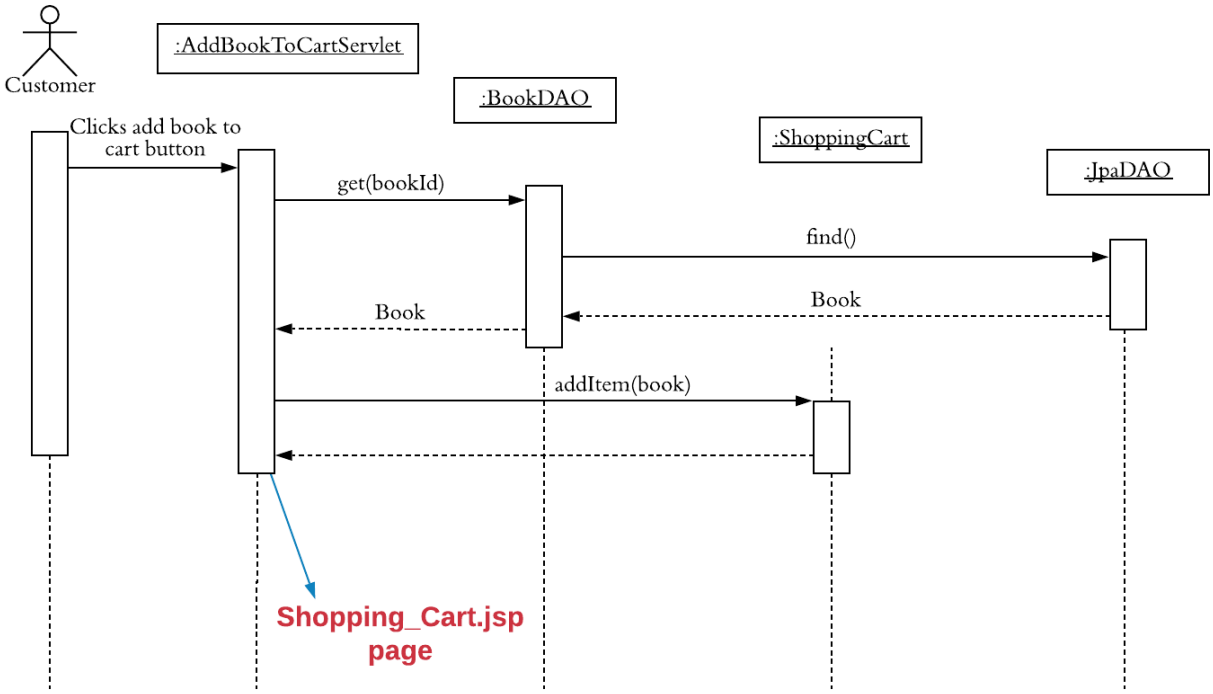
Use case Name	SearchBooks
Participating Actor	Initiated by a Customer
Flow of Events	1.The customer enter keyword to search with specific title, name, description, author in search bar. 2.SearchBookServlet invoked and it calls the search() method on the Bookservices class then calls the search() method on the BookDAO class then, invokes the findWithNamedQuery() method of the JpaDAO class. 3.The result returned is a List collection of Book objects. 4.The BookServices class forward the request to the search_result jsp page.
Entry conditions	The customer has loaded the home page.

Exit conditions	A confirmation is shown.
Quality Requirements	The process must be done in less than 3 seconds.

2.2.2 A customer is able to do add the books to the shopping cart.

Dynamic Model:

Sequence Diagram of Add To Cart



[Fig 2: Sequence diagram of Add To Cart]

Functionality: Customers add the books to the shopping cart.

Functionality Name: **Add To Cart**

Functional Model:

Refine Use Cases

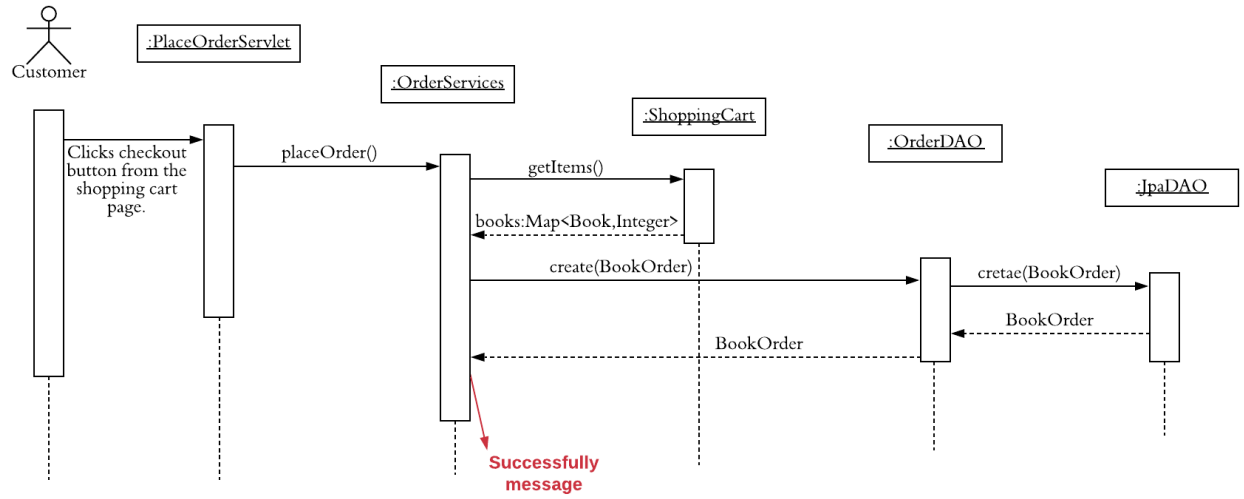
Use case Name	AddToCart
Participating Actor	Initiated by a Customer
Flow of Events	1.The customer viewed the specific book details, the customer adding the book into shopping cart by clicking on the Add To Cart button on home page or category drop down list.

	2.The customer clicks Add To cart button and instance of the AddToBookservlet is created and it invokes the get(bookId) method on the BookDAO class to retrieve book object from the database and then it caused addItem(book) method on the ShoppingCart class to put the ShoppingCart and then forward the customer to the shopping_cart jsp page.
Entry conditions	The customer has viewed the books item.
Exit conditions	The book is added to the shopping cart.
Quality Requirements	The process must be done in less than 3 seconds.

2.2.3 A customer is able to do checkout.

Dynamic Model:

Sequence Diagram of Checkout



[Fig 3: Sequence diagram of Checkout]

Functionality: Customers checkout from the shopping cart.

Functionality Name: **Check Out**

Functional Model:

Refine Use Cases

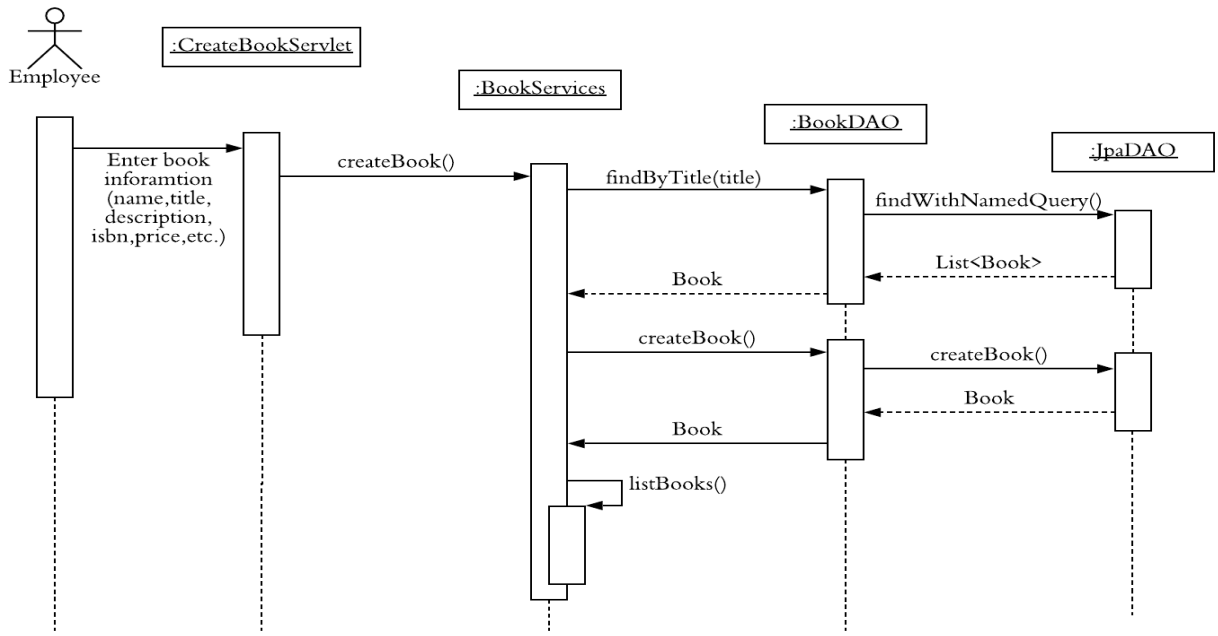
Use case Name	CheckOut
Participating Actor	Initiated by a Customer
Flow of Events	1.The customer is processing to checkout by clicking on proceed to checkout button in

	shopping cart page. 2.The customer view the checkout page and instance of PlaceOrderservlet class created. 3.This class calls the placeOrder() method on instance of OrderService class and it getItems() from the Shoppingcart object to read all books content in the ShoppingCart and then invokes a create(BookOrder) methos on the OrderDAO class to accept the order to the database. 4.Finally, Display a successfully message with Order summary in orderSummary page.
Entry conditions	The customer has added the books to the shopping cart.
Exit conditions	The order placed successfully message shown with order summery or unsuccessfully message shown.
Quality Requirements	The process must be done in less than 3 seconds.

2.2.4 A employee is able to do add the books.

Dynamic Model:

Sequence Diagram of Add Book



[Fig 4: Sequence diagram of Add Book]

Functionality: Employees add the books.

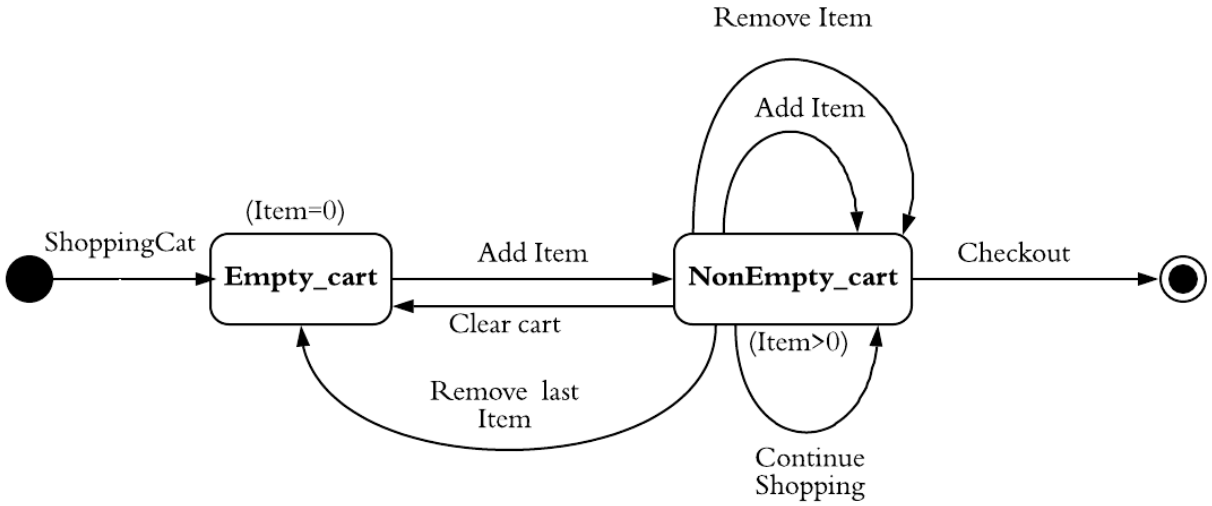
Functionality Name: **Add Book**

Functional Model:

Refine Use Cases

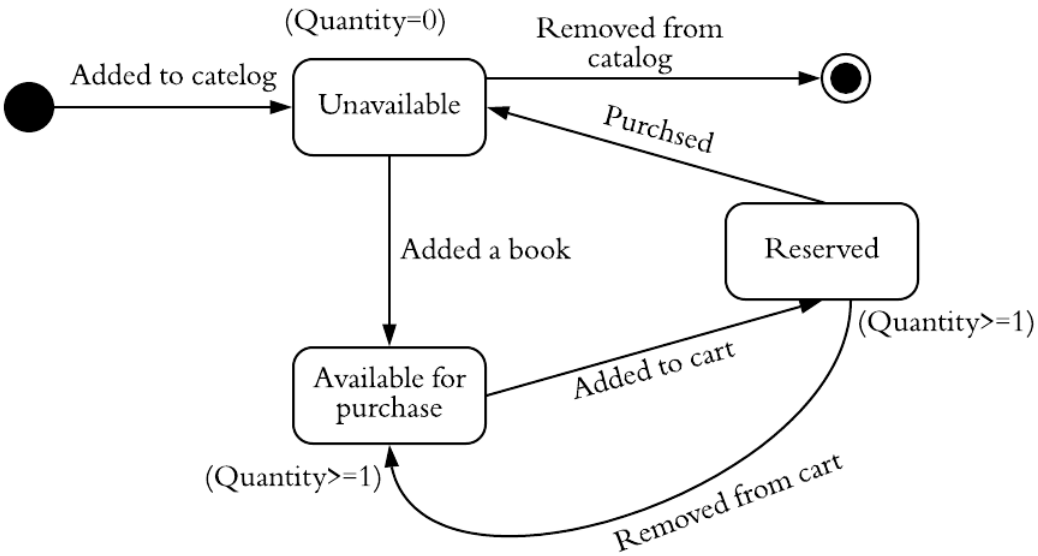
Use case Name	AddBook
Participating Actor	Initiated by an Employee
Flow of Events	1.The employee logged into his/her system and adding book information on book form page. 2.The createBookServlet class calls the createBook() method on the BookServices class and BookServices class invokes the findByTitle(title) method of the BookDAO class to find a book by title, invokes the findWithNamedQuery() method of the JpaDAO class if there's a book exists with the same title and if not then we call the create(Book) method on the BookDAO class, then invokes the create(Book) method to the JpaDAO class. And returns the newly created Book object. 3.Finally, refresh the list book page with newly created book.
Entry conditions	The Employee is logged In into his system.
Exit conditions	The book is added in system.
Quality Requirements	The process must be done in less than 3 seconds.

State Diagram of Shopping cart object



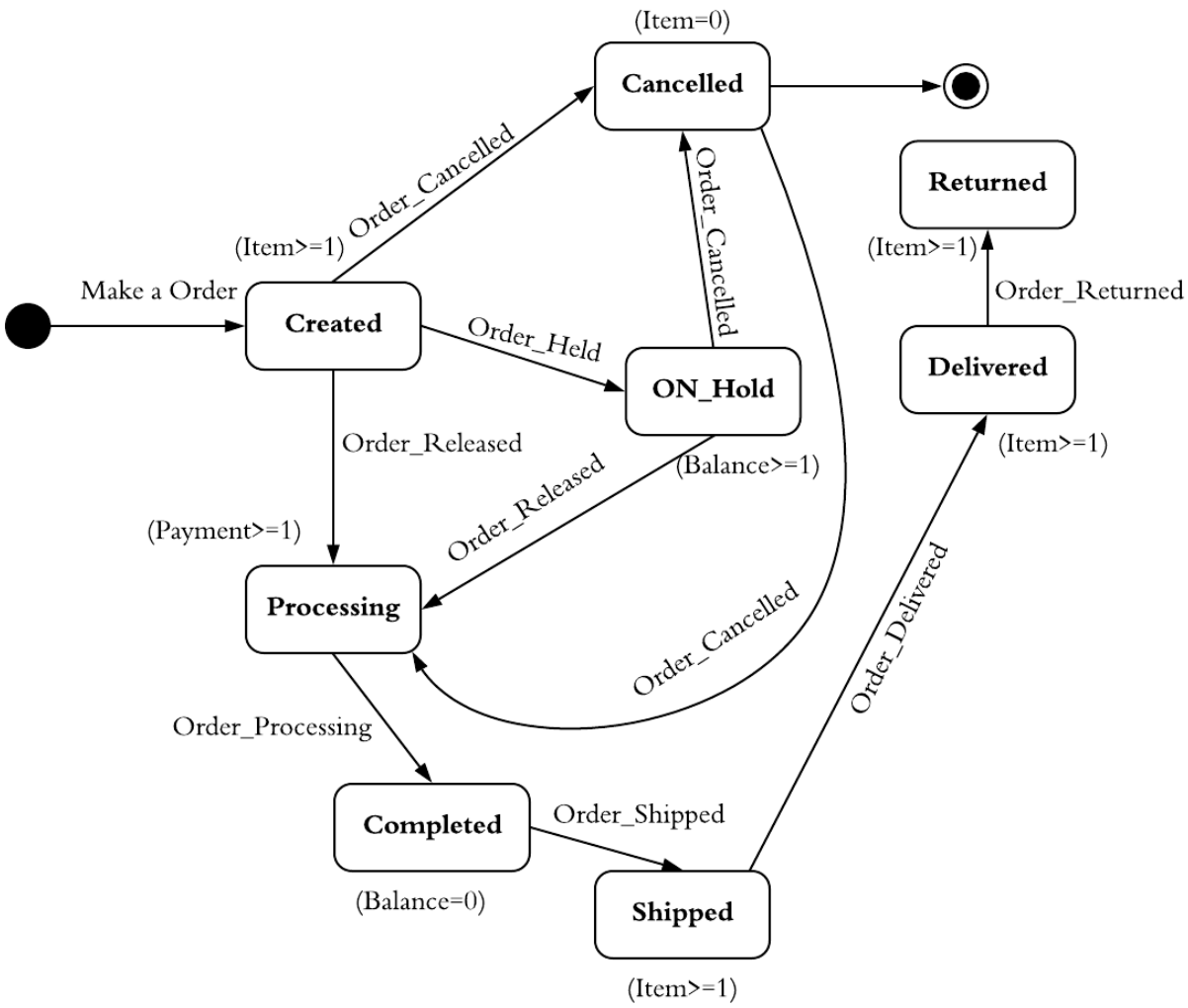
[Fig 5:Dynamic Model:-Sate diagram of Shopping Cart Object]

State Diagram of Book object



[Fig 6:Dynamic Model:-Sate diagram of Book Object]

State Diagram of Order object

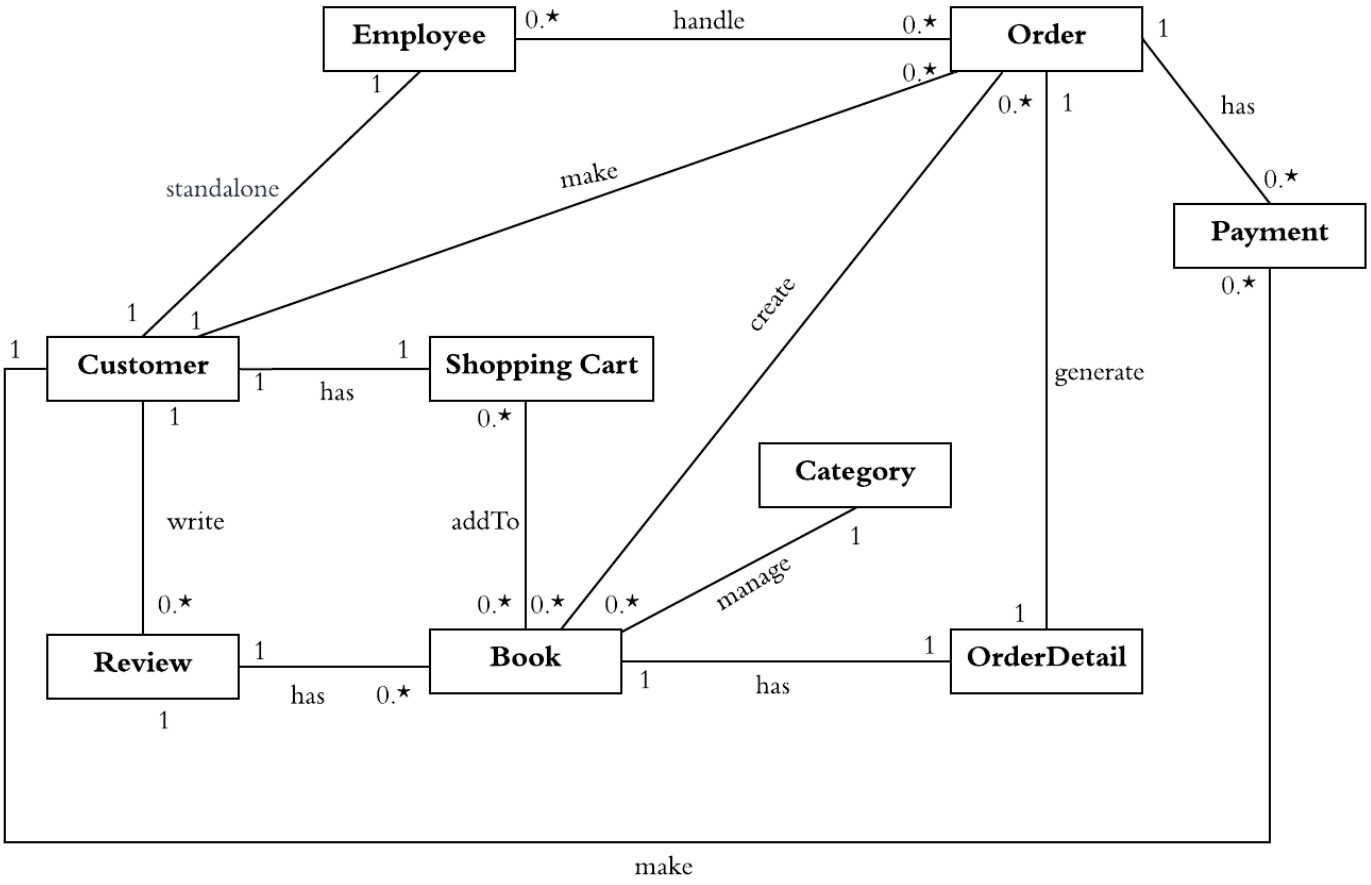


[Fig 7:Dynamic Model:-Sate diagram of Order Object]

3. Data Modeling

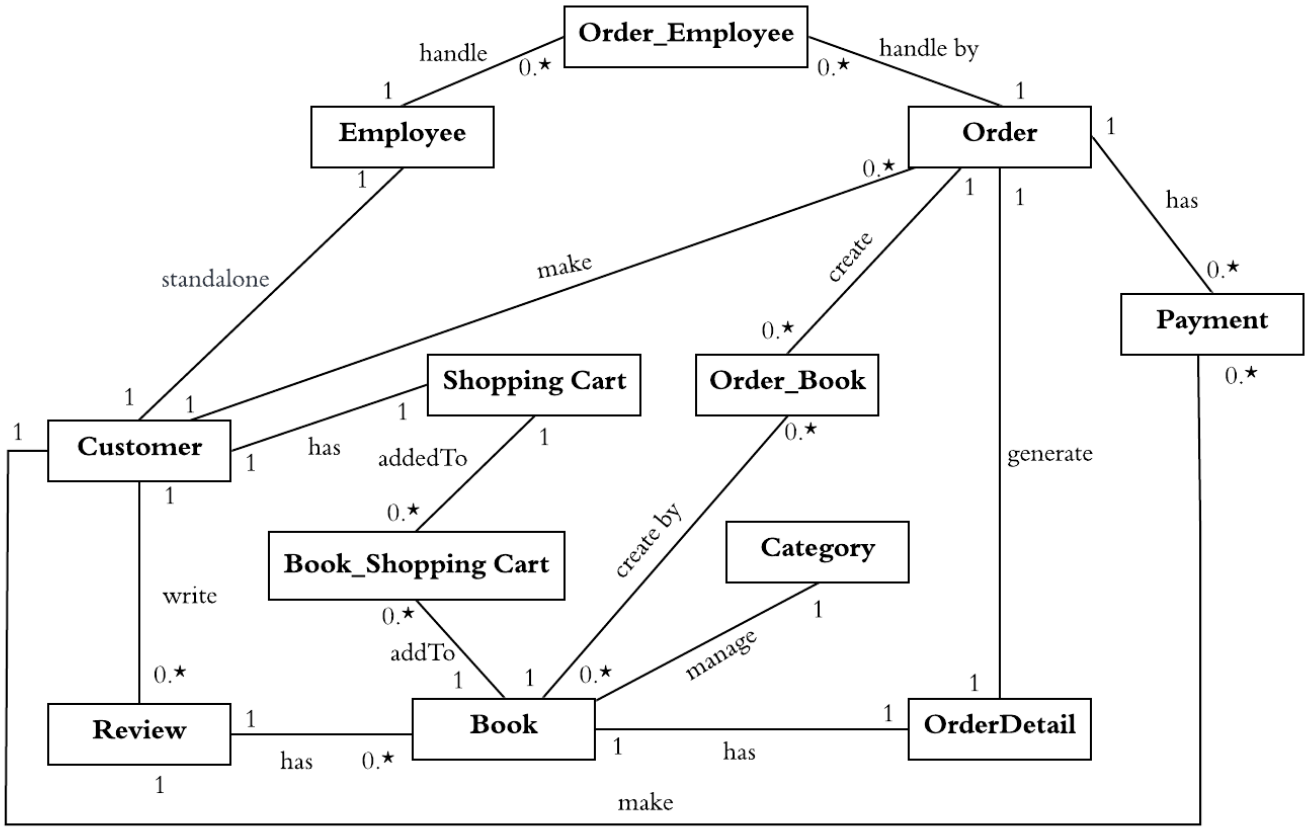
3.1 Data entities and their relationships

3.1.1 Initial Class Diagram



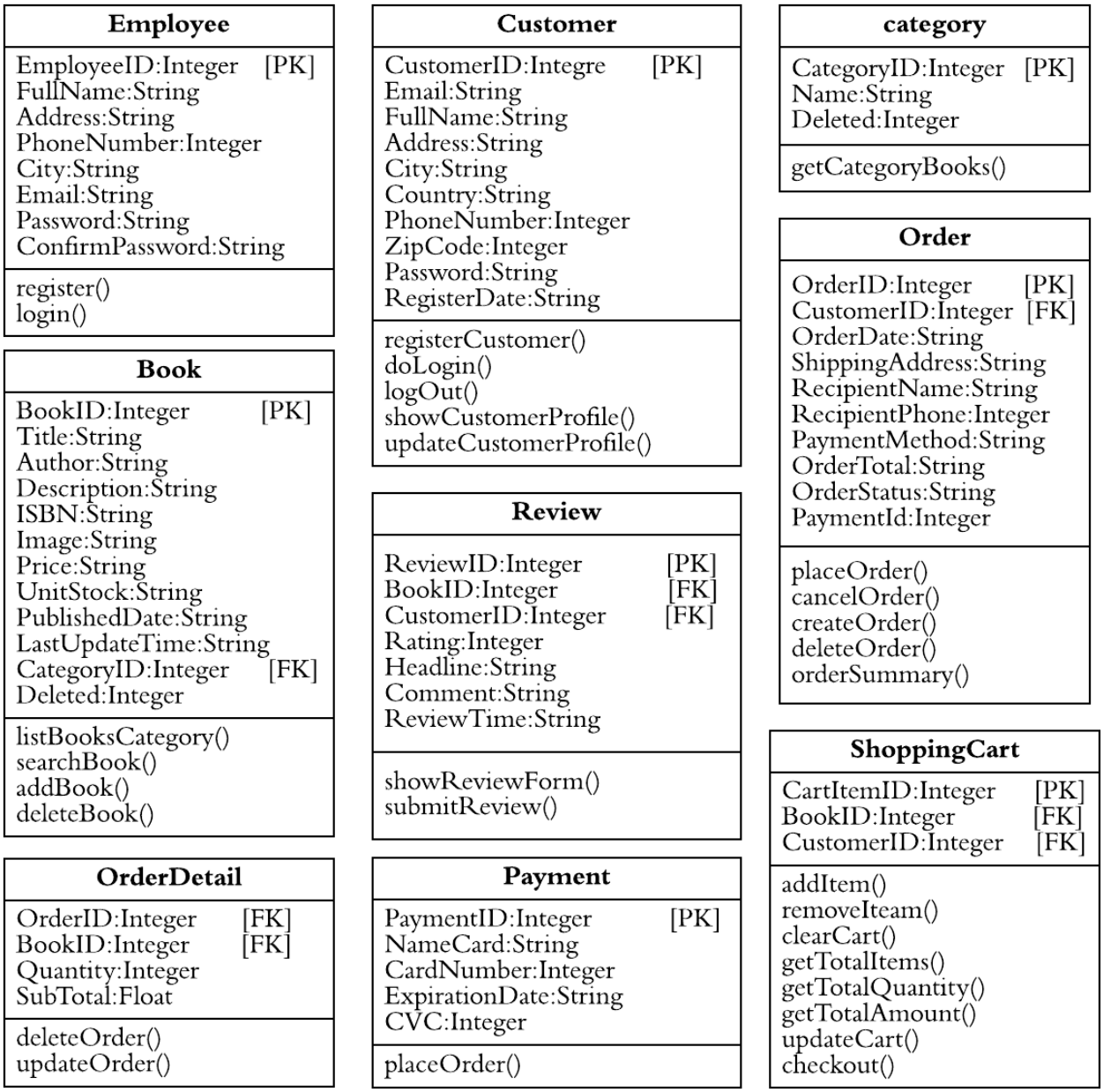
[Fig 8: Initial Class Diagram]

3.1.2 Final Class Diagram



[Fig 9: Final Class Diagram]

Class, Attributes, Operation



[Fig 10: Class, Attribute, Operation Diagram]

3.2Final table schema

Table Name	Table Field	PK	FK
Customer	CustomerID Email FullName Address City Country PhoneNumber ZipCode Password RegisterDate	CustomerID	
Category	CategoryID Name Deleted	CategoryID	
Book	BookId Title Author Description ISBN Image Price UnitStock PublishedDate LastUpdateTime CategoryID Deleted	BookID	CategoryID
Review	ReviewID BookID CustomerID Rating Headline Comment ReviewTime	ReviewID	BookID CustomerID
Order Table require two tables: master and detail.			
Order(master)	OrderID CustomerID OrderDate ShippingAddress RecipientName RecipientPhone PaymentMethod OrderTotal OrderStatus PaymentID	OrderID	CustomerID PaymentID

Order Detail(detail)	OrderID BookID Quntity SubTotal		BookID OrderID
Payment	PaymentID Namecard CardNumber ExpirationDate CVC	PaymentID	
ShoppingCart	CustomerID CartItemID BookID GradTotal	CartItemID	CustomerID BookID
Employee	EmployeeID FullName Address PhoneNumber City Email Password ConfirmPassword	EmployeeID	

4. System Design

Front End:

When customer enter the website URL**(http://localhost:8080/OnlineBookStoreWebsite/)**, the home page opens. The website lists all categories in the top drop down menu, which allows the customer to browse books in a specific domain and also search books by providing a specific keyword e.g. 'effective java',customer can view the all information about the each book and read reviews of other customers as well as average rating of a book, which can be ranged from 0 to 5 stars. customer can make only one review for a particular book but login is required first.

Before logging in, the customer must register an account by providing their personal information like full name, e-mail address, password, phone number, and the information required for shipping such as address, city, zip code and country. Customer can login by providing email and password.

Where customer are able to see the most recently published books (based on the publish date, not by the date on which the book is put onto the website). Customers can see the best-selling books (based on the number of orders have been made through the website), and the most favored books (based on their rating and number of reviews).

When customers are reading the details of book, the customer can add the book to their shopping cart by clicking the button **"Add to cart"**.Then shopping cart lists all the books that have been added. Customers can add a book multiple times to the shopping cart to increase the quantity(number of copies).The shopping cart page allows the customer to Update the quantity, remove books and even clear the cart, they also allow to keep continuous shopping. Customer can add shipping option(Free,3 Days, Next Days) delivery with sales tax(3%) of subtotal and shipping charge.

The information in shopping cart is maintained during the customer's session, which means that she can continue navigating the site before placing an order. The website also provides a menu that allows the customer to see her shopping cart quickly and for convenience, customer doesn't have to login first to use the shopping cart.

To place an order after adding books into shopping carts, the customer needs to review all books in the cart (customer can modify quantity or remove some books) before clicking "**Check Out"**. The checkout process requires the customer to login. If not, they are redirected to the login page, and the site proceeds to the check out page upon successful login.

On the Check Out page, the customer can review the books they want to order again, and confirm the shipping information. By default, the shipping information is filled with customer's registered information (name, phone, address, city, zip code and country) and add the payment information credit card through. The customer can update this information if needed. The website accepts multiple payment Delivery.

The customer clicks **"Place Order"** button to submit the order to the employee staff, and then they can check the order status via **"Orders"** menu. And same time Order summary will be send to the customer logged in email address. The default status of an order is 'Processing' and only the employee's staff can update the order status(canceled, shipped, Delivered, Completed, Returned).

On the Orders page, the customer can see all orders they have made through the website. The most recent orders are shown first and can click to see the details of each order. At this time, the customer can't edit their orders once they are submitted.

The website also allows the customer to view their registered information (profile details) and edit it. Customer cannot change their registered e-mail address, and their password won't be changed if left blank in the edit form.

when the customer logs out, the information in their shopping cart is cleared.

At any time, the customer can search the books they want by typing a keyword in the search box at the top of the site. The search result shows books that have either title or description contain the specified keyword. The customer can add the book to cart directly in the search result.

After inactivity the customer web page will expire in five minutes. And cookies will be store longer in session. Shopping cart information like subtotal, tax and shipping, Order total will be store in session

Back End:

When employee enters the URL**(http://localhost:8080/OnlineBookStoreWebsite/admin/),**

the home page is loaded, The employee can see recent customer ordered sales, recent customer reviewed books, how many books, categories, customers, reviews, total orders are in statistics panel on website home page.

Employee to manage information about categories, books, customers, reviews and orders with operations like view items (listing and detail); create, update, and delete an item. But they cannot create new review or new order.

The customer can manage all categories that are used to classify the books on the website. The only information needed for a category is the category name. Customer cannot delete a category if it contains books.

For adding a book onto the website, the employee can upload an image file that is used as the book's thumbnail. When editing a book, employee can choose to update the thumbnail or not. And if not, the old image is kept. Employee cannot remove a book if there are reviews and orders on it.

For managing customers, customer's email is unique. Employee can view the customer information.

For managing reviews, the employee cannot create a new one. Only customer can write a review. Employee can delete any review if it is inappropriate or violates DK bookstore website terms and conditions.

For managing orders, the employee can update shipping information and status of an order (more options for credit payment method).

After inactivity the employee web page will expire in five minutes. And Cookies will be stored in session.

5. Implementation Strategy

■ Techniques used for your assignments from the front end to the back end including DB

Backend: - Java Servlet, Hibernate Framework with JPA, MySQL database, JUNIT testing

Frontend: - JSP, JSTL, HTML, CSS, JavaScript and j Query, Bootstrap 3, Lucid-chart

Database: MySQL Server

■ Development Tools

IDE: Eclipse 2019-06 [Dynamic Web Project]

Java Application Server: Tomcat 9.0

Database: MySQL Server

■ Hardware and software environments

Software environments:

- I choose eclipse software to create dynamic web Project, Which is an integrated development (IDE) and is the most widely used Java SE(java 8) .
- Apache Tomcat version 9.0 to run Dynamic Web project.

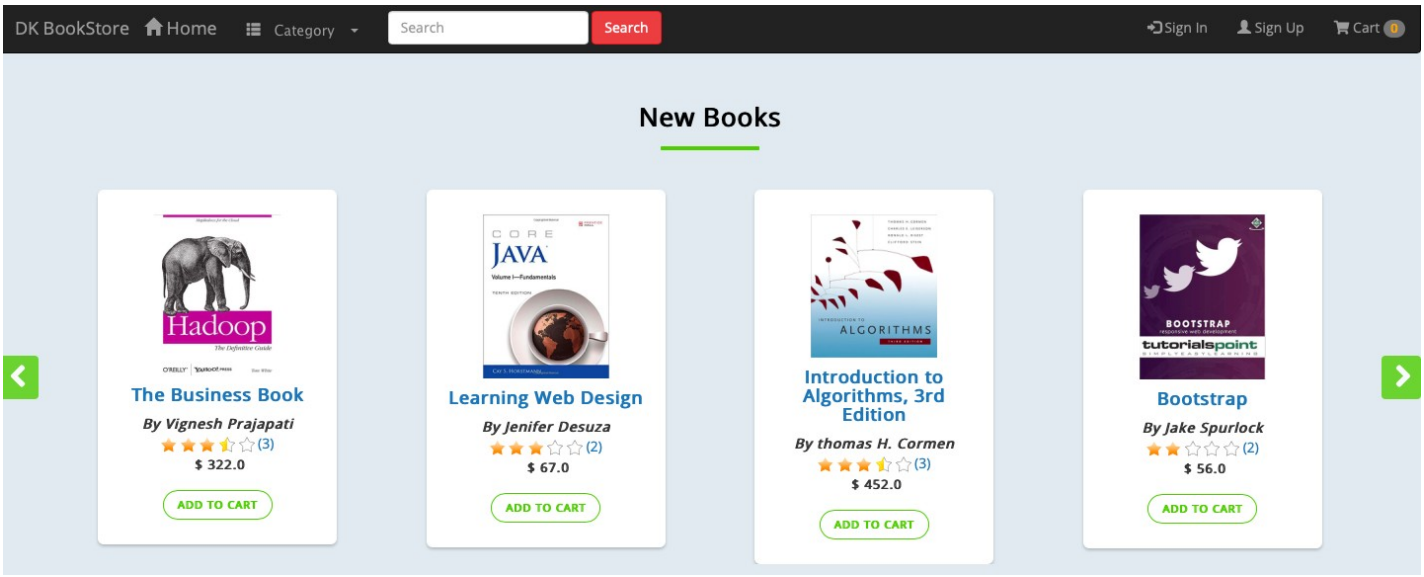
Hardware environments:

- MacBook Air

Appendices if any

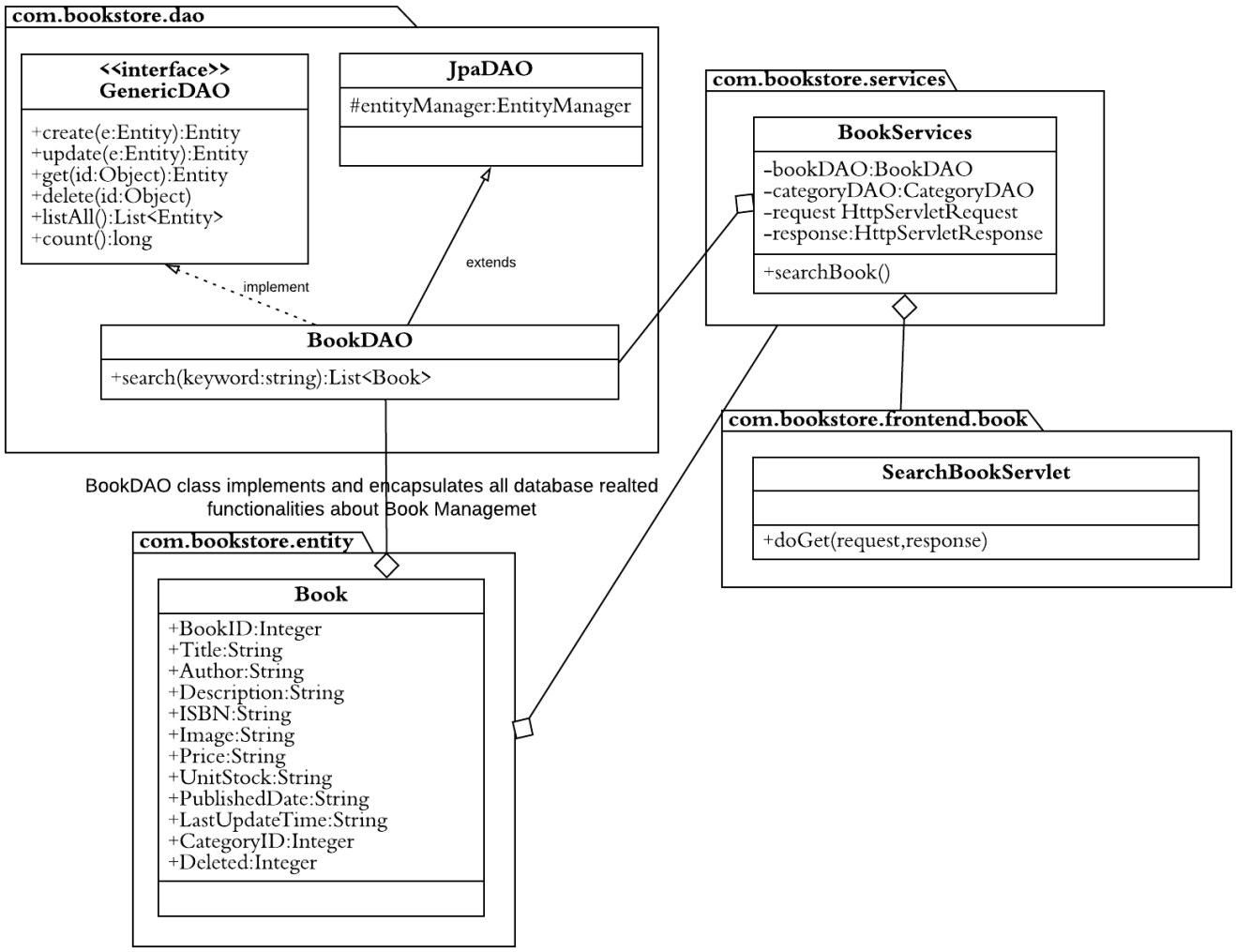
Below is the search book functionality from front end and back end perspective,

Screenshot of customer search home page.



BookDAO Class Diagram for Search Book Functionality

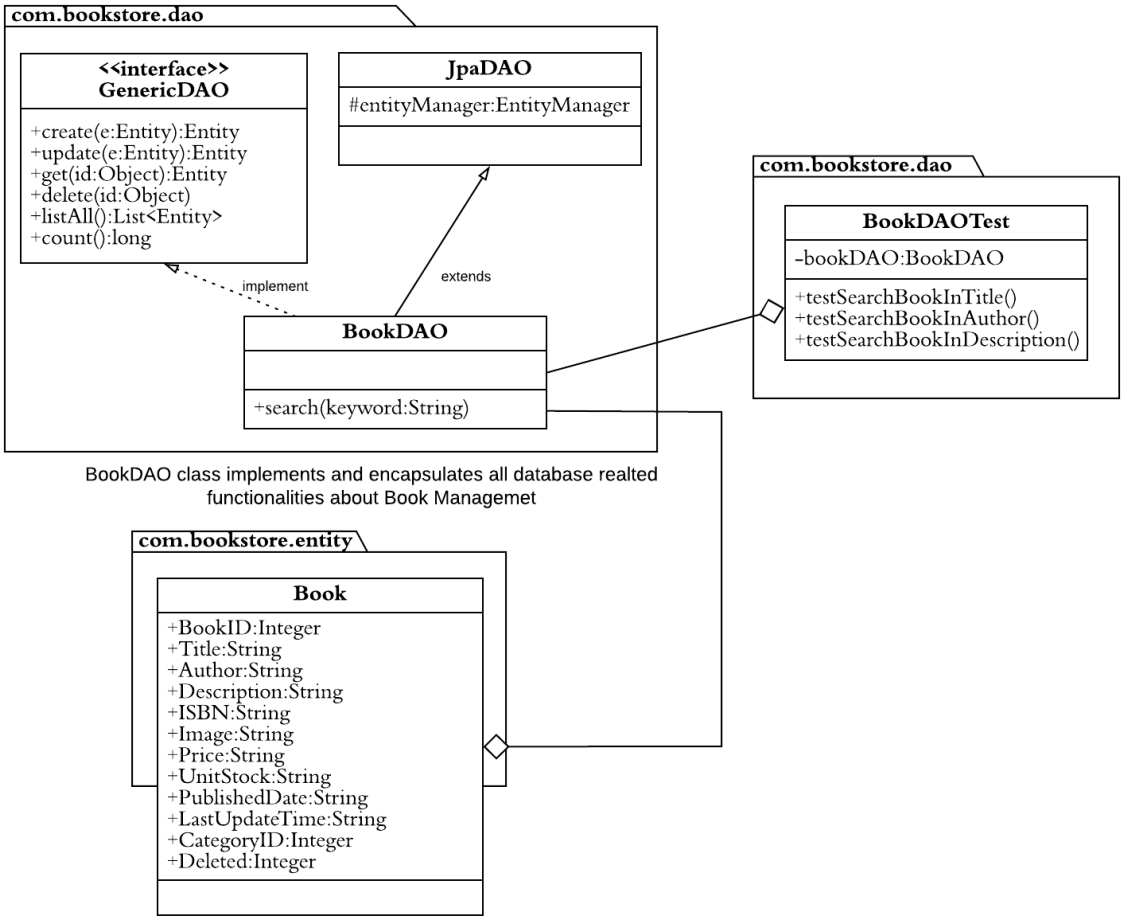
In BookDAO class, Implement a search() method that method searches for books based on the keyword and returns a List collection of Book objects. In BookServices class, update to add the searchBook() method. In Controller layer, create the SearchBookServlet that handles search requests from the client.



[BookDAO Class Daigram for search functionality]

BookDAOTest Class Diagram For search functionality Testing

First we creating BookDAO class and implement. Beside implementing the methods defined by the GenericDAO interface (create, update, delete, get, listAll, count).We also implement findByTitle, listByCategory, **search**, listrecentlyAdded methods in BookDAO class. Here, we implement search() method in BookDAO class. Book is domain model class which I mention in com.bookstore.entity. This class was generated by Hibernate Reverse Engineering tool. BookDAOTest class is a testing class for testing data before coding implementation which I mention in com.bookstore.dao. This class implement **testSearchBookInTitle(), testSearchInAuthor(), testSearchInDescription()**.



[BookDAOTest Class Daigram for Search functionality]

J UNIT Testing for Search Functionality and implemntation

1. First Implement search() method in BookDAO .java and write unit tests

This method returns a list of Book Objects search() and the parameter is keyword and invokes the findWithNamedQuery() from its superclass(return super.findWithNamedQuery(queryname)).
Query name: write the domain model class Book.java (Book.search) and the parameter name in the query is "keyword", and the value is the keyword string.

BookDAO.java

```
59
60      public List<Book> search(String keyword) {
61          return super.findWithNamedQuery("Book.search", "keyword", keyword);
62      }
```

Then, Book domain model class, we create a named query "Book.search"

Book.java

```
1  package com.bookstore.entity;
2  //Generated Sep 1, 2019 11:43:21 PM by Hibernate Tools 5.2.12.Final
3
4  import java.util.Base64;
30
31
32 /**
33  * Book generated by hbm2java
34  */
35 @Entity
36 @Table(name = "book", catalog = "bookstoredb", uniqueConstraints = @UniqueConstraint(columnNames = "title"))
37 @SQLDelete(sql = "UPDATE book SET deleted = '1' WHERE book_id = ?")
38
39 //Filter added to retrieve only records that have not been soft deleted.
40
41 @Where(clause = "deleted <> '1'")
42 @NamedQueries({ @NamedQuery(name = "Book.findAll", query = "SELECT b FROM Book b"),
43         @NamedQuery(name = "Book.findBytitle", query = "SELECT b FROM Book b WHERE b.title=:title"),
44         @NamedQuery(name = "Book.countAll", query = "SELECT Count(b.bookId) FROM Book b"),
45         @NamedQuery(name = "Book.countByCategory", query = "SELECT COUNT (b) FROM Book b "
46                 + "WHERE b.category.categoryId=:catId"),
47         @NamedQuery(name = "Book.findByCategory", query = "SELECT b FROM Book b JOIN "
48                 + "Category c ON b.category.categoryId=c.categoryId AND c.categoryId=:catId"),
49         @NamedQuery(name = "Book.listNew", query = "SELECT b FROM Book b ORDER BY b.publishedDate DESC"),
50         @NamedQuery(name = "Book.search", query = "SELECT b FROM Book b WHERE b.title LIKE '%' || :keyword || '%' "
51                 + " OR b.author LIKE '%' || :keyword || '%'" + " OR b.description LIKE '%' || :keyword || '%'")
52
53 })
```

Then, Open BookDAOTest.java class and create test method for search book title, author, description for testing code

BookDAOTest.java

```
185     @Test                                   //search book title
186     public void testSearchBookInTitle() {
187         String keyword = "java";
188         List<Book> result = bookDAO.search(keyword);
189
190         for (Book aBook : result) {
191             System.out.println(aBook.getTitle());
192         }
193         assertEquals(3, result.size());
194     }
195
196     @Test                                  //search book author
197     public void testSearchBookInAuthor() {
198         String keyword = "Craig Walls";
199         List<Book> result = bookDAO.search(keyword);
200
201         for (Book aBook : result) {
202             System.out.println(aBook.getTitle());
203         }
204         assertEquals(1, result.size());
205     }
206
207     @Test                                //search book description contains
208     public void testSearchBookInDescription() {
209         String keyword = "CompletableFuture";
210         List<Book> result = bookDAO.search(keyword);
211
212         for (Book aBook : result) {
213             System.out.println(aBook.getTitle());
214         }
215         assertEquals(1, result.size());
216     }
217
```

2.Create SearchBookServlet.java

In the SearchBookservlet class, it invokes the search()method on the BookServices class so we create an instance of the BookServices class in the SearchBooksevlet class and call the method searchBook().

SearchBookServlet.java

```
1  package com.bookstore.controller.frontend.book;
2
3  import com.bookstore.service.BookServices;
12
13 @WebServlet("/search")
14 public class SearchBookServlet extends HttpServlet {
15     private static final long serialVersionUID = 1L;
16
17     public SearchBookServlet() {
18
19     }
20
21     @Override
22     protected void doGet(HttpServletRequest request, HttpServletResponse response)
23             throws ServletException, IOException {
24         BookServices bookServices=new  BookServices(request, response);
25         bookServices.searchBook();
26     }
27
28 }
```

3. Call the searchBook() method in BookServices.java

In this method, we get the keyword from the request.getParameter("keyword"). If it is black keyword (if(keyword.equal(""))then list all books from the BookDAO.listAll() on index.jsp home page on front end side and if it is not blank keyword, we assign the result collection to the result of the search() method for the given keyword and then we set this object result as a request attribute. finally, we forward the request to the search_result.jsp page.

BookServices.java

```
210
211     public void searchBook() throws ServletException, IOException {
212         String keyword = request.getParameter("keyword");
213         List<Book> result = null;
214
215         if (keyword.equals("")) {
216             result = bookDAO.listAll();
217         } else {
218             result = bookDAO.search(keyword);
219         }
220         request.setAttribute("keyword", keyword);
221         request.setAttribute("result", result);
222
223         String resultPage = "frontend/search_result.jsp";
224         RequestDispatcher requestDispatcher = request.getRequestDispatcher(resultPage);
225         requestDispatcher.forward(request, response);
226
227     }
```

4.Code search Result Page(search_result.jsp)

In Jsp page, we used JSTL's length() function so add tag lib directive to use JSTL core tags and function tags <%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core"%>

<%@ taglib prefix="fn" uri="http://java.sun.com/jsp/jstl/functions"%>

search_result.jsp

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core"%>
<%@ taglib prefix="fn"
uri="http://java.sun.com/jsp/jstl/functions"%>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=ISO-
8859-1">
<title>Results for "${keyword}" - Online DK Bookstore</title>
<link rel="stylesheet"
    href="https://fonts.googleapis.com/css?family=Roboto|
Open+Sans">
<link rel="stylesheet"

href="https://maxcdn.bootstrapcdn.com/font-awesome/4.7.0/css/font-
awesome.min.css">
<link rel="stylesheet"

href="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/css/bootstrap.
min.css">
<script

src="https://ajax.googleapis.com/ajax/libs/jquery/1.12.4/jquery.min.
js"></script>
<script

src="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/js/bootstrap.mi
n.js"></script>
<style type="text/css">
```

```css
body {
     background: #e2eaef;
     font-family: "Open Sans", sans-serif;
}

h2 {
     color: #000;
     font-size: 26px;
     font-weight: 300;
     text-align: center;
     text-transform: uppercase,lowercase;
     position: relative;
     margin: 30px 0 60px;
}

h2::after {
     content: "";
     width: 100px;
     position: absolute;
     margin: 0 auto;
     height: 4px;
     border-radius: 1px;
     background: #7ac400;
     left: 0;
     right: 0;
     bottom: -20px;
}

.carousel {
     margin: 50px auto;
     padding: 0 70px;
}

.carousel .item {
     color: #747d89;
     min-height: 325px;
     text-align: center;
     overflow: hidden;
}

.carousel .thumb-wrapper {
     padding: 25px 15px;
     background: #fff;
     border-radius: 6px;
```

```
    text-align: center;
    position: relative;
    box-shadow: 0 2px 3px rgba(0, 0, 0, 0.2);
}

.carousel .item .img-box {
    height: 120px;
    margin-bottom: 20px;
    width: 100%;
    position: relative;
}

.carousel .item img {
    max-width: 100%;
    max-height: 100%;
    display: inline-block;
    position: absolute;
    bottom: 0;
    margin: 0 auto;
    left: 0;
    right: 0;
}

.carousel .item h4 {
    font-size: 18px;
}

.carousel .item h4, .carousel .item p, .carousel .item ul {
    margin-bottom: 5px;
}

.carousel .thumb-content .btn {
    color: #7ac400;
    font-size: 11px;
    text-transform: uppercase;
    font-weight: bold;
    background: none;
    border: 1px solid #7ac400;
    padding: 6px 14px;
    margin-top: 5px;
    line-height: 16px;
    border-radius: 20px;
}
```

```
.carousel .thumb-content .btn:hover, .carousel .thumb-content
.btn:focus
     {
     color: #fff;
     background: #7ac400;
     box-shadow: none;
}

.carousel .thumb-content .btn i {
     font-size: 14px;
     font-weight: bold;
     margin-left: 5px;
}

.carousel .carousel-control {
     height: 44px;
     width: 40px;
     background: #7ac400;
     margin: auto 0;
     border-radius: 4px;
     opacity: 0.8;
}

.carousel .carousel-control:hover {
     background: #78bf00;
     opacity: 1;
}

.carousel .carousel-control i {
     font-size: 36px;
     position: absolute;
     top: 50%;
     display: inline-block;
     margin: -19px 0 0 0;
     z-index: 5;
     left: 0;
     right: 0;
     color: #fff;
     text-shadow: none;
     font-weight: bold;
}

.carousel .item-price {
     font-size: 13px;
```

```
    padding: 2px 0;
}

.carousel .item-price strike {
    opacity: 0.7;
    margin-right: 5px;
}

.carousel .carousel-control.left i {
    margin-left: -2px;
}

.carousel .carousel-control.right i {
    margin-right: -4px;
}

.carousel .carousel-indicators {
    bottom: -50px;
}

.carousel-indicators li, .carousel-indicators li.active {
    width: 10px;
    height: 10px;
    margin: 4px;
    border-radius: 50%;
    border: none;
}

.carousel-indicators li {
    background: rgba(0, 0, 0, 0.2);
}

.carousel-indicators li.active {
    background: rgba(0, 0, 0, 0.6);
}

.carousel .wish-icon {
    position: absolute;
    right: 10px;
    top: 10px;
    z-index: 99;
    cursor: pointer;
    font-size: 16px;
    color: #abb0b8;
```

```
}

.carousel .wish-icon .fa-heart {
     color: #ff6161;
}

.star-rating li {
     padding: 0;
}

.star-rating i {
     font-size: 14px;
     color: #ffc000;
}
</style>
</head>
<body>
     <jsp:directive.include file="header.jsp" />
     <div class="form-group" align="center">

          <c:if test="${fn:length(result)==0}">
               <h2>
                    <b>No Results for "${keyword}"</b>
               </h2>
          </c:if>
          <c:if test="${fn:length(result)>0}">

               <div class="col-md-12" align="left"
                    style="width: 100%; margin: 0 auto;">
                    <h2>
                         <b>Results for "${keyword}"</b>
                    </h2>
               </div>
               <c:forEach items="${result}" var="book">
                    <div>
                         <div style="display: inline-block; margin:
20px; width: 9%"
                              align="left">
                              <div>
                                   <a href="view_book?id=$
{book.bookId}"> <img
                                        class="book-small"
                                        src="$
{book.base64Image}"
```

```
                                        class="img-responsive img-
fluid" width="128" height="164" />
                                    </a>
                                </div>
                            </div>
                            <div
                                style="display: inline-block; margin:
20px; vertical-align: top; width: 60%"
                                align="left">
                                <div>
                                    <h4>
                                        <a href="view_book?id=$
{book.bookId}"> <b>${book.title}</b>
                                        </a>
                                    </h4>
                                </div>
                                <div>
                                    <jsp:directive.include
file="book_rating.jsp" />
                                    <a href="view_book?id=$
{book.bookId}">(${fn:length(book.reviews)})</a>
                                </div>
                                <div>
                                    <i><b>${book.author}</b></i>
                                </div>
                                <br />
                                <div>
                                    <p>$
{fn:substring(book.description, 0, 100)}...</p>
                                </div>
                            </div>
                            <div
                                style="display: inline-block; margin:
20px; vertical-align: top;">

                                <h3><b>$${book.price}</b></h3>
                                <h3>
                                    <a href="add_to_cart?book_id=$
{book.bookId}" class="btn btn-success"><b>Add to Cart</b></a>
                                </h3>
                            </div>
                        </div>
                    </c:forEach>
                </c:if>
```

```
    </div>
    <jsp:directive.include file="footer.jsp" />
</body>
</html>
```

Here I attached full implementation for Book functionality.

com.bookstore.entity

Book.java

```
package com.bookstore.entity;
// Generated Sep 1, 2019 11:43:21 PM by Hibernate Tools 5.2.12.Final

import java.util.Base64;
import java.util.Comparator;
import java.util.Date;
import java.util.HashSet;
import java.util.Set;
import java.util.TreeSet;

import javax.persistence.Column;
import javax.persistence.Entity;
import javax.persistence.FetchType;
import javax.persistence.GeneratedValue;
import static javax.persistence.GenerationType.IDENTITY;
import javax.persistence.Id;
import javax.persistence.JoinColumn;
import javax.persistence.ManyToOne;
import javax.persistence.NamedQueries;
import javax.persistence.NamedQuery;
import javax.persistence.OneToMany;

import javax.persistence.Table;
import javax.persistence.Temporal;
import javax.persistence.TemporalType;
import javax.persistence.Transient;
import javax.persistence.UniqueConstraint;

import org.hibernate.annotations.SQLDelete;
import org.hibernate.annotations.Where;

/**
 * Book generated by hbm2java
 */
@Entity
```

```
@Table(name = "book", catalog = "bookstoredb", uniqueConstraints = @UniqueConstraint(columnNames =
"title"))
@SQLDelete(sql = "UPDATE book SET deleted = '1' WHERE book_id = ?")
//Filter added to retrieve only records that have not been soft deleted.
@Where(clause = "deleted <> '1'")
@NamedQueries({ @NamedQuery(name = "Book.findAll", query = "SELECT b FROM Book b ORDER BY
b.title"),
                @NamedQuery(name = "Book.findBytitle", query = "SELECT b FROM Book b WHERE
b.title=:title"),
                @NamedQuery(name = "Book.countAll", query = "SELECT Count(b.bookId) FROM Book
b"),
                @NamedQuery(name = "Book.countByCategory", query = "SELECT COUNT (b) FROM
Book b "
                                + "WHERE b.category.categoryId=:catId"),
                @NamedQuery(name = "Book.findByCategory", query = "SELECT b FROM Book b JOIN "
                                + "Category c ON b.category.categoryId = c.categoryId AND c.categoryId=
:catId"),
                @NamedQuery(name = "Book.listNew", query = "SELECT b FROM Book b ORDER BY
b.publishedDate DESC"),
                @NamedQuery(name = "Book.search", query = "SELECT b FROM Book b WHERE b.title
LIKE '%' || :keyword || '%'"
                                + " OR b.author LIKE '%' || :keyword || '%'" + " OR b.description LIKE '%'
|| :keyword || '%'")

})
public class Book implements java.io.Serializable {

        /**
         *
         */
        private static final long serialVersionUID = 1L;
        private Integer bookId;
        private Category category;
        private String title;
        private String author;
        private String description;
        private String isbn;
        private byte[] image;
        private String base64Image;
        private float price;
        private int unitstock;
        private Date publishedDate;
        private Date lastUpdateTime;
        private Set<Review> reviews = new HashSet<Review>(0);
        private Set<OrderDetail> orderDetails = new HashSet<OrderDetail>(0);
        private boolean deleted;

        public Book() {
```

```
	}

	public Book(Integer bookId) {
		super();
		this.bookId = bookId;
	}

	public Book(String title, String author, String description, String isbn, byte[] image, float price,
			Date publishedDate,int unitstock, Date lastUpdateTime) {
		this.title = title;
		this.author = author;
		this.description = description;
		this.isbn = isbn;
		this.image = image;
		this.price = price;
		this.unitstock=unitstock;
		this.publishedDate = publishedDate;
		this.lastUpdateTime = lastUpdateTime;
	}

	public Book(Category category, String title, String author, String description, String isbn, byte[]
image,
			float price,int unitstock, Date publishedDate, Date lastUpdateTime, Set<Review>
reviews, Set<OrderDetail> orderDetails) {
		this.category = category;
		this.title = title;
		this.author = author;
		this.description = description;
		this.isbn = isbn;
		this.image = image;
		this.price = price;
		this.unitstock=unitstock;
		this.publishedDate = publishedDate;
		this.lastUpdateTime = lastUpdateTime;
		this.reviews = reviews;
		this.orderDetails = orderDetails;
	}

	@Id
	@GeneratedValue(strategy = IDENTITY)

	@Column(name = "book_id", unique = true, nullable = false)
	public Integer getBookId() {
		return this.bookId;
	}

	public void setBookId(Integer bookId) {
```

```
		this.bookId = bookId;
	}

	@Column(name = "deleted", nullable = false)
	public boolean isDeleted() {
		return this.deleted;
	}

	public void setDeleted(boolean deleted) {
		this.deleted = deleted;
	}

	@ManyToOne(fetch = FetchType.EAGER)
	@JoinColumn(name = "category_id")
	public Category getCategory() {
		return this.category;
	}

	public void setCategory(Category category) {
		this.category = category;
	}

	@Column(name = "title", unique = true, nullable = false, length = 45)
	public String getTitle() {
		return this.title;
	}

	public void setTitle(String title) {
		this.title = title;
	}

	@Column(name = "author", nullable = false, length = 45)
	public String getAuthor() {
		return this.author;
	}

	public void setAuthor(String author) {
		this.author = author;
	}

	@Column(name = "description", nullable = false, length = 16777215)
	public String getDescription() {
		return this.description;
	}

	public void setDescription(String description) {
		this.description = description;
	}
```

```
@Column(name = "isbn", nullable = false, length = 45)
public String getIsbn() {
	return this.isbn;
}

public void setIsbn(String isbn) {
	this.isbn = isbn;
}

@Column(name = "image", nullable = false)
public byte[] getImage() {
	return this.image;
}

public void setImage(byte[] image) {
	this.image = image;
}

@Column(name = "price", nullable = false, precision = 12, scale = 0)
public float getPrice() {
	return this.price;
}

public void setPrice(float price) {
	this.price = price;
}

@Column(name = "unitstock", nullable = false)
public int getUnitstock() {
	return this.unitstock;
}

public void setUnitstock(int unitstock) {
	this.unitstock = unitstock;
}


@Temporal(TemporalType.DATE)
@Column(name = "published_date", nullable = false, length = 10)
public Date getPublishedDate() {
	return this.publishedDate;
}

public void setPublishedDate(Date publishedDate) {
	this.publishedDate = publishedDate;
}
```

```
	@Temporal(TemporalType.TIMESTAMP)
	@Column(name = "last_update_time", nullable = false, length = 19)
	public Date getLastUpdateTime() {
		return this.lastUpdateTime;
	}

	public void setLastUpdateTime(Date lastUpdateTime) {
		this.lastUpdateTime = lastUpdateTime;
	}

	@OneToMany(fetch = FetchType.EAGER, mappedBy = "book")
	public Set<Review> getReviews() {	//this methods correct order
		TreeSet<Review> sortedReviews=new TreeSet<Review>(new Comparator<Review>() {

			@Override
			public int compare(Review review1, Review review2) {
				return review2.getReviewTime().compareTo(review1.getReviewTime());
			}
		});
		sortedReviews.addAll(reviews);
		return this.reviews;
	}

	public void setReviews(Set<Review> reviews) {
		this.reviews = reviews;
	}

	@OneToMany(fetch = FetchType.LAZY, mappedBy = "book")
	public Set<OrderDetail> getOrderDetails() {
		return this.orderDetails;
	}

	public void setOrderDetails(Set<OrderDetail> orderDetails) {
		this.orderDetails = orderDetails;
	}

	@Transient
	public String getBase64Image() {
		this.base64Image = Base64.getEncoder().encodeToString(this.image);
		return this.base64Image;
	}

	@Transient
	public void setBase64Image(String base64Image) {
		this.base64Image = base64Image;
	}

	@Transient // Average rating
```

```
	public float getAverageRating() {
		float averageRating = 0.0f;
		float sum = 0.0f;

		if (reviews.isEmpty()) {
			return 0.0f;
		}

		for (Review review : reviews) {
			sum += review.getRating();
		}

		averageRating = sum / reviews.size();

		return averageRating;
	}

	@Transient
	public String getRatingStars() {
		float averageRating = getAverageRating();

		return getRatingString(averageRating);
	}

	@Transient
	public String getRatingString(float averageRating) {
		String result = "";

		int numberOfStarOn = (int) averageRating;

		for (int i = 1; i <= numberOfStarOn; i++) {
			result += "on,";
		}

		int next = numberOfStarOn + 1;

		if (averageRating > numberOfStarOn) {
			result += "half,";
			next++;
		}

		for (int j = next; j <= 5; j++) {
			result += "off,";
		}
		return result.substring(0, result.length() - 1);
	}

	@Override
```

```
	public int hashCode() {
		final int prime = 31;
		int result = 1;
		result = prime * result + ((bookId == null) ? 0 : bookId.hashCode());
		return result;
	}

	@Override // hash code moethod
	public boolean equals(Object obj) {
		if (this == obj)
			return true;
		if (obj == null)
			return false;
		if (getClass() != obj.getClass())
			return false;
		Book other = (Book) obj;
		if (bookId == null) {
			if (other.bookId != null)
				return false;
		} else if (!bookId.equals(other.bookId))
			return false;
		return true;
	}
}
```

com.bookstore.dao

GenericDAO.java (Interface class)

```
package com.bookstore.dao;

import java.util.List;

//GenericDAO interface define operations that
//are common to all specific DAO classes
public interface GenericDAO<T> {
	public T create(T t);

	public T update(T t);

	public T get(Object id);

	public void delete(Object id);

	public List<T> listAll();
```

```
        public long count(); // this method returns total
                        //number of entity and total number of rows in a table

}
```

JpaDAO.java

```
package com.bookstore.dao;

import java.util.List;
import java.util.Map;
import java.util.Map.Entry;
import java.util.Set;

import javax.persistence.EntityManager;
import javax.persistence.EntityManagerFactory;
import javax.persistence.Persistence;
import javax.persistence.Query;

//This class JPA to implement some persistence operations
//that are common to all specific DAO classes
//All DAO class have subclasses of JpaDAO class.
//All DAO class implementing the Generic interface.
//<E> is Parameterize type of generic type E
//implement all operation for all subclasses
public class JpaDAO<E> {

        private static EntityManagerFactory entityManagerFactory;
        protected EntityManager entityManager;

        static {
                entityManagerFactory =
Persistence.createEntityManagerFactory("OnlineBookStoreWebsite");
        }

        public JpaDAO() {

        }

        public E create(E entity) {

                EntityManager entityManager = entityManagerFactory.createEntityManager();
                entityManager.getTransaction().begin();

                entityManager.persist(entity);
                entityManager.flush();
                entityManager.refresh(entity);
```

```
                entityManager.getTransaction().commit();
                entityManager.close();

                return entity;
        }

        public E update(E entity) {
                EntityManager entityManager = entityManagerFactory.createEntityManager();
                entityManager.getTransaction().begin();
                entityManager.merge(entity);
                entityManager.getTransaction().commit();
                entityManager.close();
                return entity;
        }

        public E find(Class<E> type, Object id) {
                EntityManager entityManager = entityManagerFactory.createEntityManager();
                E entity = entityManager.find(type, id);
                if (entity != null) {
                        entityManager.refresh(entity);
                }
                entityManager.close();
                return entity;
        }

        public void delete(Class<E> type, Object id) {
                EntityManager entityManager = entityManagerFactory.createEntityManager();
                entityManager.getTransaction().begin();

                Object reference = entityManager.getReference(type, id);
                entityManager.remove(reference);

                entityManager.getTransaction().commit();
                entityManager.close();
        }

        public List<E> findWithNamedQuery(String queryName) {
                // this method returns a list of entity objects
                EntityManager entityManager = entityManagerFactory.createEntityManager();

                Query query = entityManager.createNamedQuery(queryName); // create query object from the
entity manager
                List<E> result = query.getResultList(); // returns results

                entityManager.close();
                return result;
        }
```

```
	public List<E> findWithNamedQuery(String queryName, String paramName, Object paramValue) {
		EntityManager entityManager = entityManagerFactory.createEntityManager();
		Query query = entityManager.createNamedQuery(queryName);

		query.setParameter(paramName, paramValue);
		List<E> result = query.getResultList();
		entityManager.close();

		return result;
	}

	public List<E> findWithNamedQuery(String queryName, Map<String, Object> parameters) {
		EntityManager entityManager = entityManagerFactory.createEntityManager();
		Query query = entityManager.createNamedQuery(queryName);

		Set<Entry<String, Object>> setParameters = parameters.entrySet();

		for (Entry<String, Object> entry : setParameters) {
			query.setParameter(entry.getKey(), entry.getValue());
		}
		List<E> result = query.getResultList();

		entityManager.close();

		return result;
	}

	// list new book
	public List<E> findWithNamedQuery(String queryName, int firstResult, int maxResult) {
		EntityManager entityManager = entityManagerFactory.createEntityManager();

		Query query = entityManager.createNamedQuery(queryName);
		query.setFirstResult(firstResult);
		query.setMaxResults(maxResult);

		List<E> result = query.getResultList();

		entityManager.close();

		return result;
	}

	// list new book
	public List<Object[]> findWithNamedQueryObjects(String queryName, int firstResult, int maxResult)
{
		EntityManager entityManager = entityManagerFactory.createEntityManager();

		Query query = entityManager.createNamedQuery(queryName);
```

```
		query.setFirstResult(firstResult);
		query.setMaxResults(maxResult);

		List<Object[]> result = query.getResultList();

		entityManager.close();

		return result;
	}

	public long countWithNamedQuery(String QueryName) {
		EntityManager entityManager = entityManagerFactory.createEntityManager();
		Query query = entityManager.createNamedQuery(QueryName);
		long result = (long) query.getSingleResult();
		entityManager.close();

		return result;
	}

	public long countWithNamedQuery(String QueryName, String paramName, Object paramValue) {
		EntityManager entityManager = entityManagerFactory.createEntityManager();
		Query query = entityManager.createNamedQuery(QueryName);

		query.setParameter(paramName, paramValue);
		long result = (long) query.getSingleResult();
		entityManager.close();

		return result;
	}

	public void close() {
		if (entityManagerFactory != null) {
			entityManagerFactory.close();
		}
	}

}
```

BookDAO.java

```
package com.bookstore.dao;

import java.util.ArrayList;
import java.util.Date;
import java.util.List;
import com.bookstore.entity.Book;

public class BookDAO extends JpaDAO<Book> implements GenericDAO<Book> {
```

```
public BookDAO() {
}

@Override
public Book create(Book book) {
	book.setLastUpdateTime(new Date());
	return super.create(book);
}

@Override
public Book update(Book book) {
	book.setLastUpdateTime(new Date());
	return super.update(book);
}

@Override
public Book get(Object bookId) {
	return super.find(Book.class, bookId);
}

@Override
public void delete(Object bookId) {
	super.delete(Book.class, bookId);
}

@Override
public List<Book> listAll() {
	return super.findWithNamedQuery("Book.findAll");
}

public Book findByTitle(String title) {
	List<Book> result = super.findWithNamedQuery("Book.findBytitle", "title", title);
	if (!result.isEmpty()) {
		return result.get(0);
	}
	return null;
}

public List<Book> listByCategory(int categoryId) {

	return super.findWithNamedQuery("Book.findByCategory", "catId", categoryId);

}

public List<Book> listNewBooks() {

	return super.findWithNamedQuery("Book.listNew", 0, 4);
```

```
	}

	public List<Book> search(String keyword) {
		return super.findWithNamedQuery("Book.search", "keyword", keyword);
	}

	@Override
	public long count() {
		return super.countWithNamedQuery("Book.countAll");
	}

	public long countByCategory(int categoryId) {
		return super.countWithNamedQuery("Book.countByCategory", "catId", categoryId);
	}

	public List<Book> listBestSellingBooks() {
		return super.findWithNamedQuery("OrderDetail.bestSelling", 0, 4);
	}

	public List<Book> listMostFavoredBooks() {
		List<Book> mostFavoredBooks = new ArrayList<>();

		List<Object[]> result = super.findWithNamedQueryObjects("Review.mostFavoredBooks", 0,
4);
		if (!result.isEmpty()) {
			for (Object[] elements : result) {
				Book book = (Book) elements[0];
				mostFavoredBooks.add(book);
			}
		}
		return mostFavoredBooks;
	}

}
```

com.bookstore.services

BookServices.java

```
package com.bookstore.service;

import java.io.IOException;
import java.io.InputStream;
import java.text.DateFormat;
import java.text.ParseException;
import java.text.SimpleDateFormat;
import java.util.Date;
```

```
import java.util.List;

import javax.servlet.RequestDispatcher;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.servlet.http.Part;

import com.bookstore.dao.BookDAO;
import com.bookstore.dao.CategoryDAO;
import com.bookstore.entity.Book;
import com.bookstore.entity.Category;

public class BookServices {
	private BookDAO bookDAO;
	private CategoryDAO categoryDAO;
	private HttpServletRequest request;
	private HttpServletResponse response;

	public BookServices(HttpServletRequest request, HttpServletResponse response) {
		super();
		this.request = request;
		this.response = response;
		bookDAO = new BookDAO();
		categoryDAO = new CategoryDAO();
	}

	public void listBooks() throws ServletException, IOException {
		listBooks(null);
	}

	public void listBooks(String message) throws ServletException, IOException {

		List<Book> listBooks = bookDAO.listAll();
		request.setAttribute("listBooks", listBooks);

		if (message != null) {
			request.setAttribute("message", message);
		}
		String listPage = "book_list.jsp";
		RequestDispatcher requestDispatcher = request.getRequestDispatcher(listPage);
		requestDispatcher.forward(request, response);
	}

	public void showBookNewForm() throws ServletException, IOException {
		List<Category> listCategory = categoryDAO.listAll();
		request.setAttribute("listCategory", listCategory);
```

```
                String newPage = "book_form.jsp";
                RequestDispatcher requestDispatcher = request.getRequestDispatcher(newPage);
                requestDispatcher.forward(request, response);

        }

        public void createBook() throws ServletException, IOException {
                String title = request.getParameter("title");

                Book existBook = bookDAO.findByTitle(title);

                if (existBook != null) {
                        String message = "Could not create new book because the title '" + title + "' already
exists.";

                        listBooks(message);

                        return;
                }
                Book newBook = new Book();
                readBookFields(newBook);

                Book createdBook = bookDAO.create(newBook);

                if (createdBook.getBookId() > 0) {
                        String message = "A new book has been created successfully.";
                        listBooks(message);
                }
        }

        public void readBookFields(Book book) throws ServletException, IOException {
                String title = request.getParameter("title");
                String author = request.getParameter("author");
                String description = request.getParameter("description");
                String isbn = request.getParameter("isbn");
                float price = Float.parseFloat(request.getParameter("price"));
                Integer unitstock=Integer.parseInt(request.getParameter("stockAvailable"));

                DateFormat dateFormat = new SimpleDateFormat("MM/dd/yyyy");
                Date publishDate = null;
                try {
                        publishDate = dateFormat.parse(request.getParameter("publishedDate"));
                } catch (ParseException ex) {
                        ex.printStackTrace();
                        throw new ServletException("Error while parsing publish date(format is
MM/dd/yyyy)");
                }

                book.setTitle(title);
```

```
            book.setAuthor(author);
            book.setDescription(description);
            book.setIsbn(isbn);
            book.setPublishedDate(publishDate);

            Integer categoryId = Integer.parseInt(request.getParameter("category"));
            Category category = categoryDAO.get(categoryId);
            book.setCategory(category);

            book.setPrice(price);
            book.setUnitstock(unitstock);

            Part part = request.getPart("bookImage");

            if (part != null && part.getSize() > 0) {
                  long size = part.getSize();
                  byte[] imageBytes = new byte[(int) size];

                  InputStream inputStream = part.getInputStream();
                  inputStream.read(imageBytes);
                  inputStream.close();

                  book.setImage(imageBytes);
            }

      }

      public void editBook() throws ServletException, IOException {
            Integer bookId = Integer.parseInt(request.getParameter("id"));
            Book book = bookDAO.get(bookId);

            String editPage = "book_form.jsp";
            if (book != null) {
                  List<Category> listCategory = categoryDAO.listAll();

                  request.setAttribute("book", book);
                  request.setAttribute("listCategory", listCategory);
            } else {
                  editPage = "message.jsp";
                  String errorMessage = "Could not find book with ID " + bookId;
                  request.setAttribute("message", errorMessage);
            }
            RequestDispatcher requestDispatcher = request.getRequestDispatcher(editPage);
            requestDispatcher.forward(request, response);
      }

      public void updateBook() throws ServletException, IOException {
            Integer bookId = Integer.parseInt(request.getParameter("bookId"));
```

```
		String title = request.getParameter("title");

		Book exitBook = bookDAO.get(bookId);
		Book bookByTitle = bookDAO.findByTitle(title);

		if (bookByTitle != null && !exitBook.equals(bookByTitle)) {
			String message = "Could not update book because there's another book having same
title!";
			listBooks(message);
			return;
		}

		readBookFields(exitBook);
		bookDAO.update(exitBook);

		String message = "The book has been updated successfully!";
		listBooks(message);

	}

	public void deleteBook() throws ServletException, IOException {
		Integer bookId = Integer.parseInt(request.getParameter("id"));
		bookDAO.delete(bookId);

		String message = "The Book with ID " + bookId
				+ " has been soft deleted successfully from here but store in database!";

		listBooks(message);

	}

	public void listBooksCategory() throws ServletException, IOException {
		Integer categoryId = Integer.parseInt(request.getParameter("id"));
		List<Book> listBooks = bookDAO.listByCategory(categoryId);
		Category category = categoryDAO.get(categoryId);
		List<Category> listCategory = categoryDAO.listAll();

		request.setAttribute("listCategory", listCategory);
		request.setAttribute("listBooks", listBooks);
		request.setAttribute("category", category);

		String listPage = "frontend/books_list_by_Category.jsp";
		RequestDispatcher requestDispatcher = request.getRequestDispatcher(listPage);
		requestDispatcher.forward(request, response);

	}

	public void viewBookDetail() throws ServletException, IOException {
```

```
                Integer bookId = Integer.parseInt(request.getParameter("id"));
                Book book = bookDAO.get(bookId);
                List<Category> listCategory = categoryDAO.listAll();

                request.setAttribute("listCategory", listCategory);
                request.setAttribute("book", book);

                String detailPage = "frontend/book_detail.jsp";
                RequestDispatcher requestDispatcher = request.getRequestDispatcher(detailPage);
                requestDispatcher.forward(request, response);

        }

        public void searchBook() throws ServletException, IOException {
                String keyword = request.getParameter("keyword");
                List<Book> result = null;

                if (keyword.equals("")) {
                        result = bookDAO.listAll();
                } else {
                        result = bookDAO.search(keyword);
                }
                request.setAttribute("keyword", keyword);
                request.setAttribute("result", result);

                String resultPage = "frontend/search_result.jsp";
                RequestDispatcher requestDispatcher = request.getRequestDispatcher(resultPage);
                requestDispatcher.forward(request, response);

        }
}
```

com.bookstore.dao //in test folder

BookDAOTest.java

```
package com.bookstore.dao;

import static org.junit.Assert.*;

import java.io.IOException;
import java.nio.file.Files;
import java.nio.file.Paths;
import java.text.DateFormat;
import java.text.ParseException;
import java.text.SimpleDateFormat;
import java.util.Date;
```

```
import java.util.List;

import javax.persistence.EntityNotFoundException;

import org.junit.AfterClass;
import org.junit.BeforeClass;
import org.junit.Test;

import com.bookstore.entity.Book;
import com.bookstore.entity.Category;

public class BookDAOTest {

	private static BookDAO bookDAO;

	@BeforeClass
	public static void setUpBeforeClass() throws Exception {
		bookDAO = new BookDAO();
	}

	@Test
	public void testCreateBook() throws ParseException, IOException {
		Book newBook = new Book();
		Category category = new Category("java");
		category.setCategoryId(1);
		newBook.setCategory(category);

		newBook.setTitle("Effective Java(3rd Edition)");
		newBook.setAuthor("Joshua Bloch");
		newBook.setDescription("New Coverage-of generics,enums,annotations,autoboxing");
		newBook.setPrice(38.87f);
		newBook.setUnitstock(12);
		newBook.setIsbn("0-13-468599-7");

		DateFormat dateFormate = new SimpleDateFormat("MM/dd/yyyy");
		Date publishDate = dateFormate.parse("05/28/2008");
		newBook.setPublishedDate(publishDate);

		String imagePath = "./books/Effective Java.jpg";
		byte[] imageBytes = Files.readAllBytes(Paths.get(imagePath));
		newBook.setImage(imageBytes);

		Book createBook = bookDAO.create(newBook);
		assertTrue(createBook.getBookId() > 0);
	}

	@Test
	public void testCreate2Book() throws ParseException, IOException {
```

```
		Book newBook = new Book();
		Category category = new Category("java");
		category.setCategoryId(1);
		newBook.setCategory(category);

		newBook.setTitle("Java 8 in Action");
		newBook.setAuthor("Raoul-Gabriel Urma");
		newBook.setDescription("java 8 in Action is a clearly written guide to the new features of Java
8");
		newBook.setPrice(36.72f);

		newBook.setIsbn("1-61-729199-4");

		DateFormat dateFormate = new SimpleDateFormat("MM/dd/yyyy");
		Date publishDate = dateFormate.parse("08/28/2014");
		newBook.setPublishedDate(publishDate);

		String imagePath = "./books/Java 8 in Action.jpg";
		byte[] imageBytes = Files.readAllBytes(Paths.get(imagePath));
		newBook.setImage(imageBytes);

		Book createBook = bookDAO.create(newBook);
		assertTrue(createBook.getBookId() > 0);
	}

	@Test
	public void testUpdateBook() throws ParseException, IOException {
		Book exitBook = new Book();
		exitBook.setBookId(4);

		Category category = new Category("Java Programming");
		category.setCategoryId(1);
		exitBook.setCategory(category);

		exitBook.setTitle("Effective Java(3rd Edition)");
		exitBook.setAuthor("Joshua Bloch");
		exitBook.setDescription("New Coverage-of generics,enums,annotations,autoboxing");
		exitBook.setPrice(40f);

		exitBook.setIsbn("0-13-468599-8");

		DateFormat dateFormate = new SimpleDateFormat("MM/dd/yyyy");
		Date publishDate = dateFormate.parse("05/28/2008");
		exitBook.setPublishedDate(publishDate);

		String imagePath = "./books/Effective Java.jpg";
		byte[] imageBytes = Files.readAllBytes(Paths.get(imagePath));
		exitBook.setImage(imageBytes);
```

```
		Book updatedBook = bookDAO.update(exitBook);
		assertEquals(updatedBook.getTitle(), "Effective Java(3rd Edition)");
	}

	@Test(expected = EntityNotFoundException.class)
	public void testDeleteBookFail() {
		Integer bookId = 100;
		bookDAO.delete(bookId);
	}

	@Test
	public void testGetBookFail() {
		Integer bookId = 99;
		Book book = bookDAO.get(bookId);

		assertNull(book);
	}

	@Test
	public void testGetBookSuccess() {
		Integer bookId = 4;
		Book book = bookDAO.get(bookId);

		assertNotNull(book);
	}

	@Test //list all book
	public void testListAll() {
		List<Book> listBooks = bookDAO.listAll();

		for (Book aBook : listBooks) {
			System.out.println(aBook.getTitle() + "-" + aBook.getAuthor());
		}
		assertFalse(listBooks.isEmpty());
	}

	@Test
	public void testCount() {
		long totalBooks = bookDAO.count();
		System.out.println("Total Book Count: " + totalBooks);
		assertEquals(2, totalBooks);
	}

	@Test
	public void testDeleteBookSuccess() {
		Integer bookId = 10;
		bookDAO.delete(bookId);
```

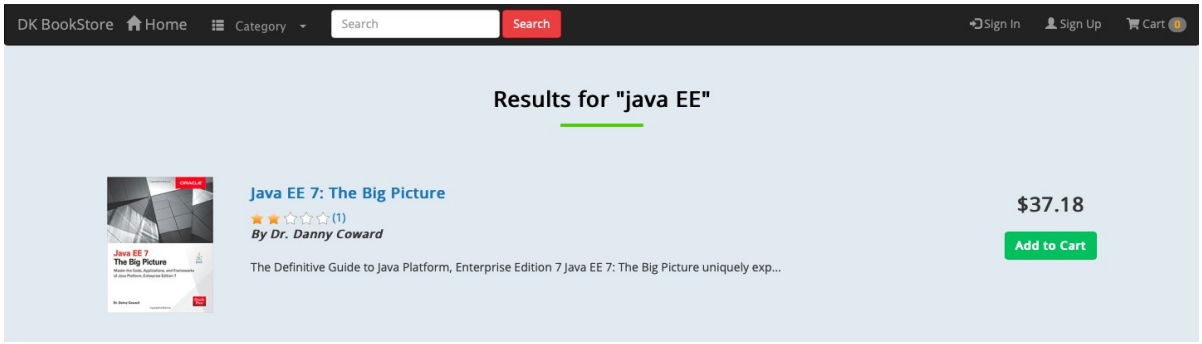
```
        assertTrue(true);
    }

    @Test
    public void testFindByTitleNotExist() {
        String title = "Thinking in java";
        Book book = bookDAO.findByTitle(title);

        assertNull(book);
    }

    @Test
    public void testFindByTitleExist() {
        String title = "Effective Java(3rd Edition)";
        Book book = bookDAO.findByTitle(title);
        System.out.println("Book Author:" + book.getAuthor());
        System.out.println("Book Price" + book.getPrice());
        assertNotNull(book);
    }

    @Test
    public void testListByCategory() {
        int categoryId = 1;

        List<Book> listBooks = bookDAO.listByCategory(categoryId);

        assertTrue(listBooks.size() > 0);
    }

    @Test                       //search book title
    public void testSearchBookInTitle() {
        String keyword = "java";
        List<Book> result = bookDAO.search(keyword);

        for (Book aBook : result) {
            System.out.println(aBook.getTitle());
        }
        assertEquals(3, result.size());
    }

    @Test                       //search book author
    public void testSearchBookInAuthor() {
        String keyword = "Craig Walls";
        List<Book> result = bookDAO.search(keyword);

        for (Book aBook : result) {
            System.out.println(aBook.getTitle());
```

```
        }
        assertEquals(1, result.size());
    }

    @Test                   //search book description contains
    public void testSearchBookInDescription() {
        String keyword = "CompletableFuture";
        List<Book> result = bookDAO.search(keyword);

        for (Book aBook : result) {
            System.out.println(aBook.getTitle());
        }
        assertEquals(1, result.size());
    }

    @Test
    public void testCountByCategory() {
        int categoryId = 69;
        long numOfBooks = bookDAO.countByCategory(categoryId);
        assertTrue(numOfBooks == 7);
    }

    @Test // list new Books
    public void testListByNewBooks() {
        List<Book> listNewBooks = bookDAO.listNewBooks();
        for (Book aBook : listNewBooks) {
            System.out.println(aBook.getTitle() + "-" + aBook.getPublishedDate());
        }
        assertEquals(4, listNewBooks.size());
    }

    @Test // list best selling books
    public void testListBestSellingBooks() {
        List<Book> topBestSellingBooks = bookDAO.listBestSellingBooks();

        for (Book book : topBestSellingBooks) {
            System.out.println(book.getTitle());
        }
        assertEquals(4, topBestSellingBooks.size());
    }

    @Test // list Most Favourite book
    public void testListMostFavoredBooks() {
        List<Book> topFavoredBooks = bookDAO.listMostFavoredBooks();

        for (Book book : topFavoredBooks) {
            System.out.println(book.getTitle());
        }
```

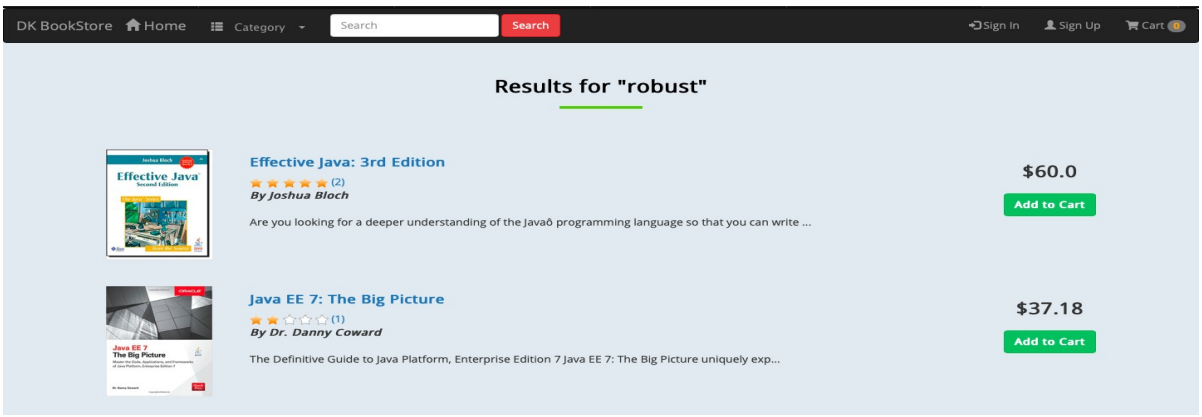
```
                assertEquals(4, topFavoredBooks.size());
        }

        @AfterClass // After all test methods in the test After class
        public static void tearDownAfterClass() {
                bookDAO.close();
        }
}
```

Output:

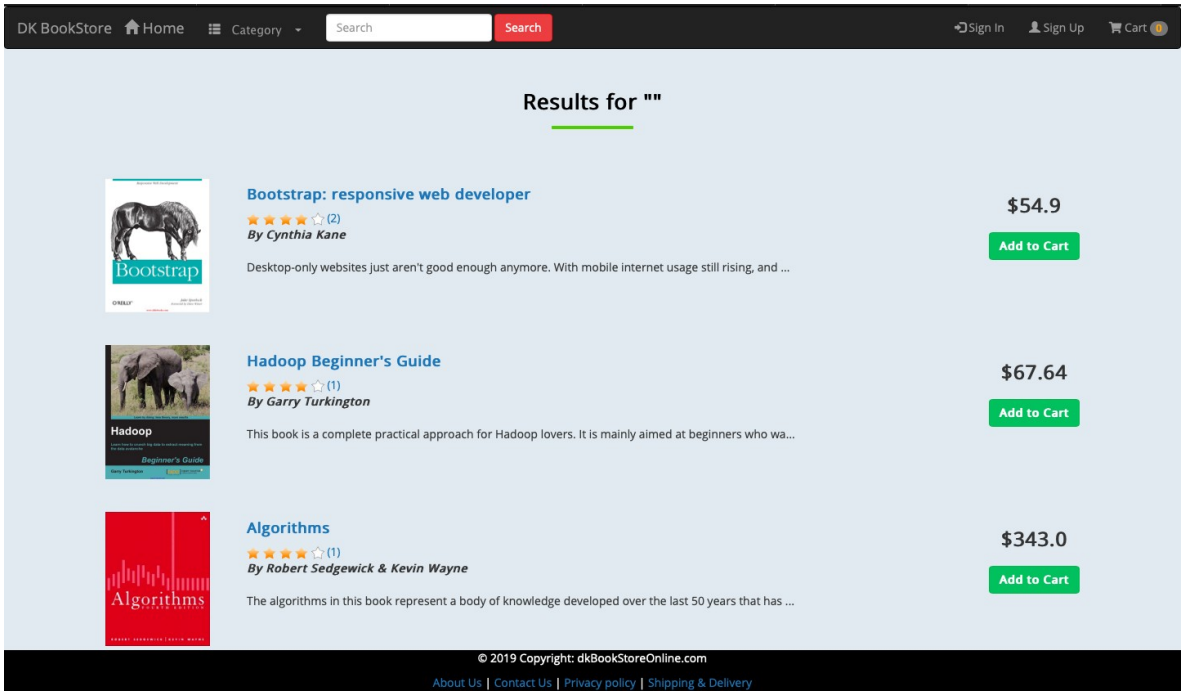
1. search **“java EE”** keyword.



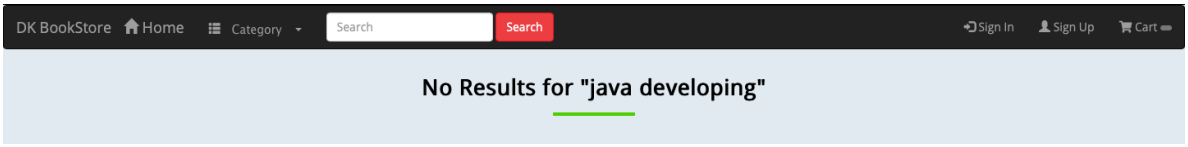
2. Search **“robust”** keyword (Description contains).



3.Search **“”** without keyword.



4. Search **“java develoing”** keyword (no keyword result found).



----------End----------