UNIVERSITI MALAYSIA TERENGGANU

UMT

CSM3023 WEB BASED APPLICATION DEVELOPMENT (K1)

BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONORS

SEMESTER 2 2023/2024

LAB 8 – An MVC Example with Servlets and JSP

Prepared by:

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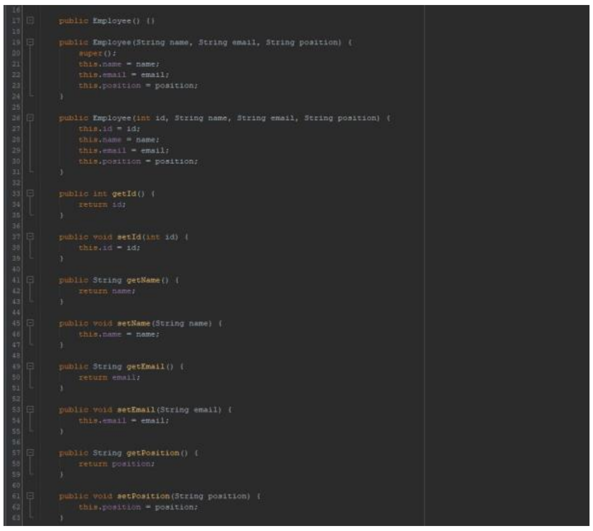
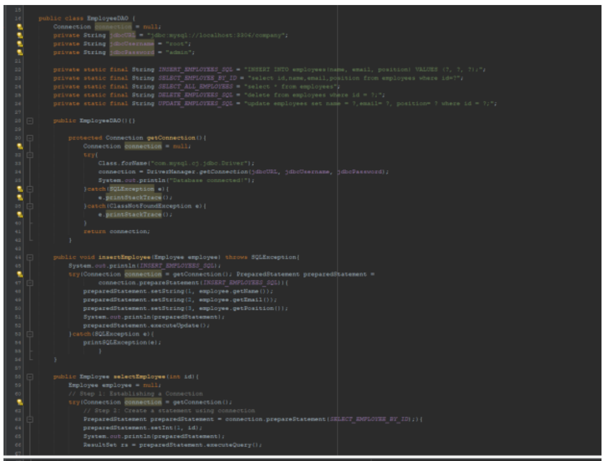
Coding:

Employee.java

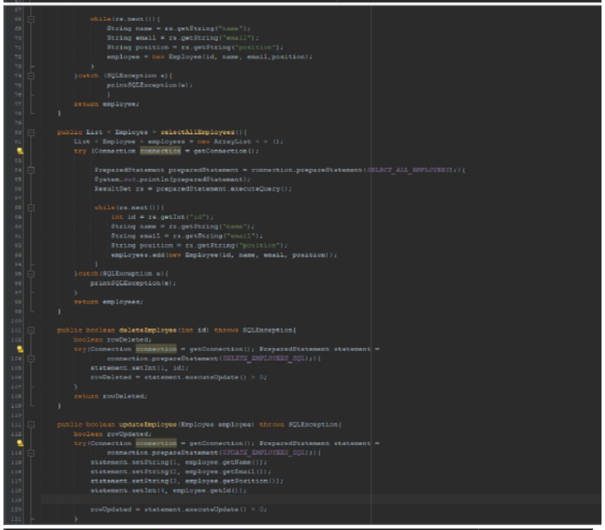


```java
    public Employee() {}

    public Employee(String name, String email, String position) {
        super();
        this.name = name;
        this.email = email;
        this.position = position;
    }

    public Employee(int id, String name, String email, String position) {
        this.id = id;
        this.name = name;
        this.email = email;
        this.position = position;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public String getEmail() {
        return email;
    }

    public void setEmail(String email) {
        this.email = email;
    }

    public String getPosition() {
        return position;
    }

    public void setPosition(String position) {
        this.position = position;
    }
```

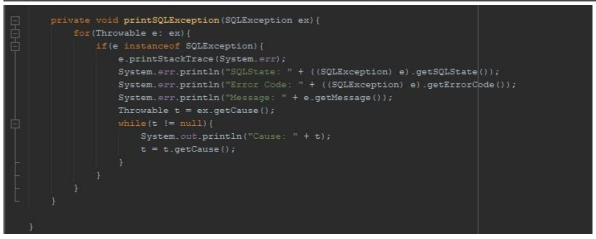
EmployeeDAO.java



```java
public class EmployeeDAO {
    Connection connection = null;
    private String jdbcURL = "jdbc:mysql://localhost:3306/company";
    private String jdbcUsername = "root";
    private String jdbcPassword = "admin";

    private static final String INSERT_EMPLOYEES_SQL = "INSERT INTO employees(name, email, position) VALUES (?, ?, ?);";
    private static final String SELECT_EMPLOYEE_BY_ID = "select id,name,email,position from employees where id=?";
    private static final String SELECT_ALL_EMPLOYEES = "select * from employees";
    private static final String DELETE_EMPLOYEES_SQL = "delete from employees where id = ?;";
    private static final String UPDATE_EMPLOYEES_SQL = "update employees set name = ?,email= ?, position= ? where id = ?;";

    public EmployeeDAO(){}

        protected Connection getConnection(){
            Connection connection = null;
            try{
                Class.forName("com.mysql.cj.jdbc.Driver");
                connection = DriverManager.getConnection(jdbcURL, jdbcUsername, jdbcPassword);
                System.out.println("Database connected!");
            }catch(SQLException e){
                e.printStackTrace();
            }catch(ClassNotFoundException e){
                e.printStackTrace();
            }
            return connection;
        }

    public void insertEmployee(Employee employee) throws SQLException{
        System.out.println(INSERT_EMPLOYEES_SQL);
        try(Connection connection = getConnection(); PreparedStatement preparedStatement =
                connection.prepareStatement(INSERT_EMPLOYEES_SQL)){
            preparedStatement.setString(1, employee.getName());
            preparedStatement.setString(2, employee.getEmail());
            preparedStatement.setString(3, employee.getPosition());
            System.out.println(preparedStatement);
            preparedStatement.executeUpdate();
        }catch(SQLException e){
            printSQLException(e);
                }
    }

    public Employee selectEmployee(int id){
        Employee employee = null;
        // Step 1: Establishing a Connection
        try(Connection connection = getConnection();
            // Step 2: Create a statement using connection
            PreparedStatement preparedStatement = connection.prepareStatement(SELECT_EMPLOYEE_BY_ID);){
            preparedStatement.setInt(1, id);
            System.out.println(preparedStatement);
            ResultSet rs = preparedStatement.executeQuery();
```



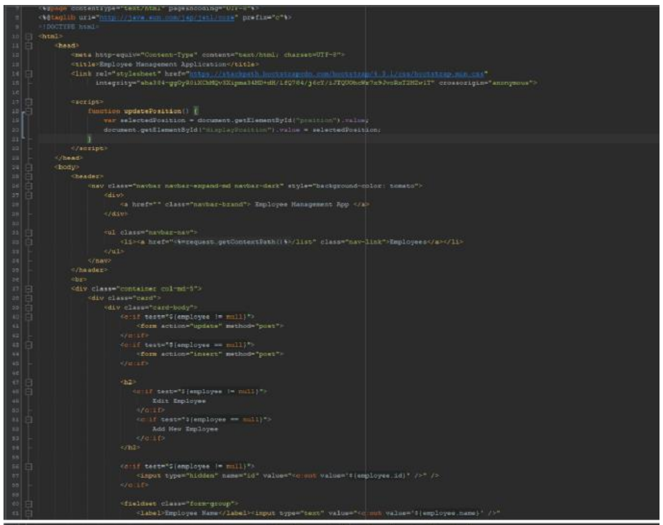
```java
            while(rs.next()){
                String name = rs.getString("name");
                String email = rs.getString("email");
                String position = rs.getString("position");
                employee = new Employee(id, name, email,position);
            }
        }catch (SQLException e){
                printSQLException(e);
                }
        return employee;
    }

    public List < Employee > selectAllEmployees(){
        List < Employee > employees = new ArrayList < > ();
        try (Connection connection = getConnection();

             PreparedStatement preparedStatement = connection.prepareStatement(SELECT_ALL_EMPLOYEES);){
             System.out.println(preparedStatement);
             ResultSet rs = preparedStatement.executeQuery();

             while(rs.next()){
                 int id = rs.getInt("id");
                 String name = rs.getString("name");
                 String email = rs.getString("email");
                 String position = rs.getString("position");
                 employees.add(new Employee(id, name, email, position));
             }
        }catch(SQLException e){
            printSQLException(e);
        }
        return employees;
    }

    public boolean deleteEmployee(int id) throws SQLException{
        boolean rowDeleted;
        try(Connection connection = getConnection(); PreparedStatement statement =
                connection.prepareStatement(DELETE_EMPLOYEES_SQL);){
            statement.setInt(1, id);
            rowDeleted = statement.executeUpdate() > 0;
        }
        return rowDeleted;
    }

    public boolean updateEmployee(Employee employee) throws SQLException{
        boolean rowUpdated;
        try(Connection connection = getConnection(); PreparedStatement statement =
                connection.prepareStatement(UPDATE_EMPLOYEES_SQL);){
            statement.setString(1, employee.getName());
            statement.setString(2, employee.getEmail());
            statement.setString(3, employee.getPosition());
            statement.setInt(4, employee.getId());

            rowUpdated = statement.executeUpdate() > 0;
        }
```



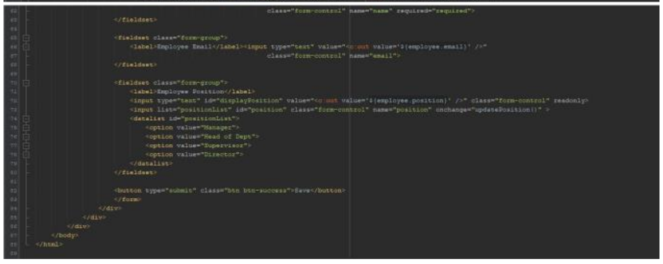
```java
    private void printSQLException(SQLException ex){
        for(Throwable e: ex){
            if(e instanceof SQLException){
                e.printStackTrace(System.err);
                System.err.println("SQLState: " + ((SQLException) e).getSQLState());
                System.err.println("Error Code: " + ((SQLException) e).getErrorCode());
                System.err.println("Message: " + e.getMessage());
                Throwable t = ex.getCause();
                while(t != null){
                    System.out.println("Cause: " + t);
                    t = t.getCause();
                }
            }
        }
    }

}
```

EmployeeServlet.java

EmployeeForm.jsp

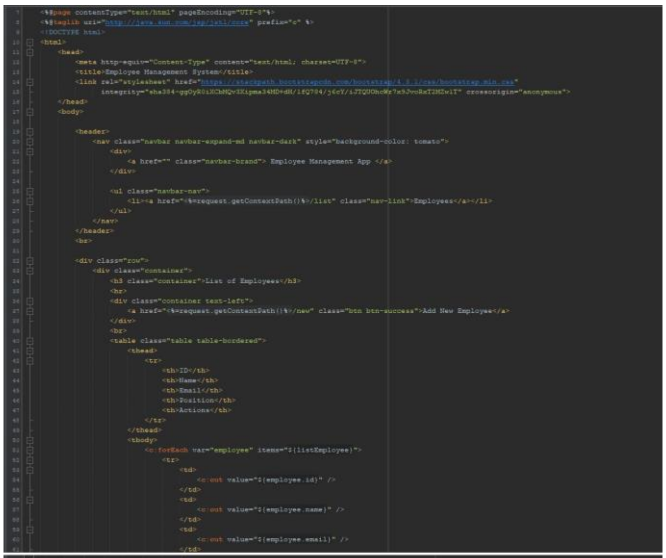


```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Employee Management Application</title>
        <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
              integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">

        <script>
            function updatePosition() {
                var selectedPosition = document.getElementById("position").value;
                document.getElementById("displayPosition").value = selectedPosition;
            }
        </script>
    </head>
    <body>
        <header>
            <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
                <div>
                    <a href="" class="navbar-brand"> Employee Management App </a>
                </div>

                <ul class="navbar-nav">
                    <li><a href="<%=request.getContextPath()%>/list" class="nav-link">Employees</a></li>
                </ul>
            </nav>
        </header>
        <br>
        <div class="container col-md-5">
            <div class="card">
                <div class="card-body">
                    <c:if test="${employee != null}">
                        <form action="update" method="post">
                    </c:if>
                    <c:if test="${employee == null}">
                        <form action="insert" method="post">
                    </c:if>

                    <h2>
                        <c:if test="${employee != null}">
                            Edit Employee
                        </c:if>
                        <c:if test="${employee == null}">
                            Add New Employee
                        </c:if>
                    </h2>

                    <c:if test="${employee != null}">
                        <input type="hidden" name="id" value="<c:out value='${employee.id}' />" />
                    </c:if>

                    <fieldset class="form-group">
                        <label>Employee Name</label><input type="text" value="<c:out value='${employee.name}' />"
```

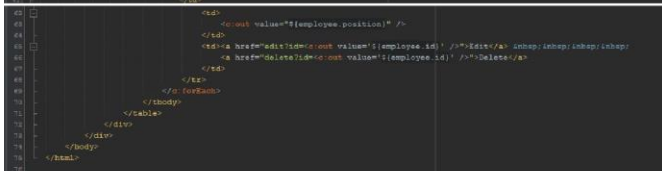


```
                                                         class="form-control" name="name" required="required">
                    </fieldset>

                    <fieldset class="form-group">
                        <label>Employee Email</label><input type="text" value="<c:out value='${employee.email}' />"
                                                         class="form-control" name="email">
                    </fieldset>

                    <fieldset class="form-group">
                        <label>Employee Position</label>
                        <input type="text" id="displayPosition" value="<c:out value='${employee.position}' />" class="form-control" readonly>
                        <input list="positionList" id="position" class="form-control" name="position" onchange="updatePosition()" >
                        <datalist id="positionList">
                            <option value="Manager">
                            <option value="Head of Dept">
                            <option value="Supervisor">
                            <option value="Director">
                        </datalist>
                    </fieldset>

                    <button type="submit" class="btn btn-success">Save</button>
                    </form>
                </div>
            </div>
        </div>
    </body>
</html>
```

EmployeeList.jsp

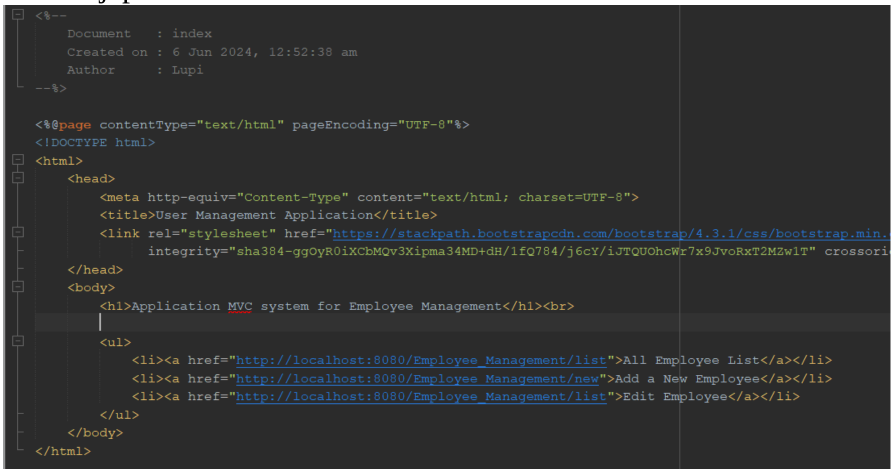


```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Employee Management System</title>
        <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
              integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">
    </head>
    <body>

        <header>
            <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
                <div>
                    <a href="" class="navbar-brand"> Employee Management App </a>
                </div>

                <ul class="navbar-nav">
                    <li><a href="<%=request.getContextPath()%>/list" class="nav-link">Employees</a></li>
                </ul>
            </nav>
        </header>
        <br>

        <div class="row">
            <div class="container">
                <h3 class="container">List of Employees</h3>
                <hr>
                <div class="container text-left">
                    <a href="<%=request.getContextPath()%>/new" class="btn btn-success">Add New Employee</a>
                </div>
                <br>
                <table class="table table-bordered">
                    <thead>
                        <tr>
                            <th>ID</th>
                            <th>Name</th>
                            <th>Email</th>
                            <th>Position</th>
                            <th>Actions</th>
                        </tr>
                    </thead>
                    <tbody>
                        <c:forEach var="employee" items="${listEmployee}">
                            <tr>
                                <td>
                                    <c:out value="${employee.id}" />
                                </td>
                                <td>
                                    <c:out value="${employee.name}" />
                                </td>
                                <td>
                                    <c:out value="${employee.email}" />
                                </td>
```



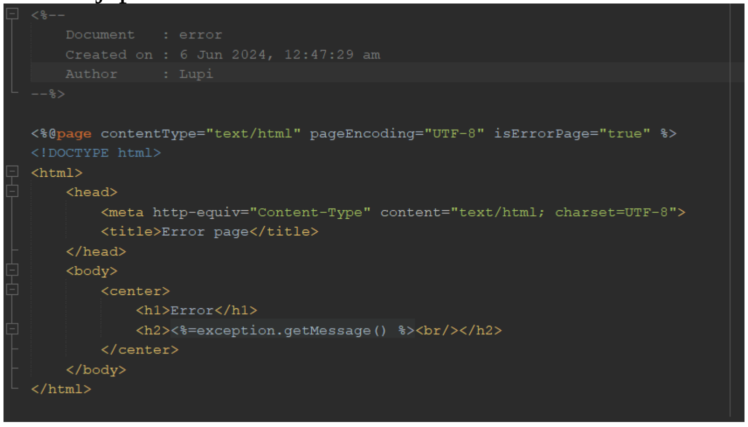
```
                                <td>
                                    <c:out value="${employee.position}" />
                                </td>
                                <td><a href="edit?id=<c:out value='${employee.id}' />">Edit</a> &nbsp;&nbsp;&nbsp;&nbsp;
                                    <a href="delete?id=<c:out value='${employee.id}' />">Delete</a>
                                </td>
                            </tr>
                        </c:forEach>
                    </tbody>
                </table>
            </div>
        </div>
    </body>
</html>
```

Index.jsp



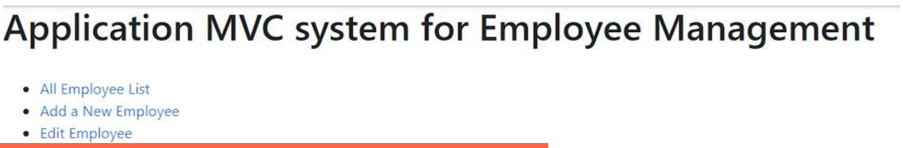
```
<%--
    Document   : index
    Created on : 6 Jun 2024, 12:52:38 am
    Author     : Lupi
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>User Management Application</title>
        <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.
              integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossori
    </head>
    <body>
        <h1>Application MVC system for Employee Management</h1><br>
        
        <ul>
            <li><a href="http://localhost:8080/Employee_Management/list">All Employee List</a></li>
            <li><a href="http://localhost:8080/Employee_Management/new">Add a New Employee</a></li>
            <li><a href="http://localhost:8080/Employee_Management/list">Edit Employee</a></li>
        </ul>
    </body>
</html>
```

Error.jsp



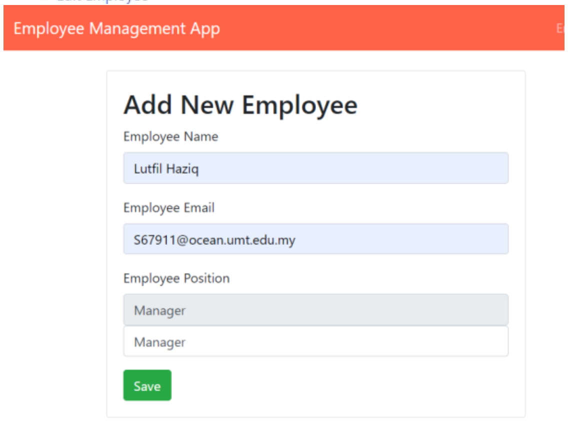
```
<%--
    Document   : error
    Created on : 6 Jun 2024, 12:47:29 am
    Author     : Lupi
--%>

<%@page contentType="text/html" pageEncoding="UTF-8" isErrorPage="true" %>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Error page</title>
    </head>
    <body>
        <center>
            <h1>Error</h1>
            <h2><%=exception.getMessage() %><br/></h2>
        </center>
    </body>
</html>
```

Output:



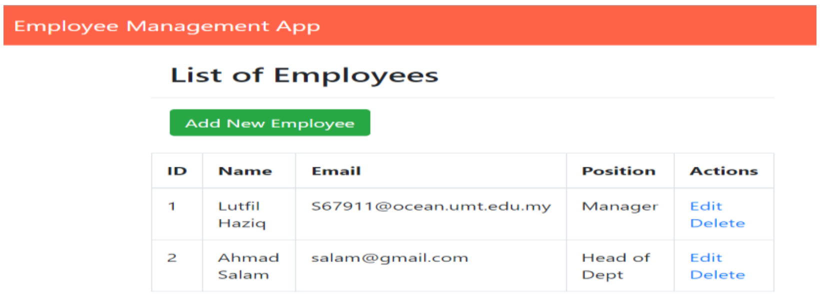
Application MVC system for Employee Management

- All Employee List
- Add a New Employee
- Edit Employee



Add New Employee

Employee Name	Lutfil Haziq
Employee Email	S67911@ocean.umt.edu.my
Employee Position	Manager
	Manager



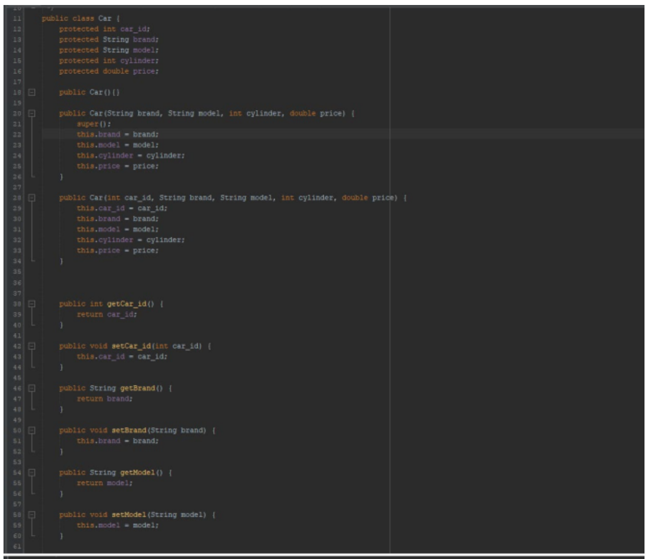
List of Employees

ID	Name	Email	Position	Actions
1	Lutfil Haziq	S67911@ocean.umt.edu.my	Manager	Edit Delete
2	Ahmad Salam	salam@gmail.com	Head of Dept	Edit Delete

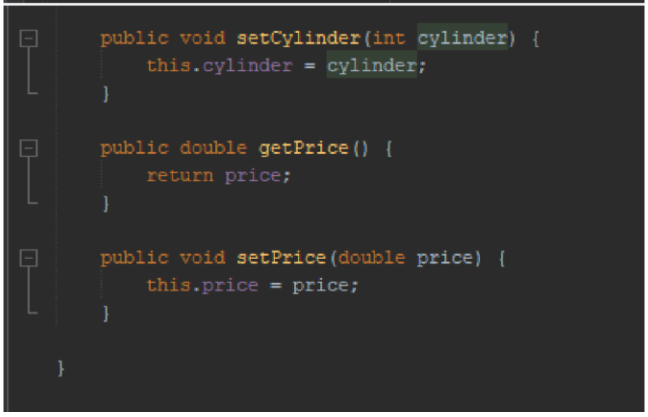
Exercise

Coding:

Car.java

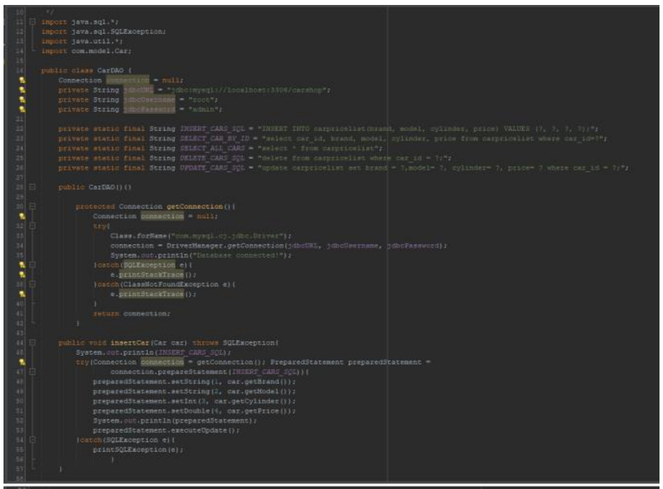


```java
public class Car {
    protected int car_id;
    protected String brand;
    protected String model;
    protected int cylinder;
    protected double price;

    public Car(){}

    public Car(String brand, String model, int cylinder, double price) {
        super();
        this.brand = brand;
        this.model = model;
        this.cylinder = cylinder;
        this.price = price;
    }

    public Car(int car_id, String brand, String model, int cylinder, double price) {
        this.car_id = car_id;
        this.brand = brand;
        this.model = model;
        this.cylinder = cylinder;
        this.price = price;
    }



    public int getCar_id() {
        return car_id;
    }

    public void setCar_id(int car_id) {
        this.car_id = car_id;
    }

    public String getBrand() {
        return brand;
    }

    public void setBrand(String brand) {
        this.brand = brand;
    }

    public String getModel() {
        return model;
    }

    public void setModel(String model) {
        this.model = model;
    }

```

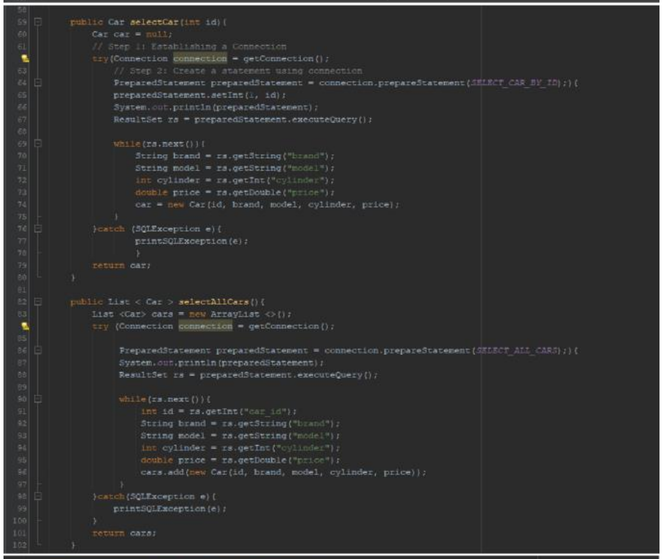


```java
    public void setCylinder(int cylinder) {
        this.cylinder = cylinder;
    }

    public double getPrice() {
        return price;
    }

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

}
```

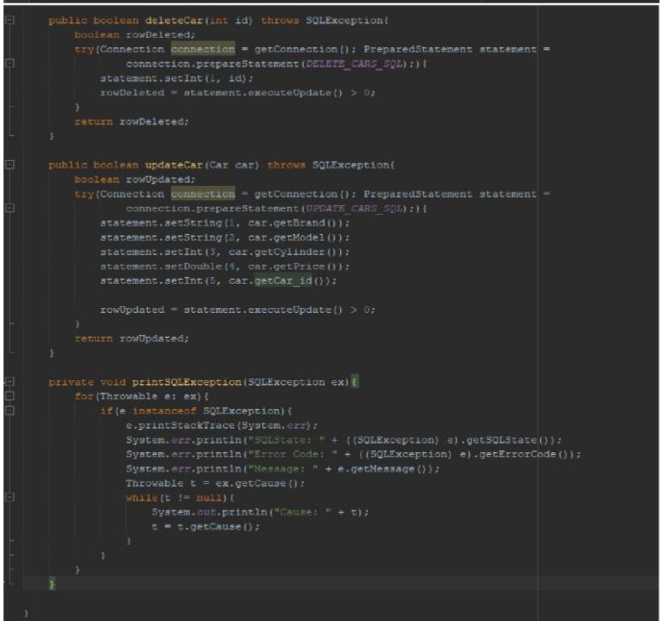
CarDAO.java



```java
    */
import java.sql.*;
import java.sql.SQLException;
import java.util.*;
import com.model.Car;

public class CarDAO {
    Connection connection = null;
    private String jdbcURL = "jdbc:mysql://localhost:3306/carshop";
    private String jdbcUsername = "root";
    private String jdbcPassword = "admin";

    private static final String INSERT_CARS_SQL = "INSERT INTO carpricelist(brand, model, cylinder, price) VALUES (?, ?, ?, ?);";
    private static final String SELECT_CAR_BY_ID = "select car_id, brand, model, cylinder, price from carpricelist where car_id=?";
    private static final String SELECT_ALL_CARS = "select * from carpricelist";
    private static final String DELETE_CARS_SQL = "delete from carpricelist where car_id = ?;";
    private static final String UPDATE_CARS_SQL = "update carpricelist set brand = ?,model= ?, cylinder= ?, price= ? where car_id = ?;";

    public CarDAO(){}

        protected Connection getConnection(){
            Connection connection = null;
            try{
                Class.forName("com.mysql.cj.jdbc.Driver");
                connection = DriverManager.getConnection(jdbcURL, jdbcUsername, jdbcPassword);
                System.out.println("Database connected!");
            }catch(SQLException e){
                e.printStackTrace();
            }catch(ClassNotFoundException e){
                e.printStackTrace();
            }
            return connection;
        }

    public void insertCar(Car car) throws SQLException{
        System.out.println(INSERT_CARS_SQL);
        try(Connection connection = getConnection(); PreparedStatement preparedStatement =
                connection.prepareStatement(INSERT_CARS_SQL)){
            preparedStatement.setString(1, car.getBrand());
            preparedStatement.setString(2, car.getModel());
            preparedStatement.setInt(3, car.getCylinder());
            preparedStatement.setDouble(4, car.getPrice());
            System.out.println(preparedStatement);
            preparedStatement.executeUpdate();
        }catch(SQLException e){
            printSQLException(e);
                }
    }
```

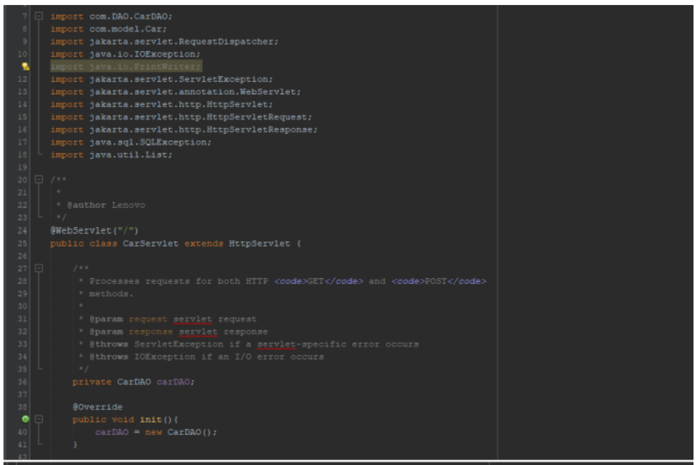


```java
    public Car selectCar(int id){
        Car car = null;
        // Step 1: Establishing a Connection
        try(Connection connection = getConnection();
            // Step 2: Create a statement using connection
            PreparedStatement preparedStatement = connection.prepareStatement(SELECT_CAR_BY_ID);){
            preparedStatement.setInt(1, id);
            System.out.println(preparedStatement);
            ResultSet rs = preparedStatement.executeQuery();

            while(rs.next()){
                String brand = rs.getString("brand");
                String model = rs.getString("model");
                int cylinder = rs.getInt("cylinder");
                double price = rs.getDouble("price");
                car = new Car(id, brand, model, cylinder, price);
            }
        }catch (SQLException e){
                printSQLException(e);
                }
        return car;
    }

    public List < Car > selectAllCars(){
        List <Car> cars = new ArrayList <>();
        try (Connection connection = getConnection();

             PreparedStatement preparedStatement = connection.prepareStatement(SELECT_ALL_CARS);){
             System.out.println(preparedStatement);
             ResultSet rs = preparedStatement.executeQuery();

             while(rs.next()){
                 int id = rs.getInt("car_id");
                 String brand = rs.getString("brand");
                 String model = rs.getString("model");
                 int cylinder = rs.getInt("cylinder");
                 double price = rs.getDouble("price");
                 cars.add(new Car(id, brand, model, cylinder, price));
             }
        }catch(SQLException e){
            printSQLException(e);
        }
        return cars;
    }
```

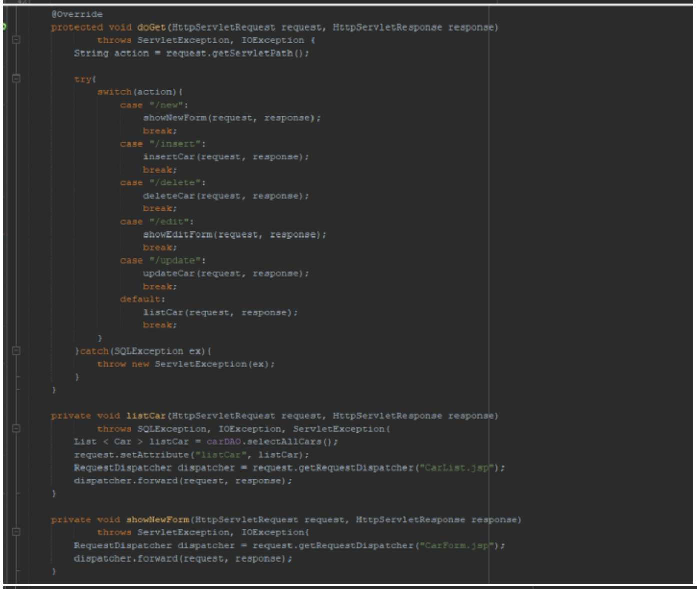


```java
    public boolean deleteCar(int id) throws SQLException{
        boolean rowDeleted;
        try(Connection connection = getConnection(); PreparedStatement statement =
                connection.prepareStatement(DELETE_CARS_SQL);){
            statement.setInt(1, id);
            rowDeleted = statement.executeUpdate() > 0;
        }
        return rowDeleted;
    }

    public boolean updateCar(Car car) throws SQLException{
        boolean rowUpdated;
        try(Connection connection = getConnection(); PreparedStatement statement =
                connection.prepareStatement(UPDATE_CARS_SQL);){
            statement.setString(1, car.getBrand());
            statement.setString(2, car.getModel());
            statement.setInt(3, car.getCylinder());
            statement.setDouble(4, car.getPrice());
            statement.setInt(5, car.getCar_id());

            rowUpdated = statement.executeUpdate() > 0;
        }
        return rowUpdated;
    }

    private void printSQLException(SQLException ex){
        for(Throwable e: ex){
            if(e instanceof SQLException){
                e.printStackTrace(System.err);
                System.err.println("SQLState: " + ((SQLException) e).getSQLState());
                System.err.println("Error Code: " + ((SQLException) e).getErrorCode());
                System.err.println("Message: " + e.getMessage());
                Throwable t = ex.getCause();
                while(t != null){
                    System.out.println("Cause: " + t);
                    t = t.getCause();
                }
            }
        }
    }

}
```

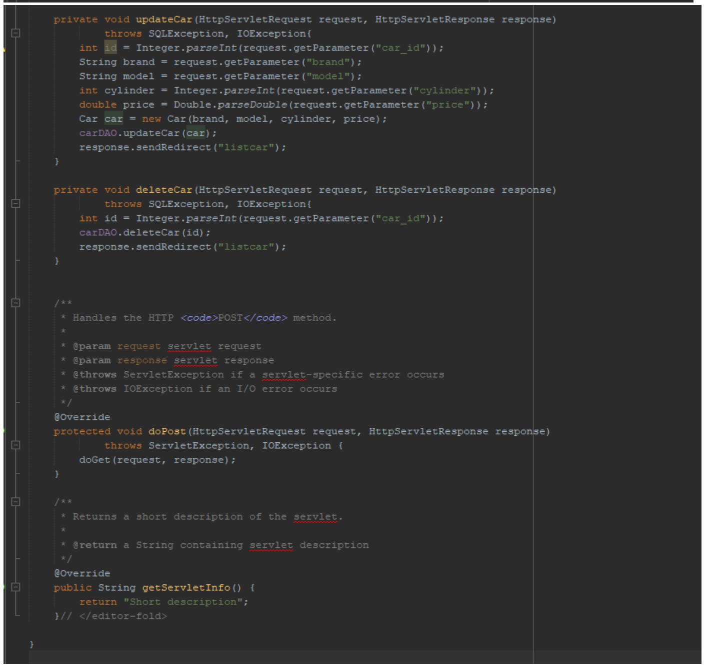
CarServlet.java



```java
import com.DAO.CarDAO;
import com.model.Car;
import jakarta.servlet.RequestDispatcher;
import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.ServletException;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;
import java.sql.SQLException;
import java.util.List;

/**
 *
 * @author Lenovo
 */
@WebServlet("/")
public class CarServlet extends HttpServlet {

    /**
     * Processes requests for both HTTP <code>GET</code> and <code>POST</code>
     * methods.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    private CarDAO carDAO;

    @Override
    public void init(){
        carDAO = new CarDAO();
    }
```

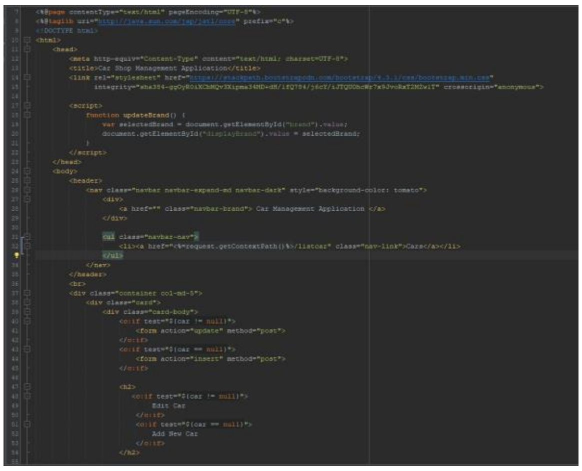


```java
    @Override
    protected void doGet(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        String action = request.getServletPath();

        try{
            switch(action){
                case "/new":
                    showNewForm(request, response);
                    break;
                case "/insert":
                    insertCar(request, response);
                    break;
                case "/delete":
                    deleteCar(request, response);
                    break;
                case "/edit":
                    showEditForm(request, response);
                    break;
                case "/update":
                    updateCar(request, response);
                    break;
                default:
                    listCar(request, response);
                    break;
            }
        }catch(SQLException ex){
            throw new ServletException(ex);
        }
    }

    private void listCar(HttpServletRequest request, HttpServletResponse response)
            throws SQLException, IOException, ServletException{
        List < Car > listCar = carDAO.selectAllCars();
        request.setAttribute("listCar", listCar);
        RequestDispatcher dispatcher = request.getRequestDispatcher("CarList.jsp");
        dispatcher.forward(request, response);
    }

    private void showNewForm(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException{
        RequestDispatcher dispatcher = request.getRequestDispatcher("CarForm.jsp");
        dispatcher.forward(request, response);
    }
```

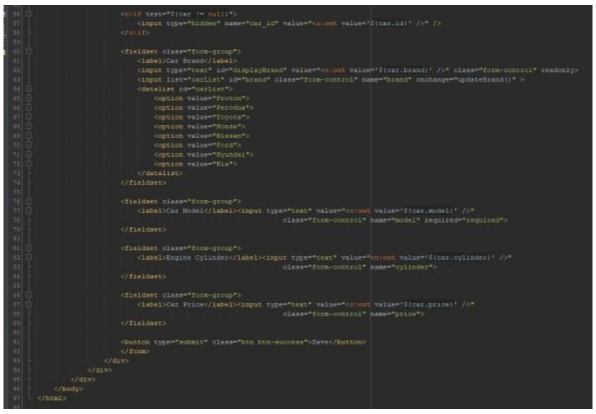


```java
    private void updateCar(HttpServletRequest request, HttpServletResponse response)
            throws SQLException, IOException{
        int id = Integer.parseInt(request.getParameter("car_id"));
        String brand = request.getParameter("brand");
        String model = request.getParameter("model");
        int cylinder = Integer.parseInt(request.getParameter("cylinder"));
        double price = Double.parseDouble(request.getParameter("price"));
        Car car = new Car(brand, model, cylinder, price);
        carDAO.updateCar(car);
        response.sendRedirect("listcar");
    }

    private void deleteCar(HttpServletRequest request, HttpServletResponse response)
            throws SQLException, IOException{
        int id = Integer.parseInt(request.getParameter("car_id"));
        carDAO.deleteCar(id);
        response.sendRedirect("listcar");
    }


    /**
     * Handles the HTTP <code>POST</code> method.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    @Override
    protected void doPost(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        doGet(request, response);
    }

    /**
     * Returns a short description of the servlet.
     *
     * @return a String containing servlet description
     */
    @Override
    public String getServletInfo() {
        return "Short description";
    }// </editor-fold>

}
```

CarForm.jsp

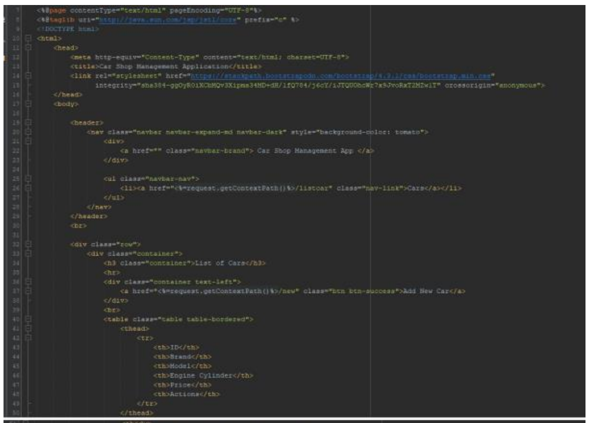


```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Car Shop Management Application</title>
        <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
              integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">

        <script>
            function updateBrand() {
                var selectedBrand = document.getElementById("brand").value;
                document.getElementById("displayBrand").value = selectedBrand;
            }
        </script>
    </head>
    <body>
        <header>
            <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
                <div>
                    <a href="" class="navbar-brand"> Car Management Application </a>
                </div>

                <ul class="navbar-nav">
                    <li><a href="<%=request.getContextPath()%>/listcar" class="nav-link">Cars</a></li>
                </ul>
            </nav>
        </header>
        <br>
        <div class="container col-md-5">
            <div class="card">
                <div class="card-body">
                    <c:if test="${car != null}">
                        <form action="update" method="post">
                    </c:if>
                    <c:if test="${car == null}">
                        <form action="insert" method="post">
                    </c:if>

                    <h2>
                       <c:if test="${car != null}">
                            Edit Car
                        </c:if>
                        <c:if test="${car == null}">
                            Add New Car
                        </c:if>
                    </h2>
```

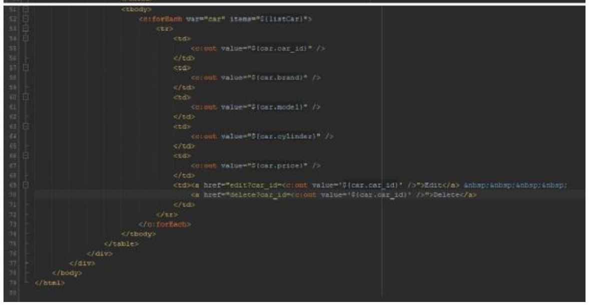


```
                    <c:if test="${car != null}">
                        <input type="hidden" name="car_id" value="<c:out value='${car.id}' />" />
                    </c:if>

                    <fieldset class="form-group">
                        <label>Car Brand</label>
                        <input type="text" id="displayBrand" value="<c:out value='${car.brand}' />" class="form-control" readonly>
                        <input list="carList" id="brand" class="form-control" name="brand" onchange="updateBrand()" >
                        <datalist id="carList">
                            <option value="Proton">
                            <option value="Perodua">
                            <option value="Toyota">
                            <option value="Honda">
                            <option value="Nissan">
                            <option value="Ford">
                            <option value="Hyundai">
                            <option value="Kia">
                        </datalist>
                    </fieldset>

                    <fieldset class="form-group">
                        <label>Car Model</label><input type="text" value="<c:out value='${car.model}' />"
                                                       class="form-control" name="model" required="required">
                    </fieldset>

                    <fieldset class="form-group">
                        <label>Engine Cylinder</label><input type="text" value="<c:out value='${car.cylinder}' />"
                                                       class="form-control" name="cylinder">
                    </fieldset>

                    <fieldset class="form-group">
                        <label>Car Price</label><input type="text" value="<c:out value='${car.price}' />"
                                                       class="form-control" name="price">
                    </fieldset>

                    <button type="submit" class="btn btn-success">Save</button>
                    </form>
                </div>
            </div>
        </div>
    </body>
</html>
```

CarList.jsp

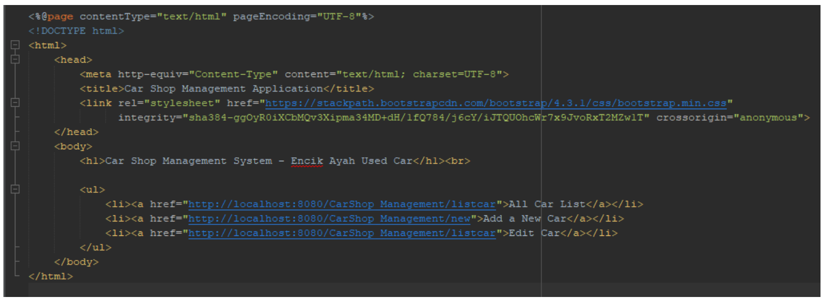


```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Car Shop Management Application</title>
        <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
              integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">
    </head>
    <body>

        <header>
            <nav class="navbar navbar-expand-md navbar-dark" style="background-color: tomato">
                <div>
                    <a href="" class="navbar-brand"> Car Shop Management App </a>
                </div>

                <ul class="navbar-nav">
                    <li><a href="<%=request.getContextPath()%>/listcar" class="nav-link">Cars</a></li>
                </ul>
            </nav>
        </header>
        <br>

        <div class="row">
            <div class="container">
                <h3 class="container">List of Cars</h3>
                <hr>
                <div class="container text-left">
                    <a href="<%=request.getContextPath()%>/new" class="btn btn-success">Add New Car</a>
                </div>
                <br>
                <table class="table table-bordered">
                    <thead>
                        <tr>
                            <th>ID</th>
                            <th>Brand</th>
                            <th>Model</th>
                            <th>Engine Cylinder</th>
                            <th>Price</th>
                            <th>Actions</th>
                        </tr>
                    </thead>
```



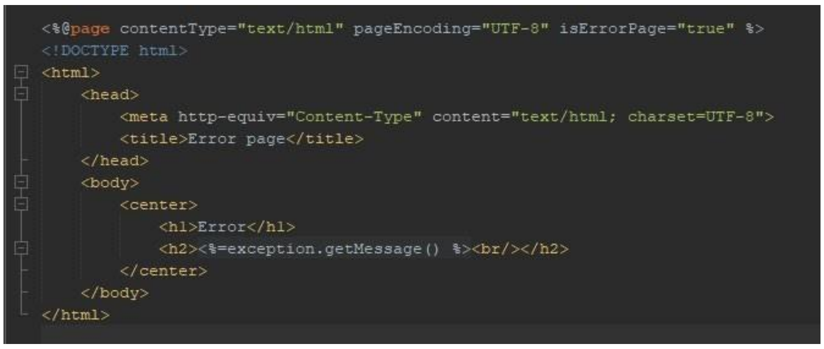
```
                    <tbody>
                        <c:forEach var="car" items="${listCar}">
                            <tr>
                                <td>
                                    <c:out value="${car.car_id}" />
                                </td>
                                <td>
                                    <c:out value="${car.brand}" />
                                </td>
                                <td>
                                    <c:out value="${car.model}" />
                                </td>
                                <td>
                                    <c:out value="${car.cylinder}" />
                                </td>
                                <td>
                                    <c:out value="${car.price}" />
                                </td>
                                <td><a href="edit?car_id=<c:out value='${car.car_id}' />">Edit</a> &nbsp;&nbsp;&nbsp;&nbsp;
                                    <a href="delete?car_id=<c:out value='${car.car_id}' />">Delete</a>
                                </td>
                            </tr>
                        </c:forEach>
                    </tbody>
                </table>
            </div>
        </div>
    </body>
</html>
```

Index.jsp



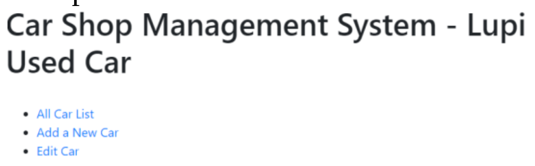
```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Car Shop Management Application</title>
        <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
              integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T" crossorigin="anonymous">
    </head>
    <body>
        <h1>Car Shop Management System - Encik Ayah Used Car</h1><br>

        <ul>
            <li><a href="http://localhost:8080/CarShop_Management/listcar">All Car List</a></li>
            <li><a href="http://localhost:8080/CarShop_Management/new">Add a New Car</a></li>
            <li><a href="http://localhost:8080/CarShop_Management/listcar">Edit Car</a></li>
        </ul>
    </body>
</html>
```

Error.jsp



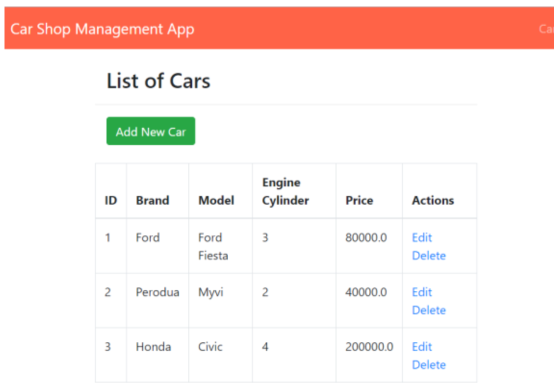
```
<%@page contentType="text/html" pageEncoding="UTF-8" isErrorPage="true" %>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Error page</title>
    </head>
    <body>
        <center>
            <h1>Error</h1>
            <h2><%=exception.getMessage() %><br/></h2>
        </center>
    </body>
</html>
```

Output:



Car Shop Management System - Lupi Used Car

- All Car List
- Add a New Car
- Edit Car

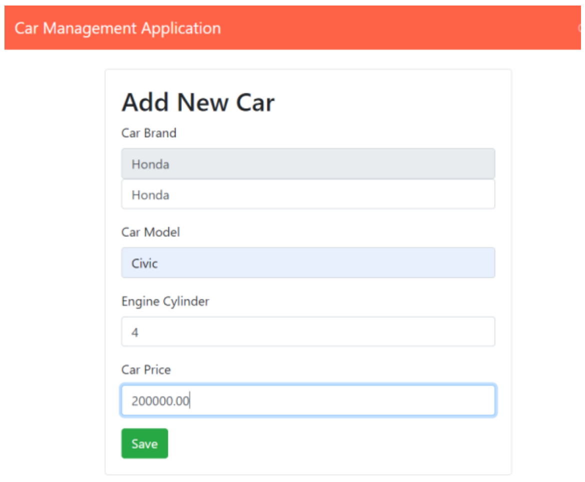


Car Shop Management App

List of Cars

Add New Car

ID	Brand	Model	Engine Cylinder	Price	Actions
1	Ford	Ford Fiesta	3	80000.0	Edit Delete
2	Perodua	Myvi	2	40000.0	Edit Delete
3	Honda	Civic	4	200000.0	Edit Delete



Car Management Application

Add New Car

Car Brand

Honda

Honda

Car Model

Civic

Engine Cylinder

4

Car Price

200000.00

Save