UNIVERSITI MALAYSIA TERENGGANU

CSM3023

BACHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONORS

LAB 7

SEMESTER II 2023/2024

Prepared for:

DR. MOHAMMAD NOR HASSAN

Prepared by:

HUSNA ZAHIRA BINTI RUZELI (S67554)
(K1)

Week 7

JSP: Perform Create, Update, Retrieve and Delete (CRUD)

Web Programming 2

Lecturers

PUSAT PENGAJIAN INFORMATIK DAN MATEMATIK GUNAAN (PPIMG), UNIVERSITI MALAYSIA TERENGGANU (UMT)

Revision History

Revision Date	Previous Revision Date	Summary of Changes	Changes Marked
		First Issue	Mohamad Nor Hassan
		Second Issue	Dr Rabiei Mamat Dr Faizah Aplop Dr Fouad Ts Dr Rosmayati Mohemad Fakhrul Adli Mohd Zaki
			Fakhrul Adli Mohd Zaki

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Arahan:

Manual makmal ini adalah untuk kegunaan pelajar-pelajar Pusat Pengajian Informatik dan Matematik Gunaan (PPIMG), Universiti Malaysia Terengganu (UMT) sahaja. Tidak dibenarkan mencetak dan mengedar manual ini tanpa kebenaran rasmi daripada penulis.

Sila ikuti langkah demi langkah sebagaimana yang dinyatakan di dalam manual. Tandakan (√) setiap langkah yang telah selesai dibuat dan tulis kesimpulan bagi setiap aktiviti yang telah selesai dijalankan.

Instruction:

This laboratory manual is for use by the students of the School of Informatics and Applied Mathematics (PPIMG), Universiti Malaysia Terengganu (UMT) only. It is not permissible to print and distribute this manual without the official authorisation of the author.

Please follow step by step as described in the manual. Tick (√) each step completed and write the conclusions for each completed activity.

Task 1: Perform Basic CRUD Process Using Java Servlet

Objective:

Using Java Servlet to perform creating, retrieving, updating and deleting (CRUD) records from MySQL database.

Problem Description:

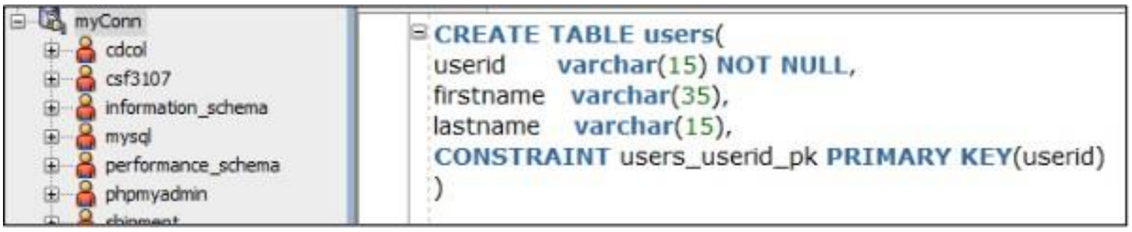
You are required to perform basic CRUD process using Java Servlet.

1. Create table users in CSF3203 database schema.
2. Create a three Java class that representing User (act as a JavaBeans to represent business object), DBConnection (to open and close database connection) and UserDao (act as a Data Access Object (DAO) to perform CRUD process).
3. Create UserController servlet to control the CRUD process.
4. Create index.jsp page as a main page.
5. Create listUser.jsp page to perform retrieving of a list of users.
6. Create user.jsp page to create a new record for user.
7. Create editUser.jsp page to update existing record for specific user.

Estimated time: 120 minutes

Step 1 - Create table users in CSF3107 database schema

1. Open XAMPP Control Panel.
2. Start Apache and MySQL module.
3. Open phpMyAdmin by clicking Admin button for MySQL module. 4. Select CSF3107 database schema.
5. Go to SQL tab.
6. Create table known as users.

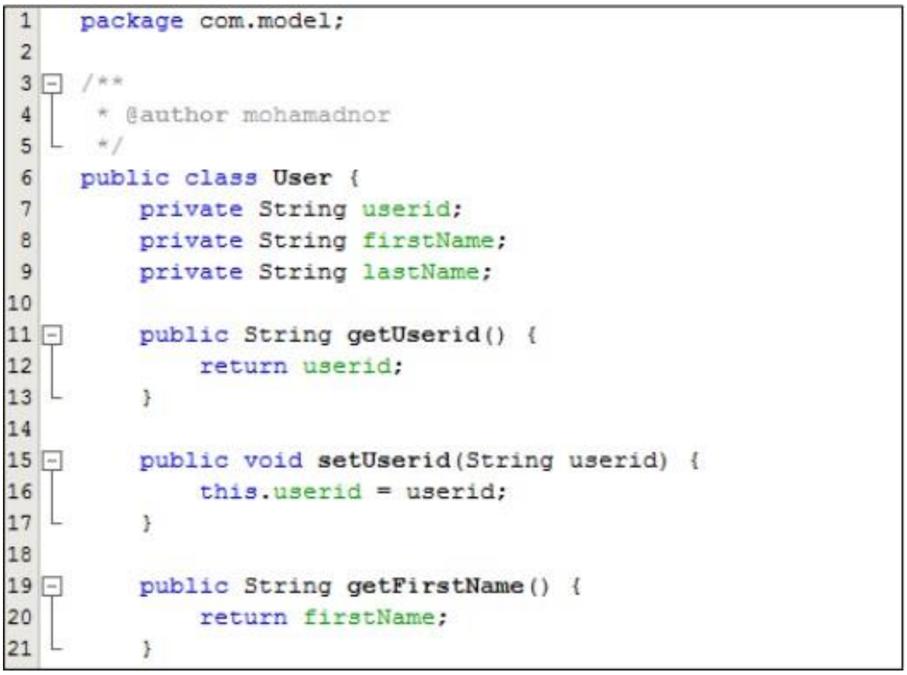


```
CREATE TABLE users(
userid      varchar(15) NOT NULL,
firstname   varchar(35),
lastname    varchar(15),
CONSTRAINT users_userid_pk PRIMARY KEY(userid)
)
```

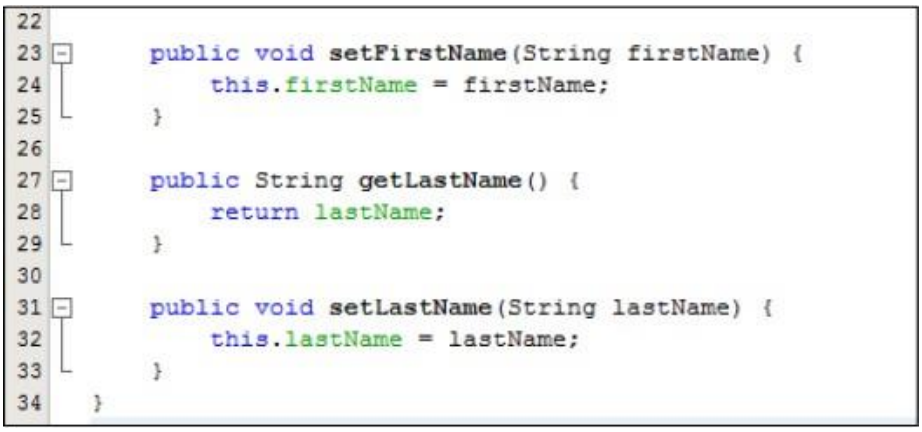
7. Click *Go* button to execute the query.

Step 2 - Create three Java class that representing User (act as a JavaBeans to represent business object), DBConnection (to open and close database connection) and UserDao (act as a Data Access Object (DAO)) to perform CRUD process

1. Create new web application as CRUDServlet.
2. Create Java class User to represent the business object for user.
3. Name the package as com.model.
4. Write a coding for getter and setter for each instance variable.

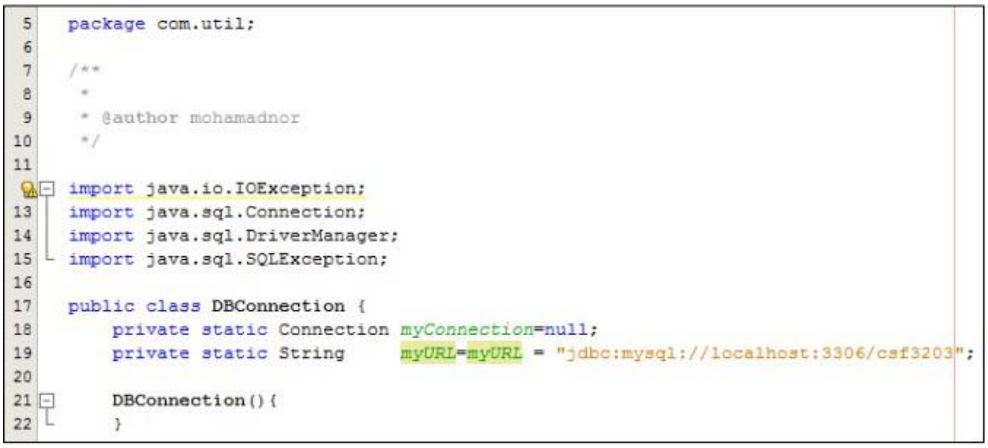


```
package com.model;

/**
 * @author mohamadnor
 */
public class User {
    private String userid;
    private String firstName;
    private String lastName;

    public String getUserid() {
        return userid;
    }

    public void setUserid(String userid) {
        this.userid = userid;
    }

    public String getFirstName() {
        return firstName;
    }
```

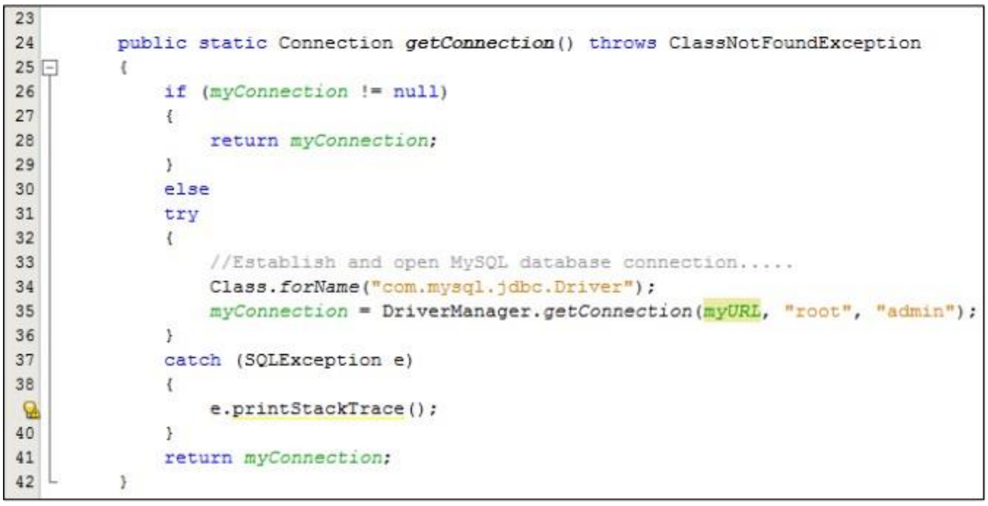


```java

    public void setFirstName(String firstName) {
        this.firstName = firstName;
    }

    public String getLastName() {
        return lastName;
    }

    public void setLastName(String lastName) {
        this.lastName = lastName;
    }
}
```

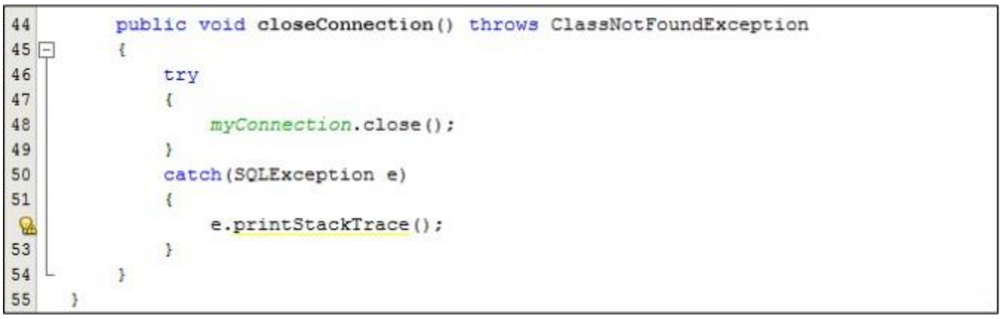
5. Create Java class *DBConnection* to open and close the database.
6. Name the package as *com.util*
7. Write a coding for connecting and closing to database.



```java
package com.util;

/**
 *
 * @author mohamadnor
 */

import java.io.IOException;
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;

public class DBConnection {
    private static Connection myConnection=null;
    private static String     myURL=myURL = "jdbc:mysql://localhost:3306/csf3203";

    DBConnection(){
    }
```

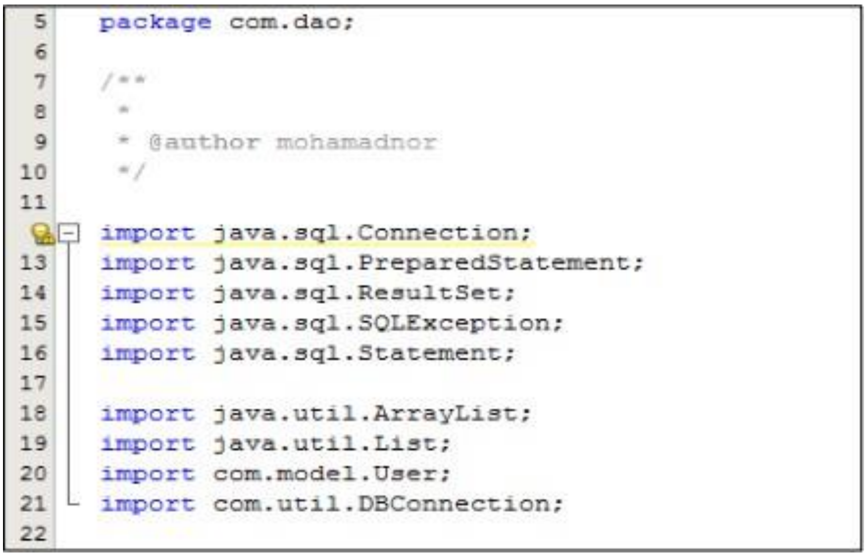


```java

    public static Connection getConnection() throws ClassNotFoundException
    {
        if (myConnection != null)
        {
            return myConnection;
        }
        else
        try
        {
            //Establish and open MySQL database connection.....
            Class.forName("com.mysql.jdbc.Driver");
            myConnection = DriverManager.getConnection(myURL, "root", "admin");
        }
        catch (SQLException e)
        {
            e.printStackTrace();
        }
        return myConnection;
    }
```

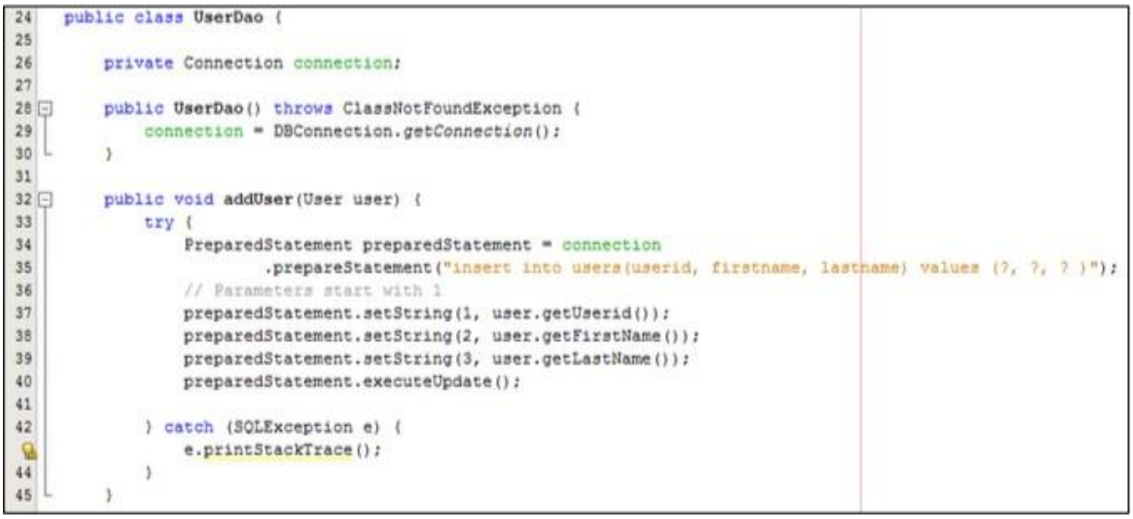


```
        public void closeConnection() throws ClassNotFoundException
        {
            try
            {
                myConnection.close();
            }
            catch(SQLException e)
            {
                e.printStackTrace();
            }
        }
    }
```

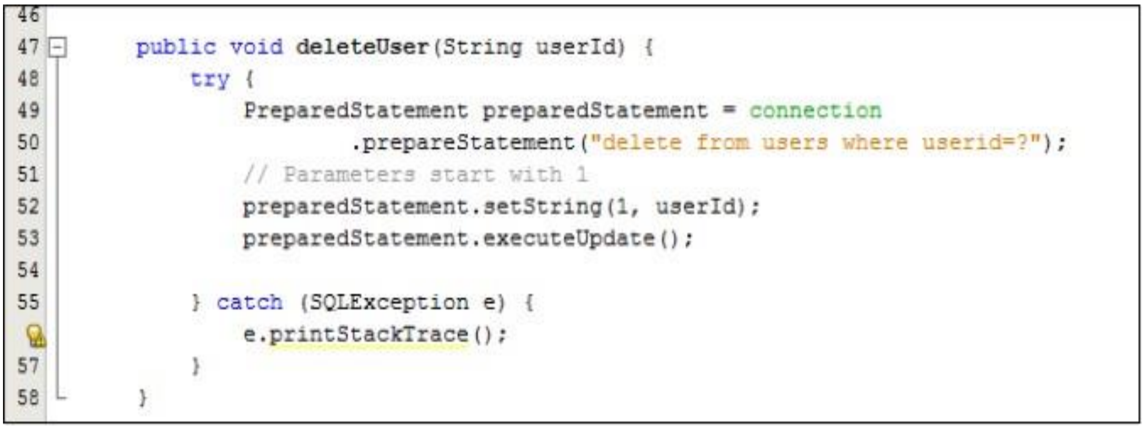
8. Create Java class *UserDao* to perform CRUD process.
9. Name the package as *com.dao*.
10. Write codes to perform CRUD process.



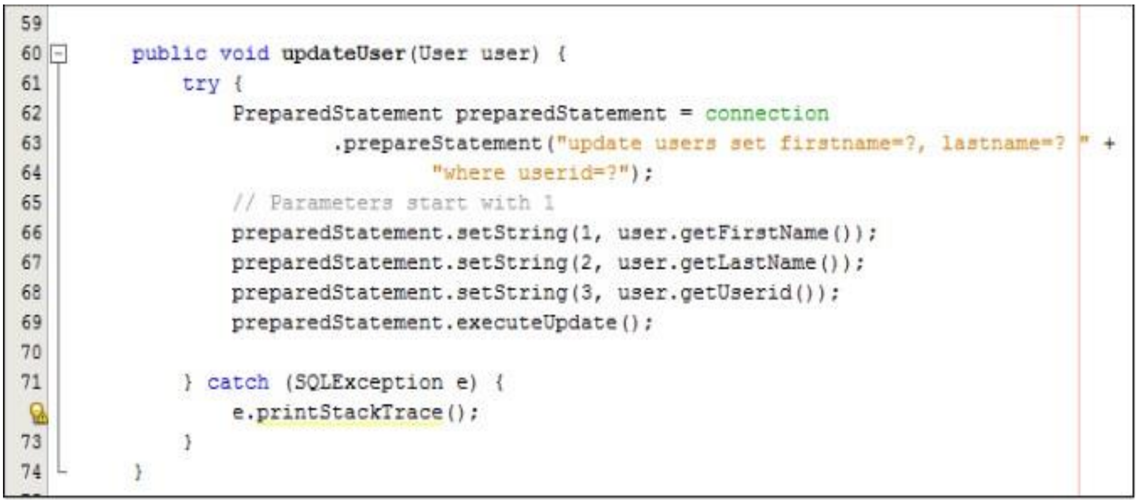
```
package com.dao;

/**
 *
 * @author mohamadnor
 */

import java.sql.Connection;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;

import java.util.ArrayList;
import java.util.List;
import com.model.User;
import com.util.DBConnection;

```



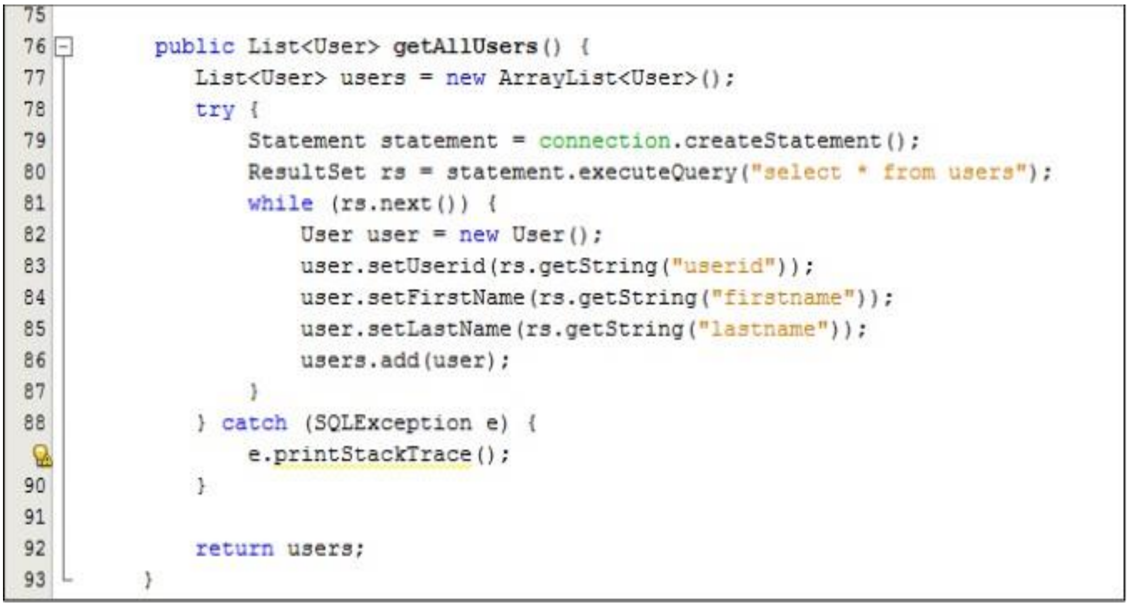
```
public class UserDao {

    private Connection connection;

    public UserDao() throws ClassNotFoundException {
        connection = DBConnection.getConnection();
    }

    public void addUser(User user) {
        try {
            PreparedStatement preparedStatement = connection
                    .prepareStatement("insert into users(userid, firstname, lastname) values (?, ?, ? )");
            // Parameters start with 1
            preparedStatement.setString(1, user.getUserid());
            preparedStatement.setString(2, user.getFirstName());
            preparedStatement.setString(3, user.getLastName());
            preparedStatement.executeUpdate();

        } catch (SQLException e) {
            e.printStackTrace();
        }
    }
```



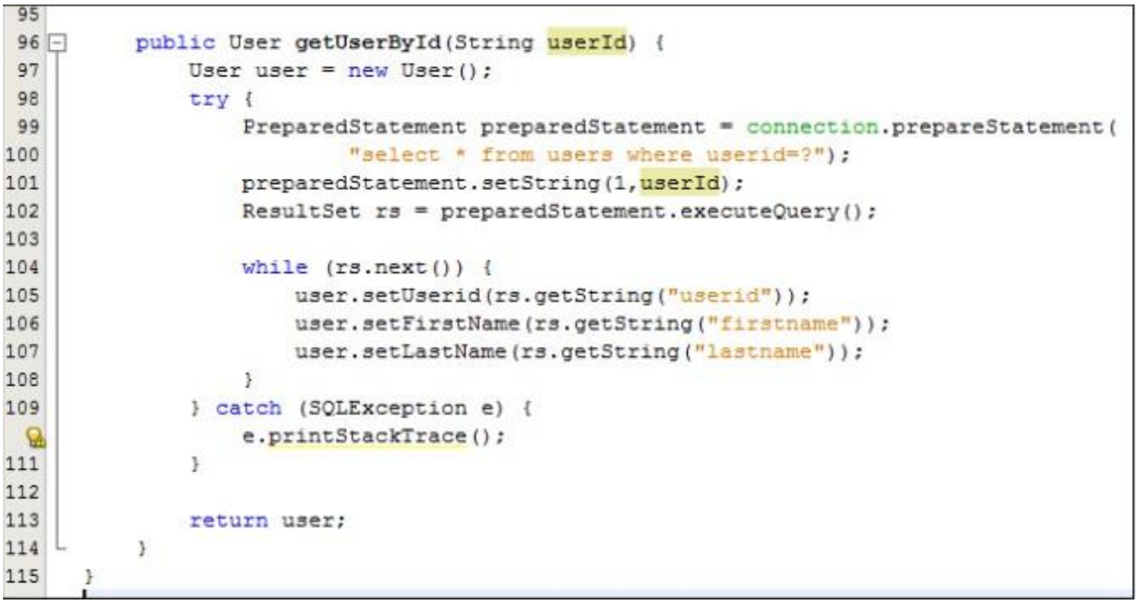
```java

    public void deleteUser(String userId) {
        try {
            PreparedStatement preparedStatement = connection
                    .prepareStatement("delete from users where userid=?");
            // Parameters start with 1
            preparedStatement.setString(1, userId);
            preparedStatement.executeUpdate();

        } catch (SQLException e) {
            e.printStackTrace();
        }
    }
```



```java

    public void updateUser(User user) {
        try {
            PreparedStatement preparedStatement = connection
                    .prepareStatement("update users set firstname=?, lastname=? " +
                            "where userid=?");
            // Parameters start with 1
            preparedStatement.setString(1, user.getFirstName());
            preparedStatement.setString(2, user.getLastName());
            preparedStatement.setString(3, user.getUserid());
            preparedStatement.executeUpdate();

        } catch (SQLException e) {
            e.printStackTrace();
        }
    }
```



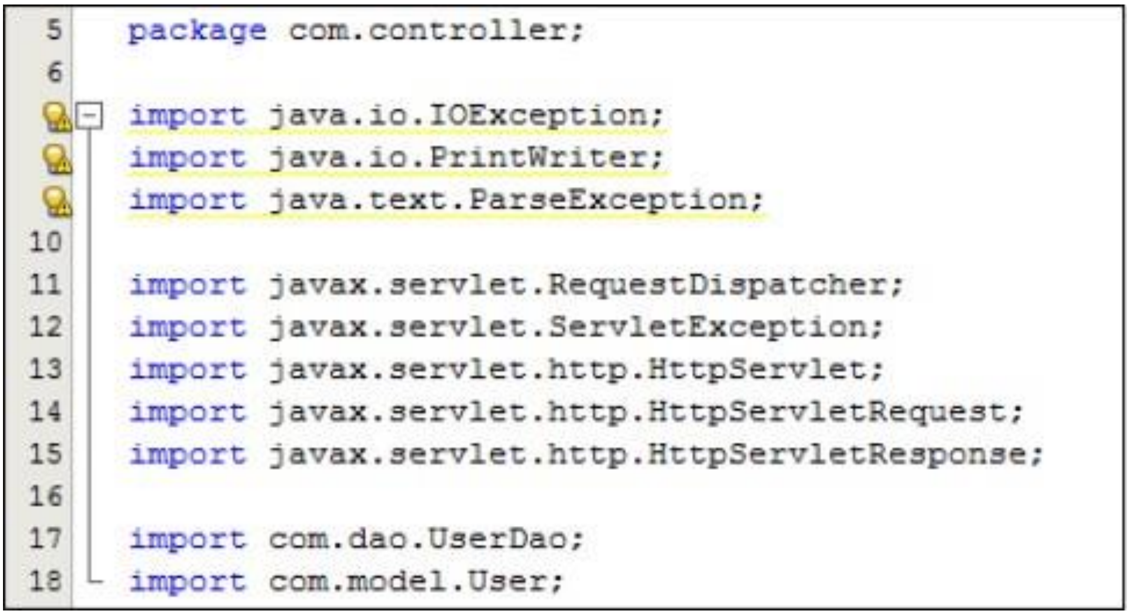
```java

    public List<User> getAllUsers() {
        List<User> users = new ArrayList<User>();
        try {
            Statement statement = connection.createStatement();
            ResultSet rs = statement.executeQuery("select * from users");
            while (rs.next()) {
                User user = new User();
                user.setUserid(rs.getString("userid"));
                user.setFirstName(rs.getString("firstname"));
                user.setLastName(rs.getString("lastname"));
                users.add(user);
            }
        } catch (SQLException e) {
            e.printStackTrace();
        }

        return users;
    }
```



```
    public User getUserById(String userId) {
        User user = new User();
        try {
            PreparedStatement preparedStatement = connection.prepareStatement(
                    "select * from users where userid=?");
            preparedStatement.setString(1,userId);
            ResultSet rs = preparedStatement.executeQuery();

            while (rs.next()) {
                user.setUserid(rs.getString("userid"));
                user.setFirstName(rs.getString("firstname"));
                user.setLastName(rs.getString("lastname"));
            }
        } catch (SQLException e) {
            e.printStackTrace();
        }

        return user;
    }
}
```

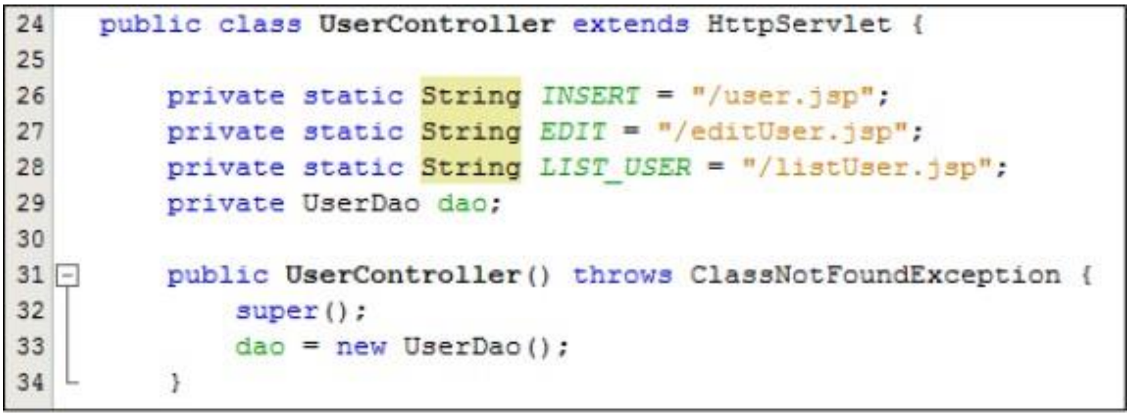
Step 3 - Create UserController servlet in order to control and redirect the request to the respective CRUD process and page

1. Create a Java servlet known as *UserController*.
2. Name the package as *com.controller*.
3. Import the related API and package.



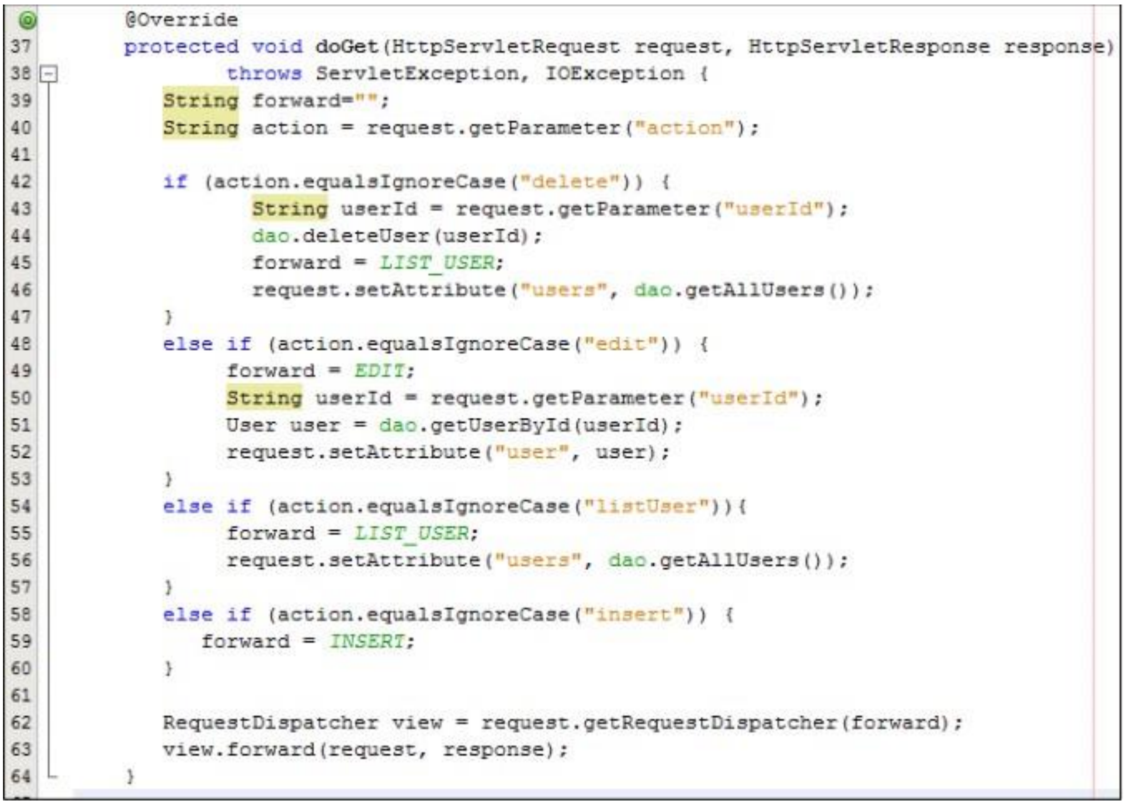
```
package com.controller;

import java.io.IOException;
import java.io.PrintWriter;
import java.text.ParseException;

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

import com.dao.UserDao;
import com.model.User;
```

4. Remove *processRequest()* method.
5. Define the static instance variables and the contructor.



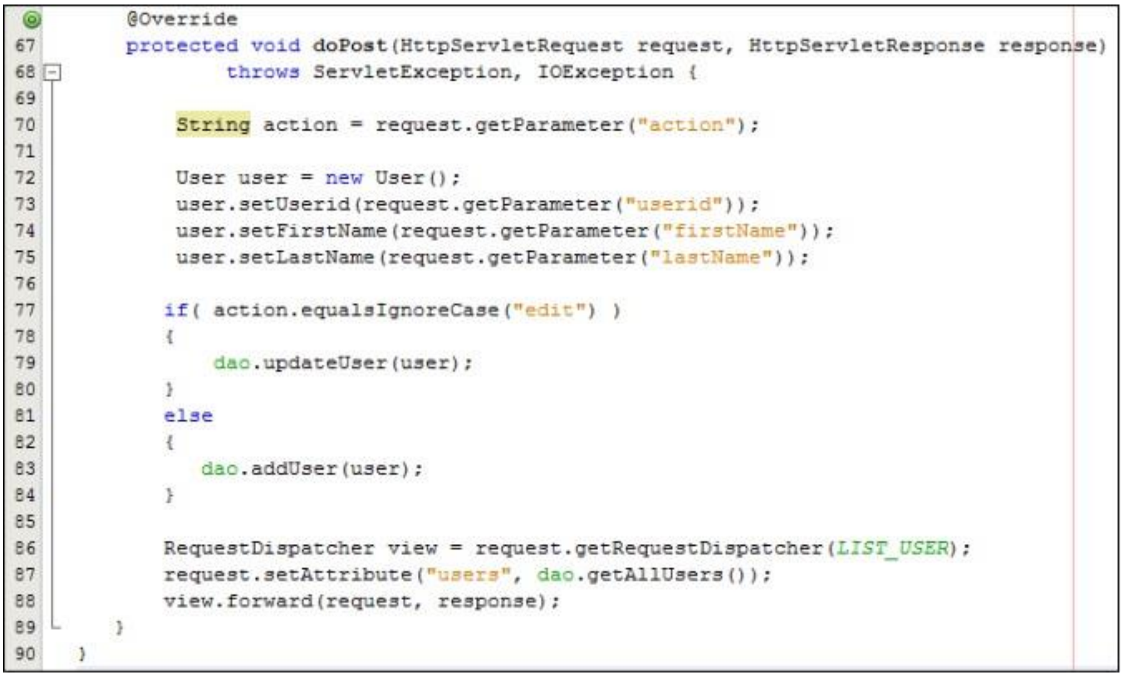
```java
public class UserController extends HttpServlet {

    private static String INSERT = "/user.jsp";
    private static String EDIT = "/editUser.jsp";
    private static String LIST_USER = "/listUser.jsp";
    private UserDao dao;

    public UserController() throws ClassNotFoundException {
        super();
        dao = new UserDao();
    }
```

6. Write a code for *doGet()* method in order to determine the respective CRUD process and redirect to related page request.



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

      if (action.equalsIgnoreCase("delete")) {
              String userId = request.getParameter("userId");
              dao.deleteUser(userId);
              forward = LIST_USER;
              request.setAttribute("users", dao.getAllUsers());
      }
      else if (action.equalsIgnoreCase("edit")) {
           forward = EDIT;
           String userId = request.getParameter("userId");
           User user = dao.getUserById(userId);
           request.setAttribute("user", user);
      }
      else if (action.equalsIgnoreCase("listUser")){
           forward = LIST_USER;
           request.setAttribute("users", dao.getAllUsers());
      }
      else if (action.equalsIgnoreCase("insert")) {
         forward = INSERT;
      }

      RequestDispatcher view = request.getRequestDispatcher(forward);
      view.forward(request, response);
    }
```

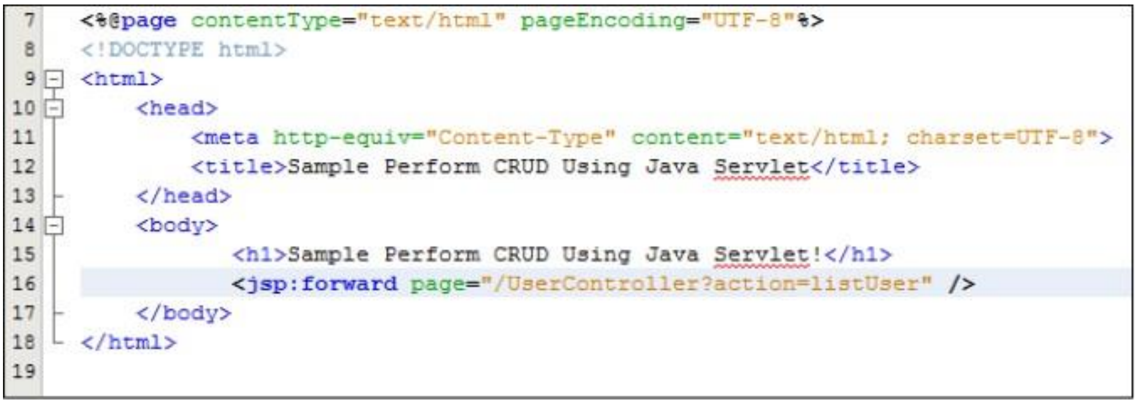
7. Write a code for doPost() method in order to perform creating or updating the record and finally, redirect to related page request.



```
    @Override
    protected void doPost(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {

        String action = request.getParameter("action");

        User user = new User();
        user.setUserid(request.getParameter("userid"));
        user.setFirstName(request.getParameter("firstName"));
        user.setLastName(request.getParameter("lastName"));

       if( action.equalsIgnoreCase("edit") )
       {
           dao.updateUser(user);
       }
       else
       {
          dao.addUser(user);
       }

       RequestDispatcher view = request.getRequestDispatcher(LIST_USER);
       request.setAttribute("users", dao.getAllUsers());
       view.forward(request, response);
    }
}
```

Step 4 - Create an index.jsp page that act as a main page

1. Create jsp page and key-in filename as *index.jsp*.
2. Write and HTML markup and JSP action tag to forward the page to UserController servlet with URL parameter as *action=listUser*.

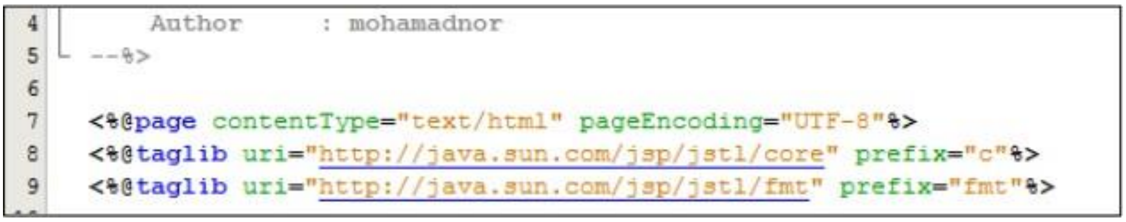


```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Sample Perform CRUD Using Java Servlet</title>
    </head>
    <body>
           <h1>Sample Perform CRUD Using Java Servlet!</h1>
           <jsp:forward page="/UserController?action=listUser" />
    </body>
</html>
```

3. Compile the file

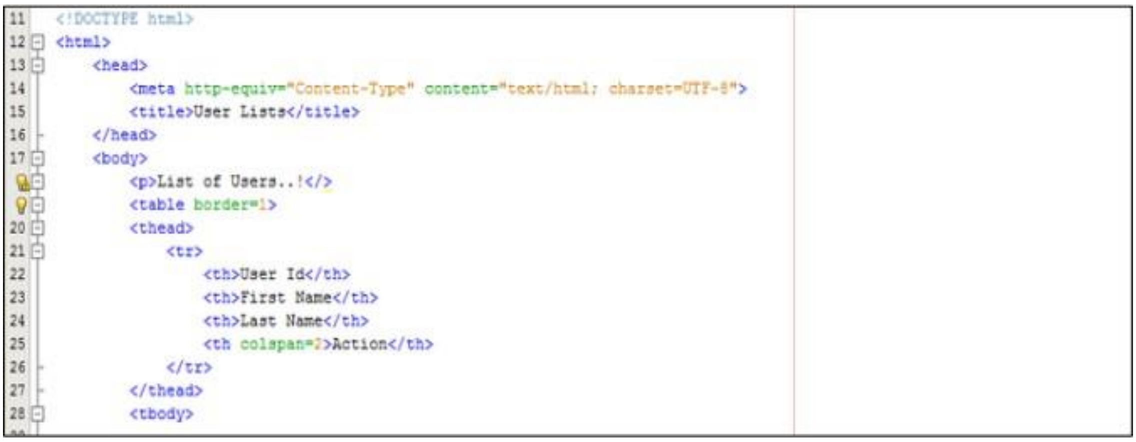
Step 5 - Create listUser.jsp page to perform retrieving of a list of users.

1. Create jsp page and key-in filename as listUser.jsp.
2. Add standard.jar and jstl.jar in library project folder.
3. Add the taglib directive to listUser.jsp.

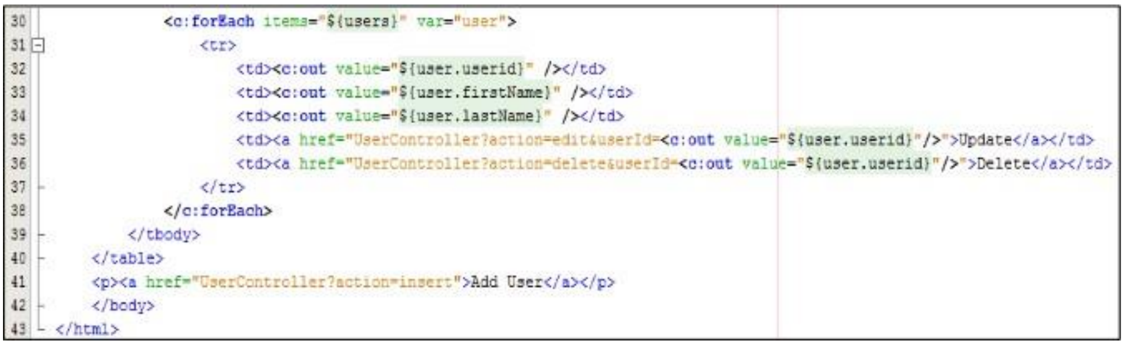


```
        Author      : mohamadnor
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/fmt" prefix="fmt"%>
```

4. Write and HTML markup and JSTL syntax to display the records.



```
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>User Lists</title>
    </head>
    <body>
        <p>List of Users..!</>
        <table border=1>
        <thead>
            <tr>
                <th>User Id</th>
                <th>First Name</th>
                <th>Last Name</th>
                <th colspan=2>Action</th>
            </tr>
        </thead>
        <tbody>
```

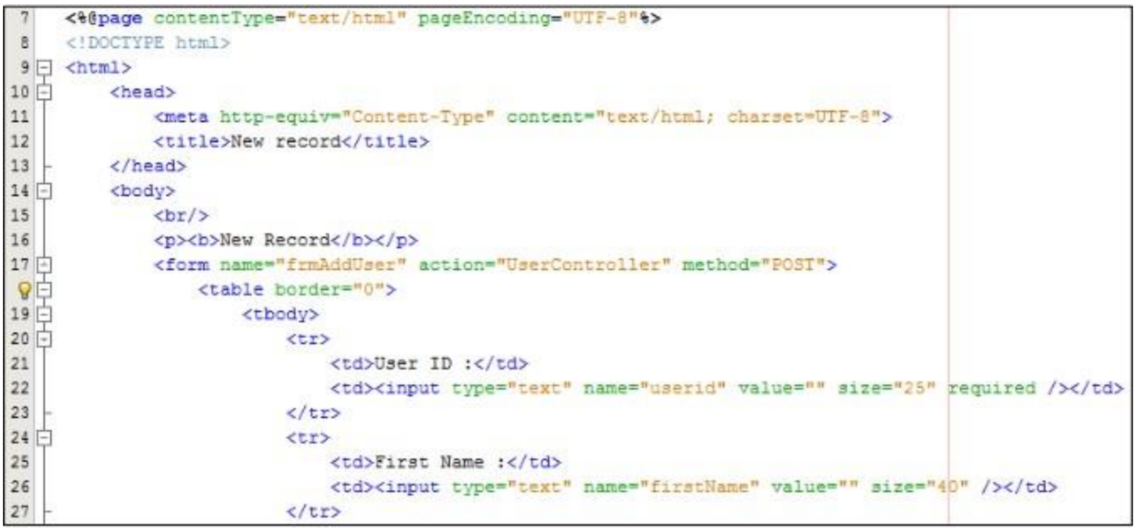


```
                <c:forEach items="${users}" var="user">
                    <tr>
                        <td><c:out value="${user.userid}" /></td>
                        <td><c:out value="${user.firstName}" /></td>
                        <td><c:out value="${user.lastName}" /></td>
                        <td><a href="UserController?action=edit&userId=<c:out value="${user.userid}"/>">Update</a></td>
                        <td><a href="UserController?action=delete&userId=<c:out value="${user.userid}"/>">Delete</a></td>
                    </tr>
                </c:forEach>
            </tbody>
        </table>
        <p><a href="UserController?action=insert">Add User</a></p>
        </body>
</html>
```

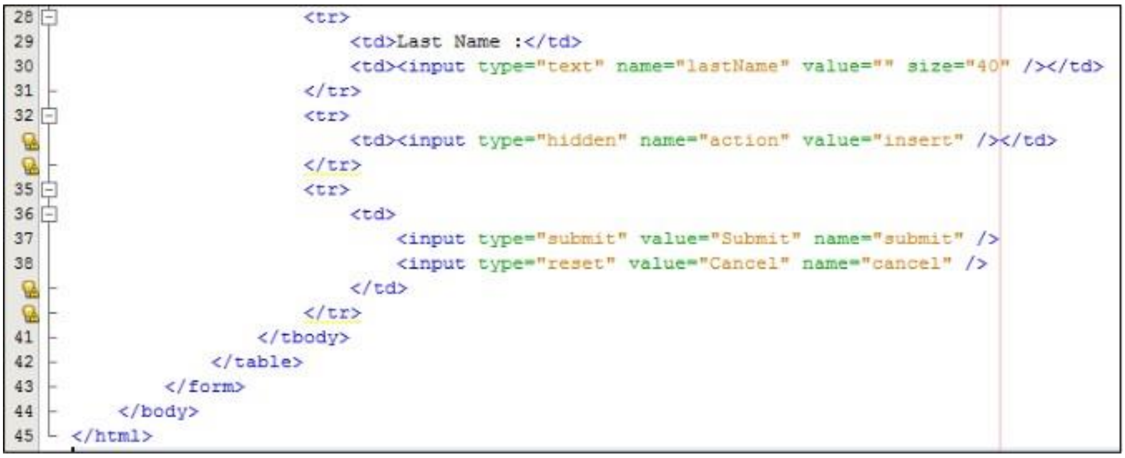
5. Compile the page

Step 6 - Create user.jsp page as a page for creating new record for user.

1. Create jsp page and key-in file name as user.jsp.
2. Create HTML markup and call UserController servlet from this page.



```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>New record</title>
    </head>
    <body>
        <br/>
        <p><b>New Record</b></p>
        <form name="frmAddUser" action="UserController" method="POST">
            <table border="0">
                <tbody>
                    <tr>
                        <td>User ID :</td>
                        <td><input type="text" name="userid" value="" size="25" required /></td>
                    </tr>
                    <tr>
                        <td>First Name :</td>
                        <td><input type="text" name="firstName" value="" size="40" /></td>
                    </tr>
```

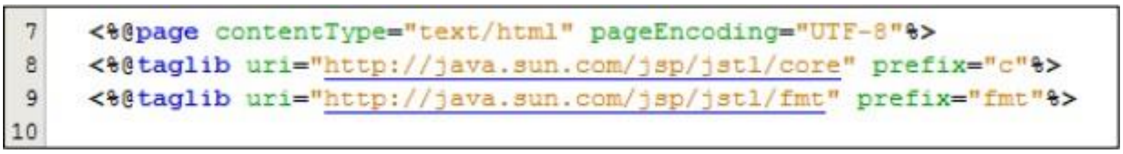


```
                    <tr>
                        <td>Last Name :</td>
                        <td><input type="text" name="lastName" value="" size="40" /></td>
                    </tr>
                    <tr>
                        <td><input type="hidden" name="action" value="insert" /></td>
                    </tr>
                    <tr>
                        <td>
                            <input type="submit" value="Submit" name="submit" />
                            <input type="reset" value="Cancel" name="cancel" />
                        </td>
                    </tr>
                </tbody>
            </table>
        </form>
    </body>
</html>
```

3. Compile the file.

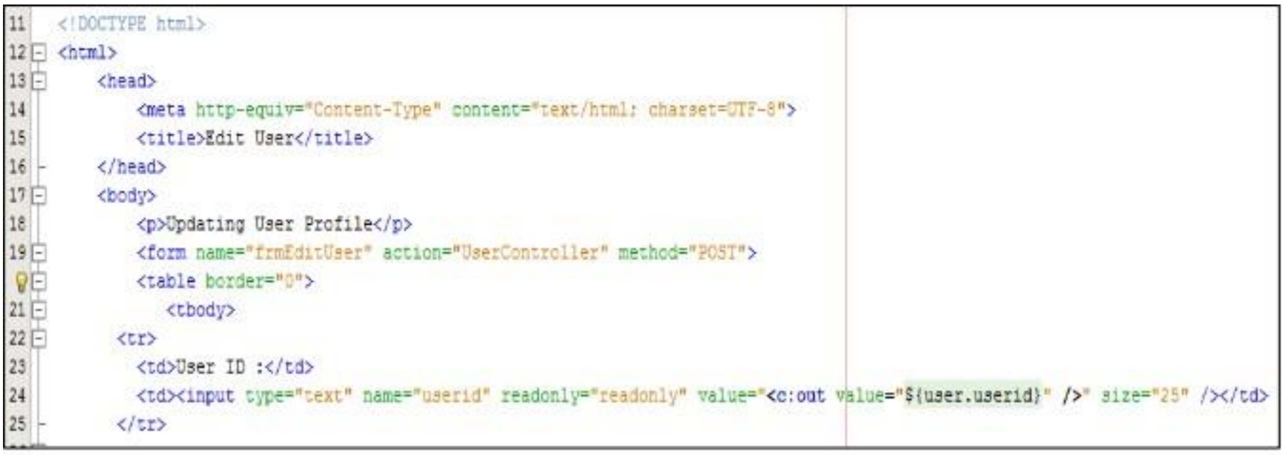
Step 7 - Create editUser.jsp page as a page for updating existing record for specific user.

1. Create jsp page and key-in file name as editUser.jsp.
2. Add the taglib directive to editUser.jsp.

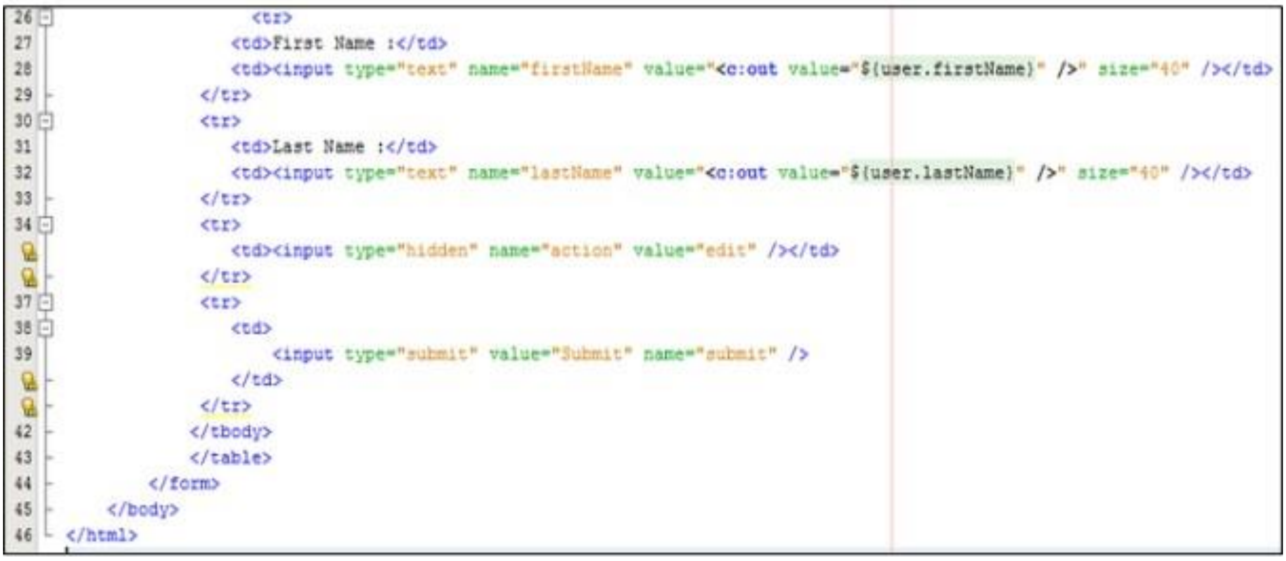


```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<%@taglib uri="http://java.sun.com/jsp/jstl/fmt" prefix="fmt"%>
```

3. Write and HTML markup and JSTL syntax to display the records.



```
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Edit User</title>
    </head>
    <body>
        <p>Updating User Profile</p>
        <form name="frmEditUser" action="UserController" method="POST">
        <table border="0">
            <tbody>
      <tr>
        <td>User ID :</td>
        <td><input type="text" name="userid" readonly="readonly" value="<c:out value="${user.userid}" />" size="25" /></td>
      </tr>
```



```
                    <tr>
                  <td>First Name :</td>
                  <td><input type="text" name="firstName" value="<c:out value="${user.firstName}" />" size="40" /></td>
              </tr>
              <tr>
                  <td>Last Name :</td>
                  <td><input type="text" name="lastName" value="<c:out value="${user.lastName}" />" size="40" /></td>
              </tr>
              <tr>
                  <td><input type="hidden" name="action" value="edit" /></td>
              </tr>
              <tr>
                  <td>
                      <input type="submit" value="Submit" name="submit" />
                  </td>
              </tr>
             </tbody>
             </table>
        </form>
    </body>
</html>
```

4. Compile the file.

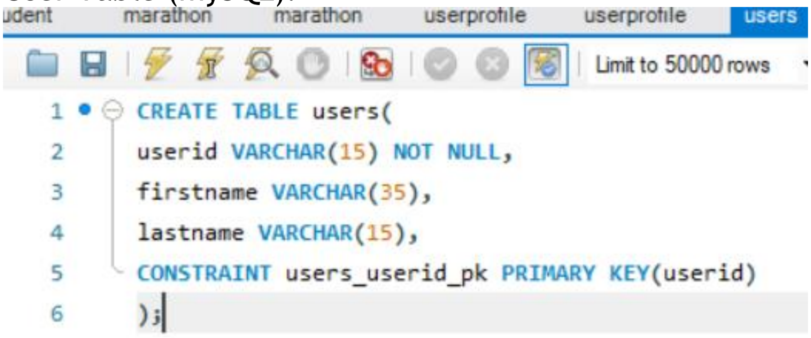
Running the program and perform CRUD process

1. Run index.jsp page.
2. Click Add User button to create new record.
3. Click hyperlink Update in order to update an existing record. 4. Click hyperlink Delete in order to delete an existing record.

Reflection:

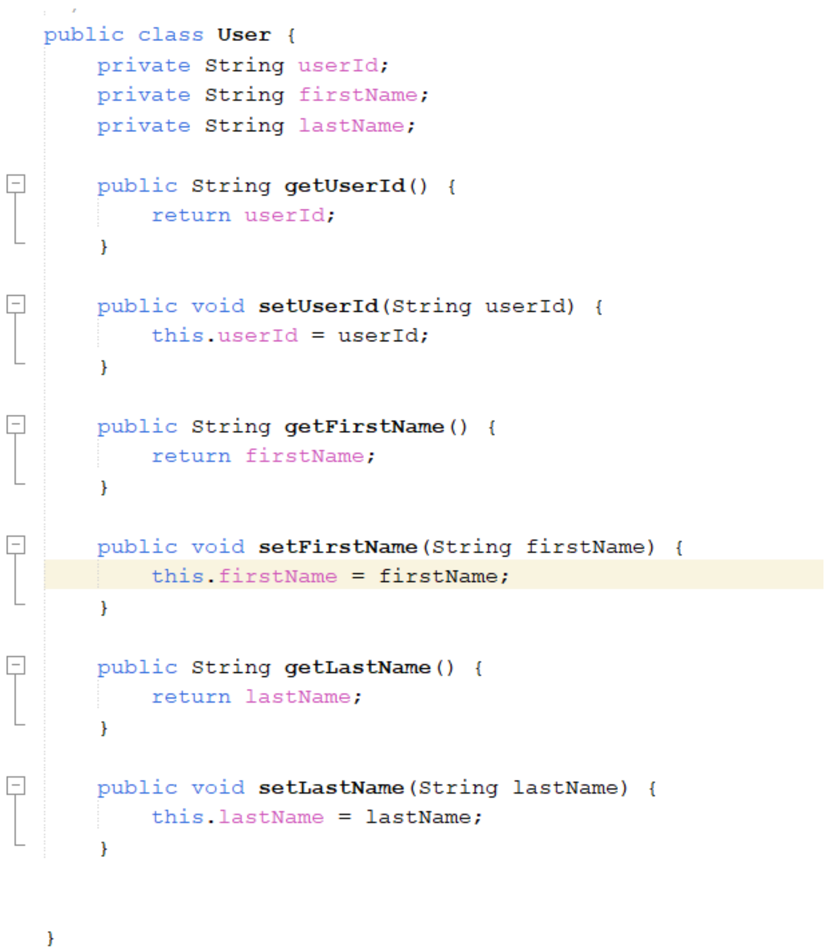
1. Why we use servlet for Java Web Application?
   -To handle the request obtained from the web server, process the request, produce the response, and send a response back to the web server

Code:
User Table (mySQL):



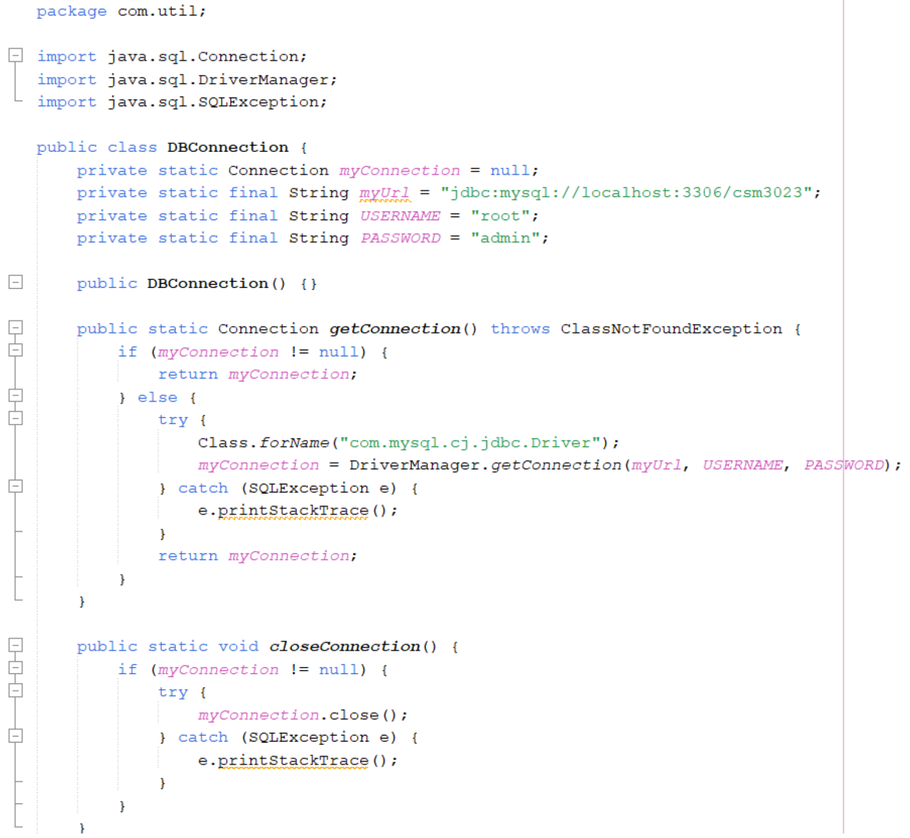
```sql
CREATE TABLE users(
userid VARCHAR(15) NOT NULL,
firstname VARCHAR(35),
lastname VARCHAR(15),
CONSTRAINT users_userid_pk PRIMARY KEY(userid)
);
```

User.java



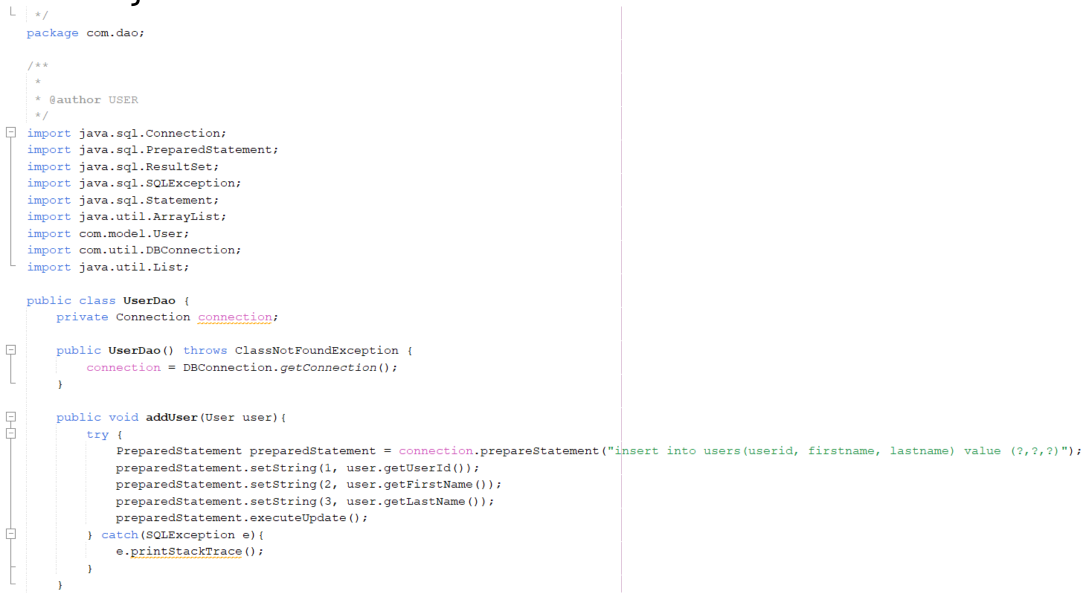
```java
public class User {
    private String userId;
    private String firstName;
    private String lastName;

    public String getUserId() {
        return userId;
    }

    public void setUserId(String userId) {
        this.userId = userId;
    }

    public String getFirstName() {
        return firstName;
    }

    public void setFirstName(String firstName) {
        this.firstName = firstName;
    }

    public String getLastName() {
        return lastName;
    }

    public void setLastName(String lastName) {
        this.lastName = lastName;
    }


}
```

DBConnection.java

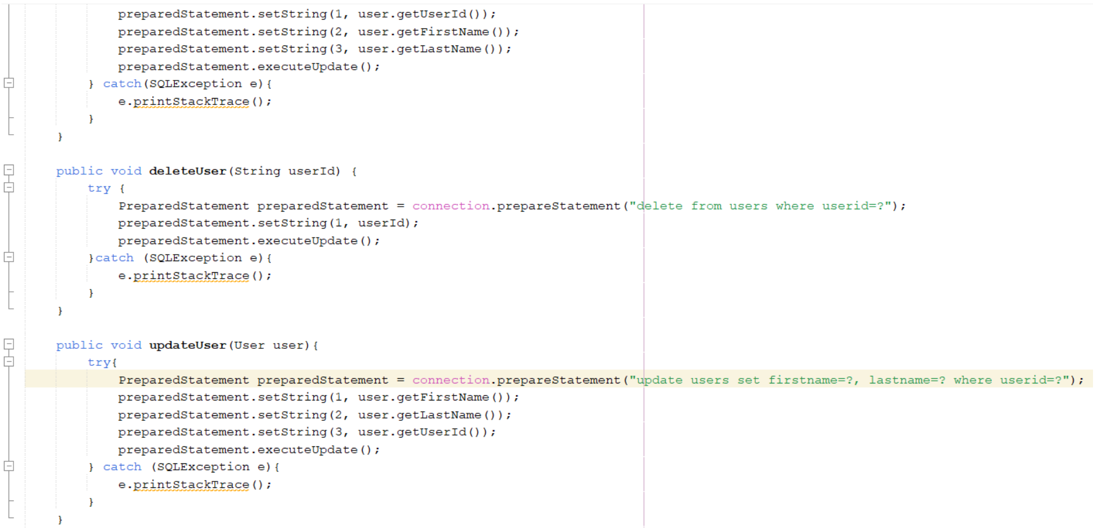


```java
package com.util;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;

public class DBConnection {
    private static Connection myConnection = null;
    private static final String myUrl = "jdbc:mysql://localhost:3306/csm3023";
    private static final String USERNAME = "root";
    private static final String PASSWORD = "admin";

    public DBConnection() {}

    public static Connection getConnection() throws ClassNotFoundException {
        if (myConnection != null) {
            return myConnection;
        } else {
            try {
                Class.forName("com.mysql.cj.jdbc.Driver");
                myConnection = DriverManager.getConnection(myUrl, USERNAME, PASSWORD);
            } catch (SQLException e) {
                e.printStackTrace();
            }
            return myConnection;
        }
    }

    public static void closeConnection() {
        if (myConnection != null) {
            try {
                myConnection.close();
            } catch (SQLException e) {
                e.printStackTrace();
            }
        }
    }
```

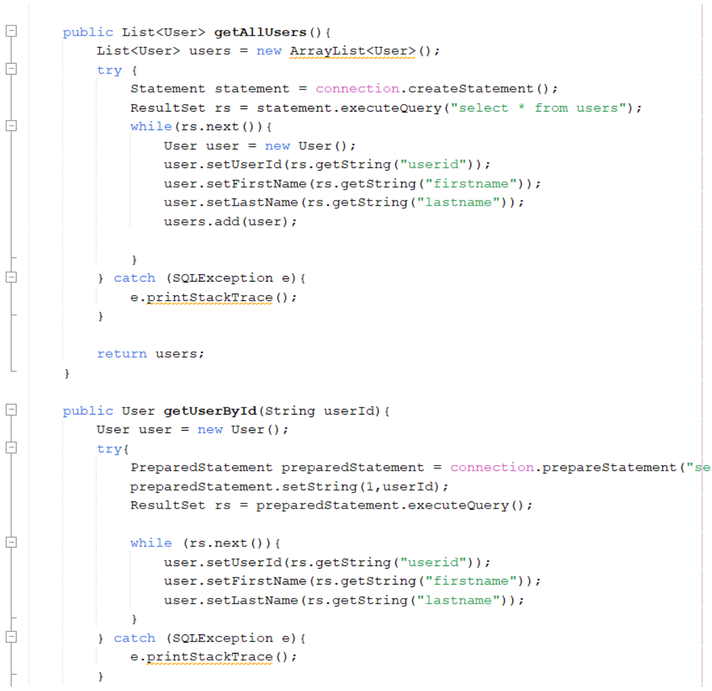
UserDao.java



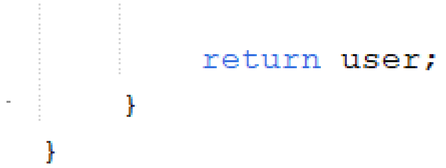
```
 */
package com.dao;

/**
 *
 * @author USER
 */
import java.sql.Connection;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.ArrayList;
import com.model.User;
import com.util.DBConnection;
import java.util.List;

public class UserDao {
    private Connection connection;

    public UserDao() throws ClassNotFoundException {
        connection = DBConnection.getConnection();
    }

    public void addUser(User user){
        try {
            PreparedStatement preparedStatement = connection.prepareStatement("insert into users(userid, firstname, lastname) value (?,?,?)");
            preparedStatement.setString(1, user.getUserId());
            preparedStatement.setString(2, user.getFirstName());
            preparedStatement.setString(3, user.getLastName());
            preparedStatement.executeUpdate();
        } catch(SQLException e){
            e.printStackTrace();
        }
    }
```



```
            preparedStatement.setString(1, user.getUserId());
            preparedStatement.setString(2, user.getFirstName());
            preparedStatement.setString(3, user.getLastName());
            preparedStatement.executeUpdate();
        } catch(SQLException e){
            e.printStackTrace();
        }
    }

    public void deleteUser(String userId) {
        try {
            PreparedStatement preparedStatement = connection.prepareStatement("delete from users where userid=?");
            preparedStatement.setString(1, userId);
            preparedStatement.executeUpdate();
        }catch (SQLException e){
            e.printStackTrace();
        }
    }

    public void updateUser(User user){
        try{
            PreparedStatement preparedStatement = connection.prepareStatement("update users set firstname=?, lastname=? where userid=?");
            preparedStatement.setString(1, user.getFirstName());
            preparedStatement.setString(2, user.getLastName());
            preparedStatement.setString(3, user.getUserId());
            preparedStatement.executeUpdate();
        } catch (SQLException e){
            e.printStackTrace();
        }
    }
```

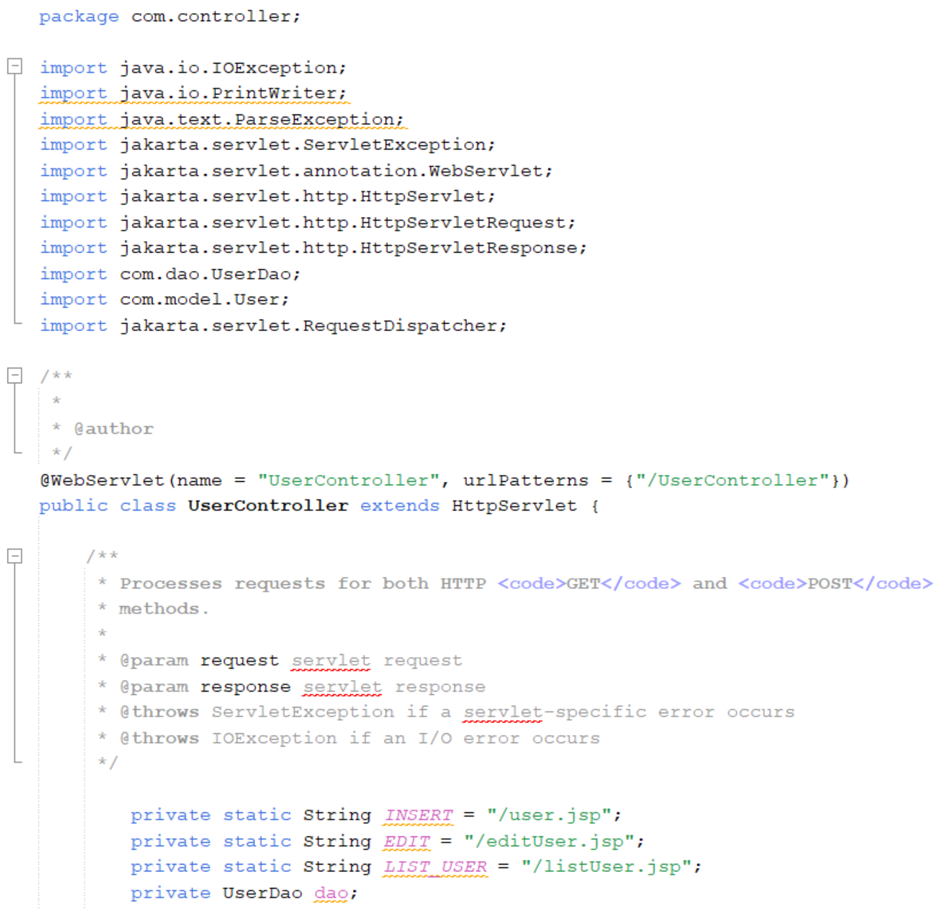


```
    public List<User> getAllUsers(){
        List<User> users = new ArrayList<User>();
        try {
            Statement statement = connection.createStatement();
            ResultSet rs = statement.executeQuery("select * from users");
            while(rs.next()){
                User user = new User();
                user.setUserId(rs.getString("userid"));
                user.setFirstName(rs.getString("firstname"));
                user.setLastName(rs.getString("lastname"));
                users.add(user);

            }
        } catch (SQLException e){
            e.printStackTrace();
        }

        return users;
    }

    public User getUserById(String userId){
        User user = new User();
        try{
            PreparedStatement preparedStatement = connection.prepareStatement("select * from users where userid=?");
            preparedStatement.setString(1,userId);
            ResultSet rs = preparedStatement.executeQuery();

            while (rs.next()){
                user.setUserId(rs.getString("userid"));
                user.setFirstName(rs.getString("firstname"));
                user.setLastName(rs.getString("lastname"));
            }
        } catch (SQLException e){
            e.printStackTrace();
        }
```

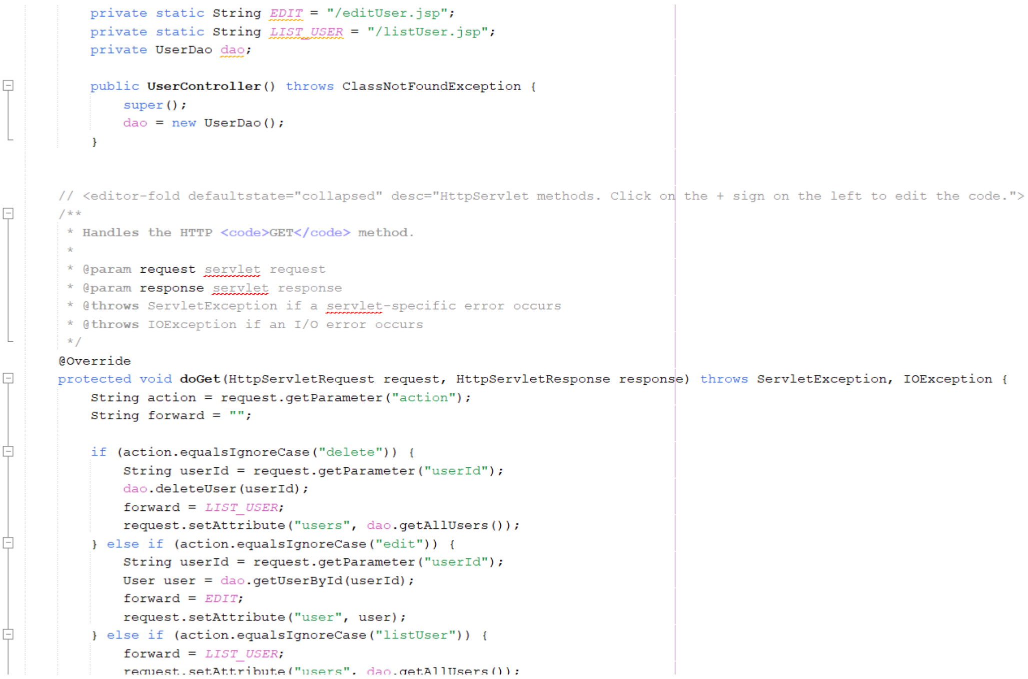


```
            return user;
        }
}
```

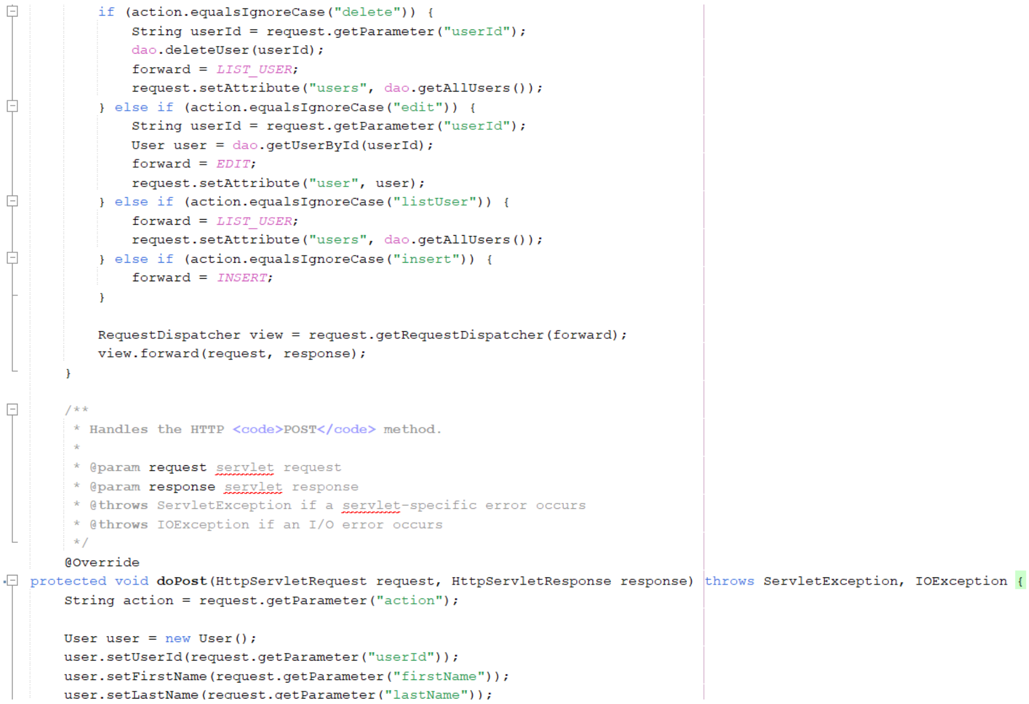
UserController.java



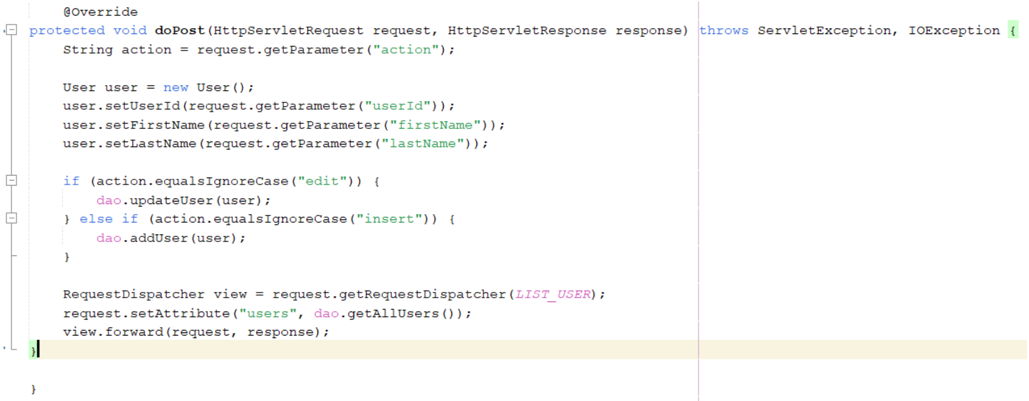
```
package com.controller;

import java.io.IOException;
import java.io.PrintWriter;
import java.text.ParseException;
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 com.dao.UserDao;
import com.model.User;
import jakarta.servlet.RequestDispatcher;

/**
 *
 * @author
 */
@WebServlet(name = "UserController", urlPatterns = {"/UserController"})
public class UserController 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 static String INSERT = "/user.jsp";
        private static String EDIT = "/editUser.jsp";
        private static String LIST_USER = "/listUser.jsp";
        private UserDao dao;
```



```
        private static String EDIT = "/editUser.jsp";
        private static String LIST_USER = "/listUser.jsp";
        private UserDao dao;

        public UserController() throws ClassNotFoundException {
            super();
            dao = new UserDao();
        }


    // <editor-fold defaultstate="collapsed" desc="HttpServlet methods. Click on the + sign on the left to edit the code.">
    /**
     * Handles the HTTP <code>GET</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 doGet(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException {
        String action = request.getParameter("action");
        String forward = "";

        if (action.equalsIgnoreCase("delete")) {
            String userId = request.getParameter("userId");
            dao.deleteUser(userId);
            forward = LIST_USER;
            request.setAttribute("users", dao.getAllUsers());
        } else if (action.equalsIgnoreCase("edit")) {
            String userId = request.getParameter("userId");
            User user = dao.getUserById(userId);
            forward = EDIT;
            request.setAttribute("user", user);
        } else if (action.equalsIgnoreCase("listUser")) {
            forward = LIST_USER;
            request.setAttribute("users", dao.getAllUsers());
```

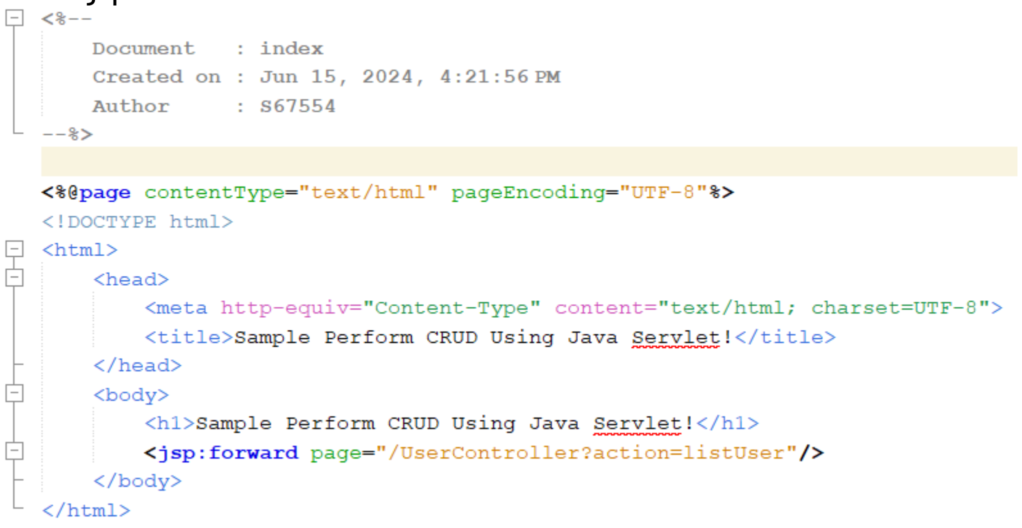


```
        if (action.equalsIgnoreCase("delete")) {
            String userId = request.getParameter("userId");
            dao.deleteUser(userId);
            forward = LIST_USER;
            request.setAttribute("users", dao.getAllUsers());
        } else if (action.equalsIgnoreCase("edit")) {
            String userId = request.getParameter("userId");
            User user = dao.getUserById(userId);
            forward = EDIT;
            request.setAttribute("user", user);
        } else if (action.equalsIgnoreCase("listUser")) {
            forward = LIST_USER;
            request.setAttribute("users", dao.getAllUsers());
        } else if (action.equalsIgnoreCase("insert")) {
            forward = INSERT;
        }

        RequestDispatcher view = request.getRequestDispatcher(forward);
        view.forward(request, response);
    }

    /**
     * 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 {
    String action = request.getParameter("action");

    User user = new User();
    user.setUserId(request.getParameter("userId"));
    user.setFirstName(request.getParameter("firstName"));
    user.setLastName(request.getParameter("lastName"));
```



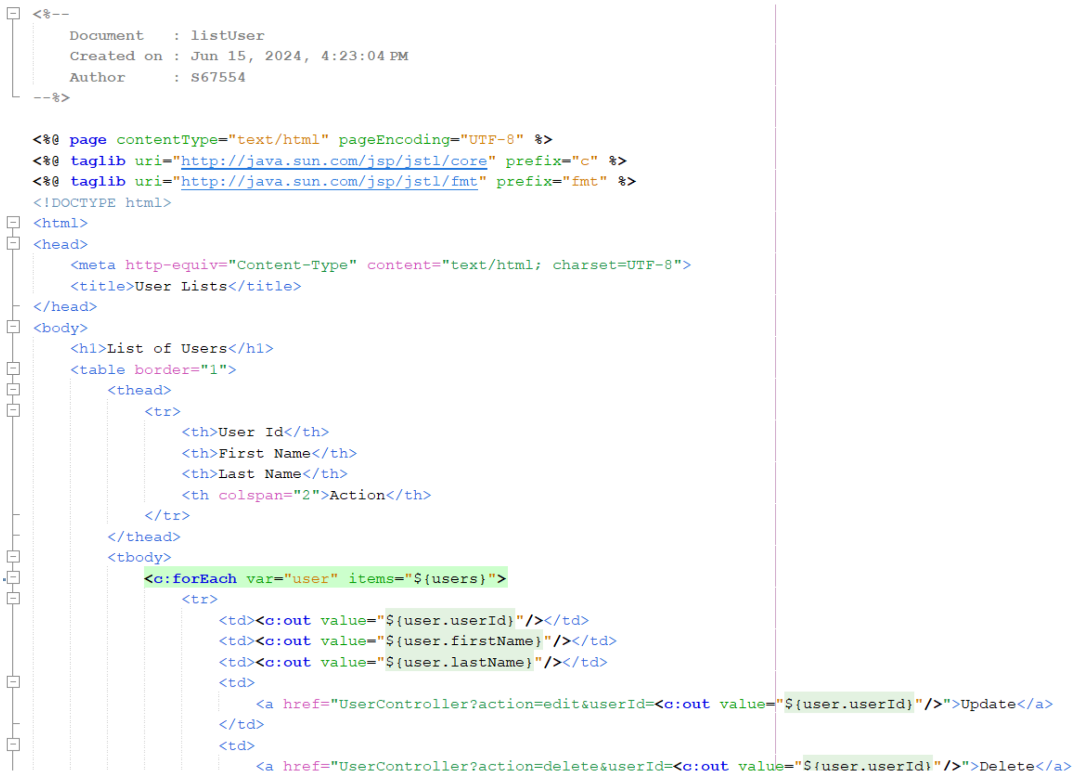
```
    @Override
protected void doPost(HttpServletRequest request, HttpServletResponse response) throws ServletException, IOException {
    String action = request.getParameter("action");

    User user = new User();
    user.setUserId(request.getParameter("userId"));
    user.setFirstName(request.getParameter("firstName"));
    user.setLastName(request.getParameter("lastName"));

    if (action.equalsIgnoreCase("edit")) {
        dao.updateUser(user);
    } else if (action.equalsIgnoreCase("insert")) {
        dao.addUser(user);
    }

    RequestDispatcher view = request.getRequestDispatcher(LIST_USER);
    request.setAttribute("users", dao.getAllUsers());
    view.forward(request, response);
}

}
```

Index.jsp

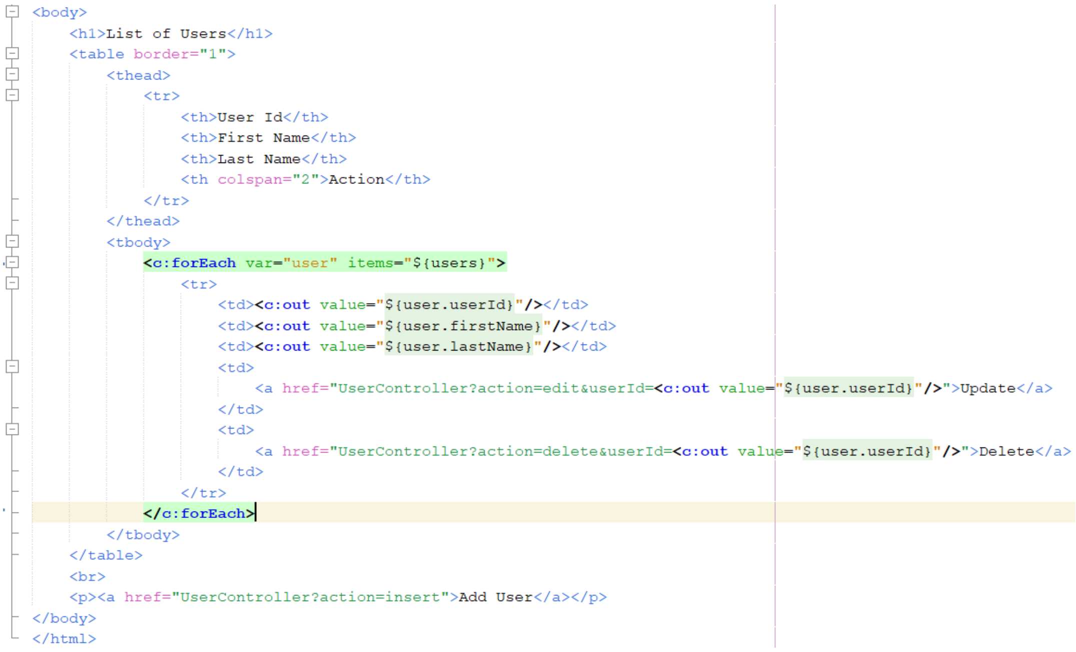


```
<%--
    Document   : index
    Created on : Jun 15, 2024, 4:21:56 PM
    Author     : S67554
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Sample Perform CRUD Using Java Servlet!</title>
    </head>
    <body>
        <h1>Sample Perform CRUD Using Java Servlet!</h1>
        <jsp:forward page="/UserController?action=listUser"/>
    </body>
</html>
```

listUser.jsp

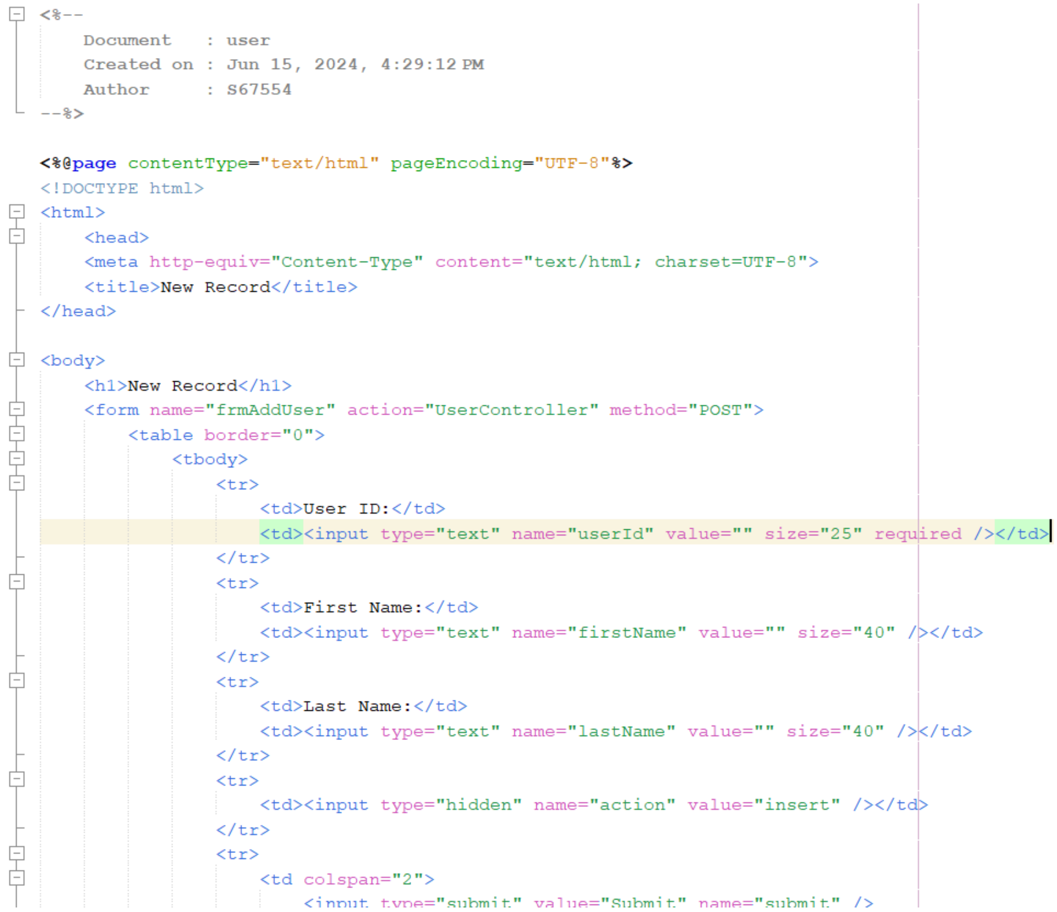


```
<%--
    Document   : listUser
    Created on : Jun 15, 2024, 4:23:04 PM
    Author     : S67554
--%>

<%@ page contentType="text/html" pageEncoding="UTF-8" %>
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jsp/jstl/fmt" prefix="fmt" %>
<!DOCTYPE html>
<html>
<head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
    <title>User Lists</title>
</head>
<body>
    <h1>List of Users</h1>
    <table border="1">
        <thead>
            <tr>
                <th>User Id</th>
                <th>First Name</th>
                <th>Last Name</th>
                <th colspan="2">Action</th>
            </tr>
        </thead>
        <tbody>
            <c:forEach var="user" items="${users}">
                <tr>
                    <td><c:out value="${user.userId}"/></td>
                    <td><c:out value="${user.firstName}"/></td>
                    <td><c:out value="${user.lastName}"/></td>
                    <td>
                        <a href="UserController?action=edit&userId=<c:out value="${user.userId}"/>">Update</a>
                    </td>
                    <td>
                        <a href="UserController?action=delete&userId=<c:out value="${user.userId}"/>">Delete</a>
```

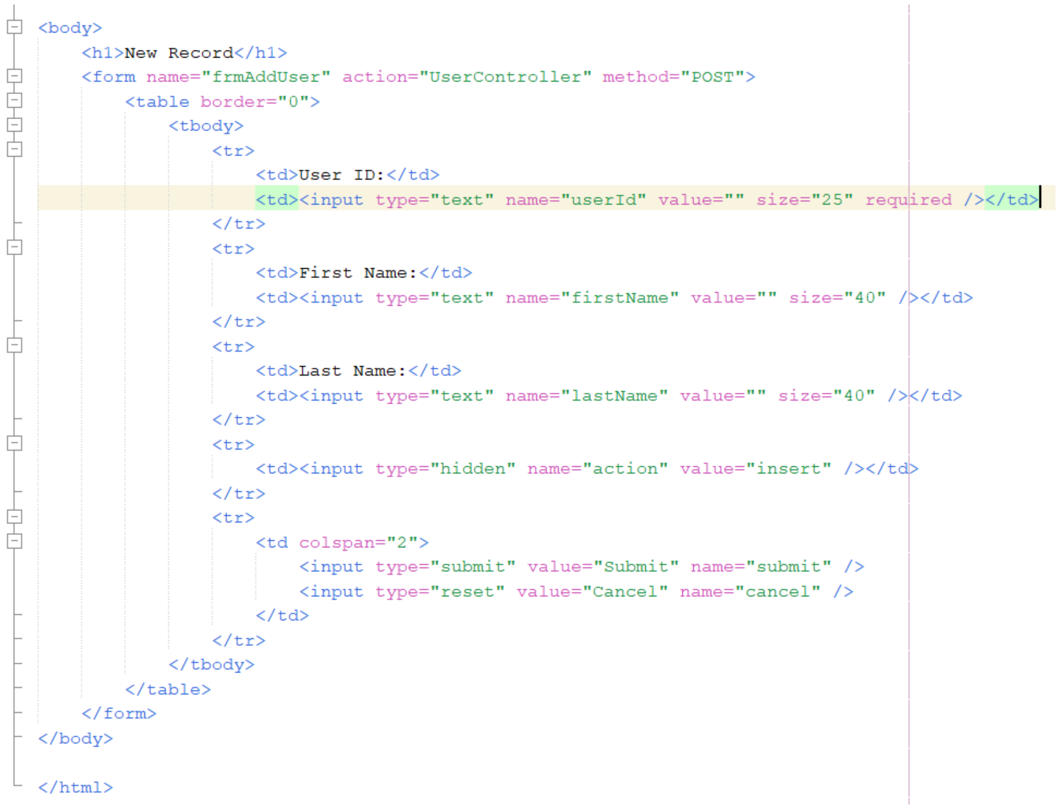


```
<body>
    <h1>List of Users</h1>
    <table border="1">
        <thead>
            <tr>
                <th>User Id</th>
                <th>First Name</th>
                <th>Last Name</th>
                <th colspan="2">Action</th>
            </tr>
        </thead>
        <tbody>
            <c:forEach var="user" items="${users}">
                <tr>
                    <td><c:out value="${user.userId}"/></td>
                    <td><c:out value="${user.firstName}"/></td>
                    <td><c:out value="${user.lastName}"/></td>
                    <td>
                        <a href="UserController?action=edit&userId=<c:out value="${user.userId}"/>">Update</a>
                    </td>
                    <td>
                        <a href="UserController?action=delete&userId=<c:out value="${user.userId}"/>">Delete</a>
                    </td>
                </tr>
            </c:forEach>
        </tbody>
    </table>
    <br>
    <p><a href="UserController?action=insert">Add User</a></p>
</body>
</html>
```

User.jsp

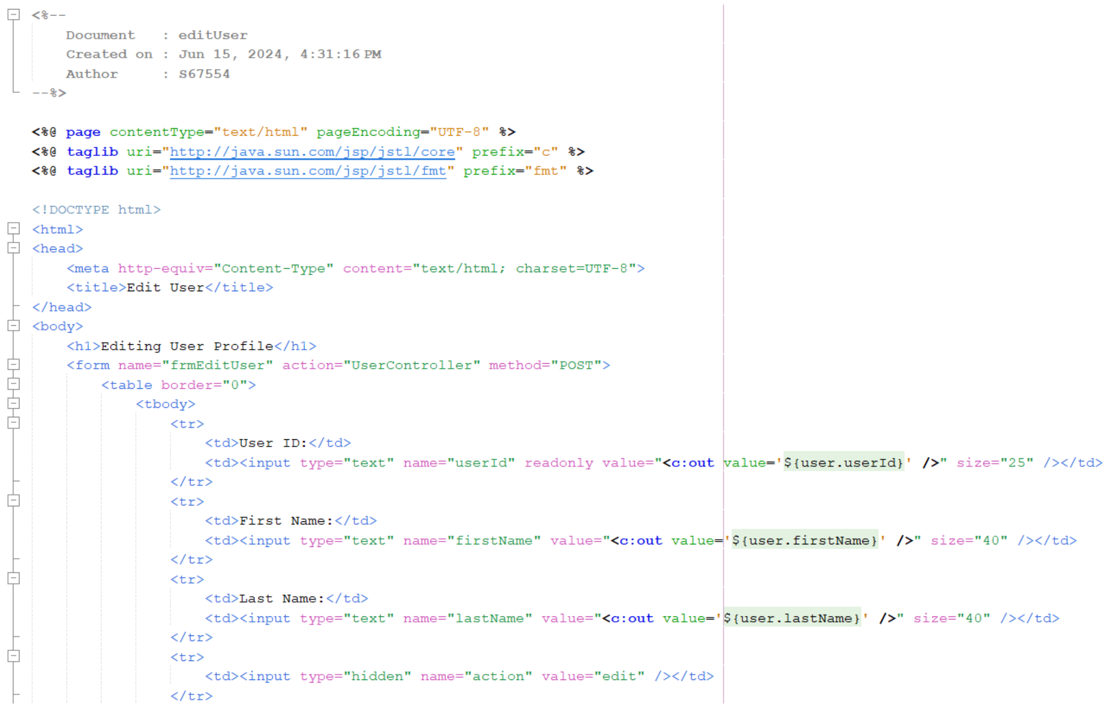


```
<%--
    Document   : user
    Created on : Jun 15, 2024, 4:29:12 PM
    Author     : S67554
--%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
    <title>New Record</title>
</head>

<body>
    <h1>New Record</h1>
    <form name="frmAddUser" action="UserController" method="POST">
        <table border="0">
            <tbody>
                <tr>
                    <td>User ID:</td>
                    <td><input type="text" name="userId" value="" size="25" required /></td>
                </tr>
                <tr>
                    <td>First Name:</td>
                    <td><input type="text" name="firstName" value="" size="40" /></td>
                </tr>
                <tr>
                    <td>Last Name:</td>
                    <td><input type="text" name="lastName" value="" size="40" /></td>
                </tr>
                <tr>
                    <td><input type="hidden" name="action" value="insert" /></td>
                </tr>
                <tr>
                    <td colspan="2">
                        <input type="submit" value="Submit" name="submit" />
```

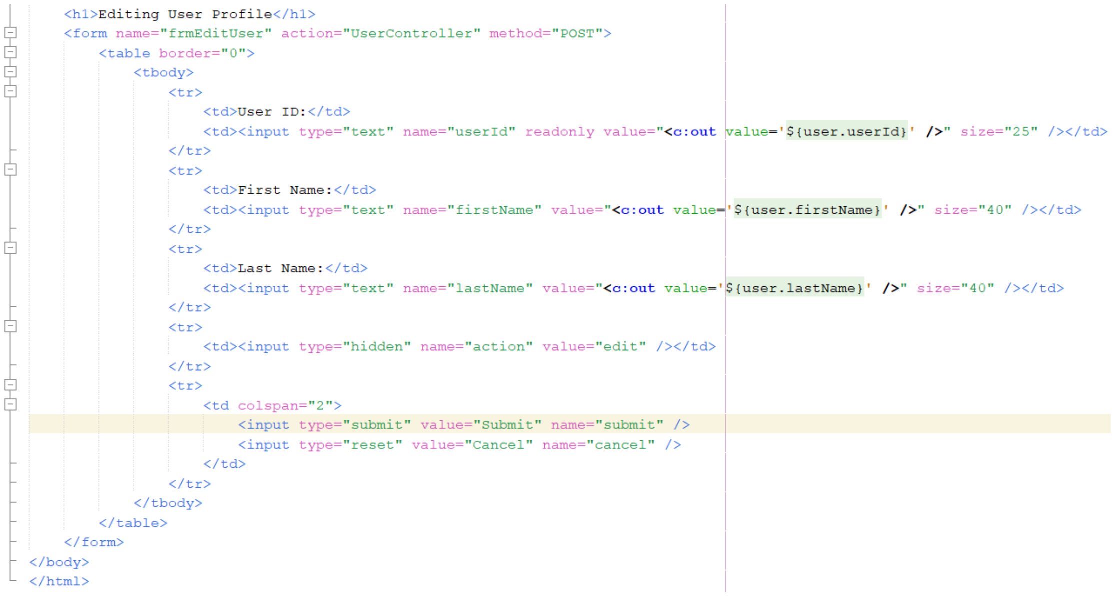


```
<body>
    <h1>New Record</h1>
    <form name="frmAddUser" action="UserController" method="POST">
        <table border="0">
            <tbody>
                <tr>
                    <td>User ID:</td>
                    <td><input type="text" name="userId" value="" size="25" required /></td>
                </tr>
                <tr>
                    <td>First Name:</td>
                    <td><input type="text" name="firstName" value="" size="40" /></td>
                </tr>
                <tr>
                    <td>Last Name:</td>
                    <td><input type="text" name="lastName" value="" size="40" /></td>
                </tr>
                <tr>
                    <td><input type="hidden" name="action" value="insert" /></td>
                </tr>
                <tr>
                    <td colspan="2">
                        <input type="submit" value="Submit" name="submit" />
                        <input type="reset" value="Cancel" name="cancel" />
                    </td>
                </tr>
            </tbody>
        </table>
    </form>
</body>

</html>
```

editUser.jsp

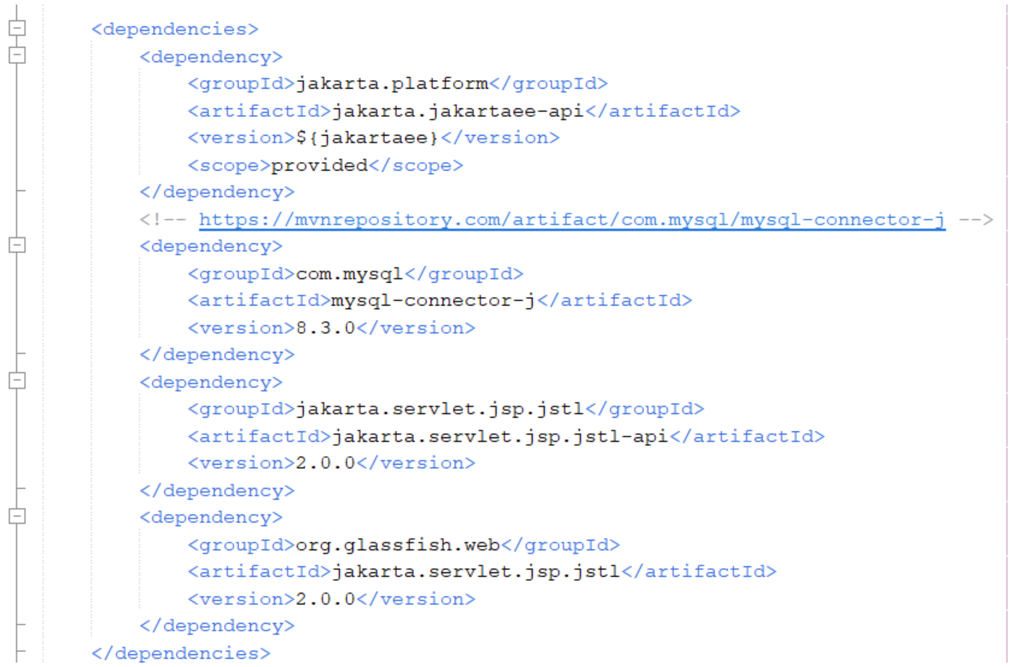


```
<%--
    Document   : editUser
    Created on : Jun 15, 2024, 4:31:16 PM
    Author     : S67554
--%>

<%@ page contentType="text/html" pageEncoding="UTF-8" %>
<%@ taglib uri="http://java.sun.com/jsp/jstl/core" prefix="c" %>
<%@ taglib uri="http://java.sun.com/jsp/jstl/fmt" prefix="fmt" %>

<!DOCTYPE html>
<html>
<head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
    <title>Edit User</title>
</head>
<body>
    <h1>Editing User Profile</h1>
    <form name="frmEditUser" action="UserController" method="POST">
        <table border="0">
            <tbody>
                <tr>
                    <td>User ID:</td>
                    <td><input type="text" name="userId" readonly value="<c:out value='${user.userId}' />" size="25" /></td>
                </tr>
                <tr>
                    <td>First Name:</td>
                    <td><input type="text" name="firstName" value="<c:out value='${user.firstName}' />" size="40" /></td>
                </tr>
                <tr>
                    <td>Last Name:</td>
                    <td><input type="text" name="lastName" value="<c:out value='${user.lastName}' />" size="40" /></td>
                </tr>
                <tr>
                    <td><input type="hidden" name="action" value="edit" /></td>
                </tr>
```



```
    <h1>Editing User Profile</h1>
    <form name="frmEditUser" action="UserController" method="POST">
        <table border="0">
            <tbody>
                <tr>
                    <td>User ID:</td>
                    <td><input type="text" name="userId" readonly value="<c:out value='${user.userId}' />" size="25" /></td>
                </tr>
                <tr>
                    <td>First Name:</td>
                    <td><input type="text" name="firstName" value="<c:out value='${user.firstName}' />" size="40" /></td>
                </tr>
                <tr>
                    <td>Last Name:</td>
                    <td><input type="text" name="lastName" value="<c:out value='${user.lastName}' />" size="40" /></td>
                </tr>
                <tr>
                    <td><input type="hidden" name="action" value="edit" /></td>
                </tr>
                <tr>
                    <td colspan="2">
                        <input type="submit" value="Submit" name="submit" />
                        <input type="reset" value="Cancel" name="cancel" />
                    </td>
                </tr>
            </tbody>
        </table>
    </form>
</body>
</html>
```

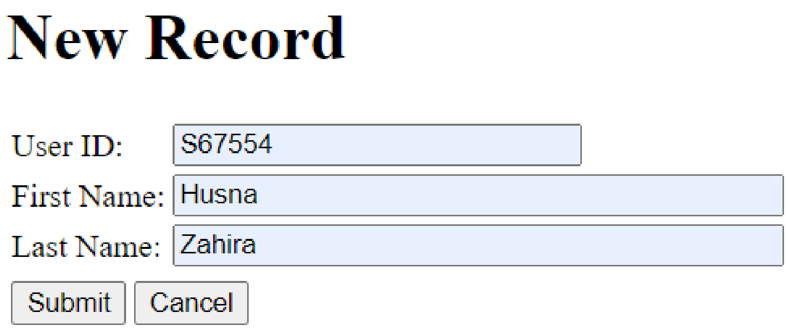
Pom.xml



```xml
<dependencies>
    <dependency>
        <groupId>jakarta.platform</groupId>
        <artifactId>jakarta.jakartaee-api</artifactId>
        <version>${jakartaee}</version>
        <scope>provided</scope>
    </dependency>
    <!-- https://mvnrepository.com/artifact/com.mysql/mysql-connector-j -->
    <dependency>
        <groupId>com.mysql</groupId>
        <artifactId>mysql-connector-j</artifactId>
        <version>8.3.0</version>
    </dependency>
    <dependency>
        <groupId>jakarta.servlet.jsp.jstl</groupId>
        <artifactId>jakarta.servlet.jsp.jstl-api</artifactId>
        <version>2.0.0</version>
    </dependency>
    <dependency>
        <groupId>org.glassfish.web</groupId>
        <artifactId>jakarta.servlet.jsp.jstl</artifactId>
        <version>2.0.0</version>
    </dependency>
</dependencies>
```

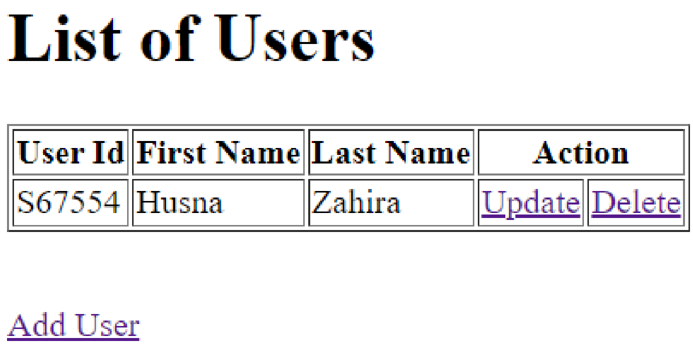
Output:

Add new record:



New Record

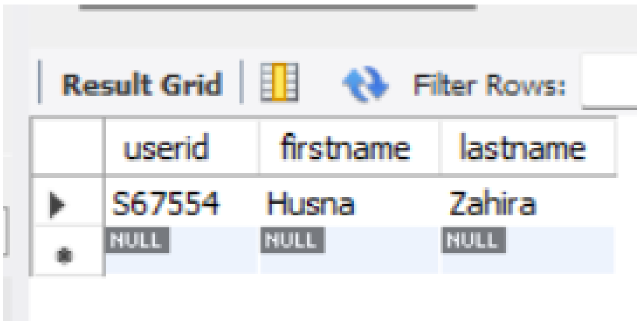
User ID:	S67554
First Name:	Husna
Last Name:	Zahira



List of Users

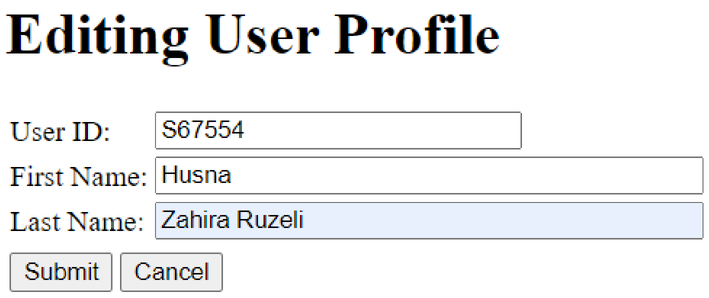
User Id	First Name	Last Name	Action	
S67554	Husna	Zahira	Update	Delete

Add User



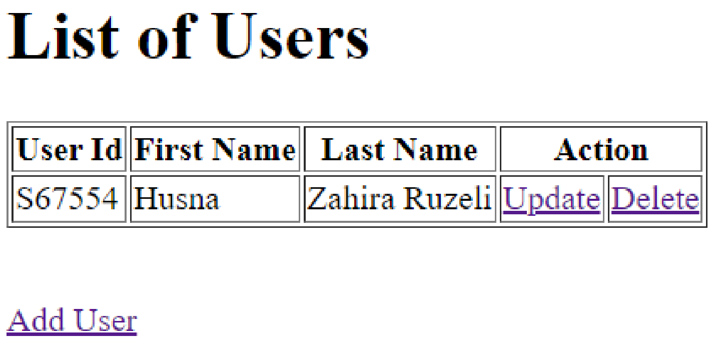
	userid	firstname	lastname
▶	S67554	Husna	Zahira
✱	NULL	NULL	NULL

Update user record:



Editing User Profile

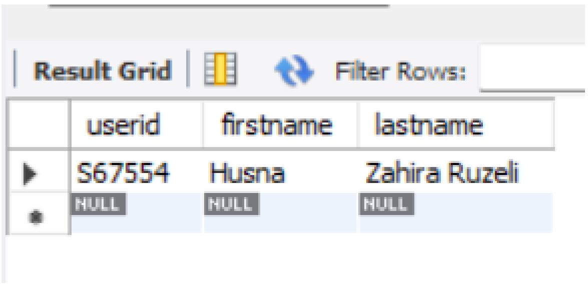
User ID:	S67554
First Name:	Husna
Last Name:	Zahira Ruzeli



List of Users

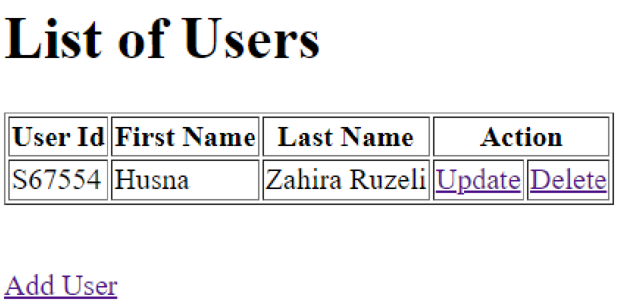
User Id	First Name	Last Name	Action	
S67554	Husna	Zahira Ruzeli	Update	Delete

Add User



	userid	firstname	lastname
▶	S67554	Husna	Zahira Ruzeli
✱	NULL	NULL	NULL

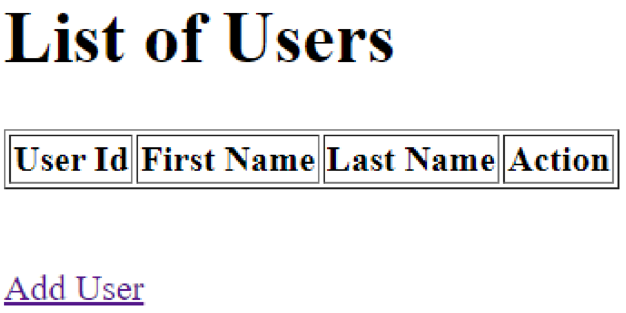
Delete user record:



List of Users

User Id	First Name	Last Name	Action	
S67554	Husna	Zahira Ruzeli	Update	Delete

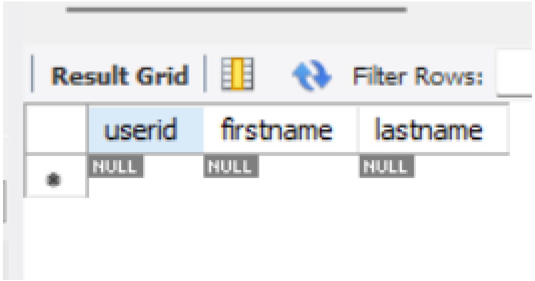
Add User



List of Users

User Id	First Name	Last Name	Action

Add User



	userid	firstname	lastname
*	NULL	NULL	NULL

Exercise

Q1) Implement profile registration using servlet

1. Create a table known as *userprofile* using database schema *CF3107* using these attributes.

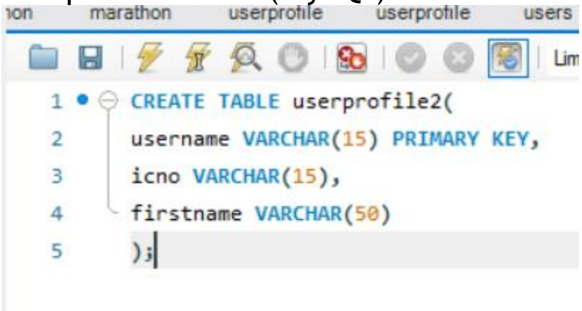
- username as a character length 15 and must be primary key
- icno as a character length 15
- firstname as varchar(50)

2. Create an entry form.
3. Create a servlet known as profileServlet.
4. Use profileServlet to ackhowledge user about the profile registration.

Q2) Applying session in student registration.

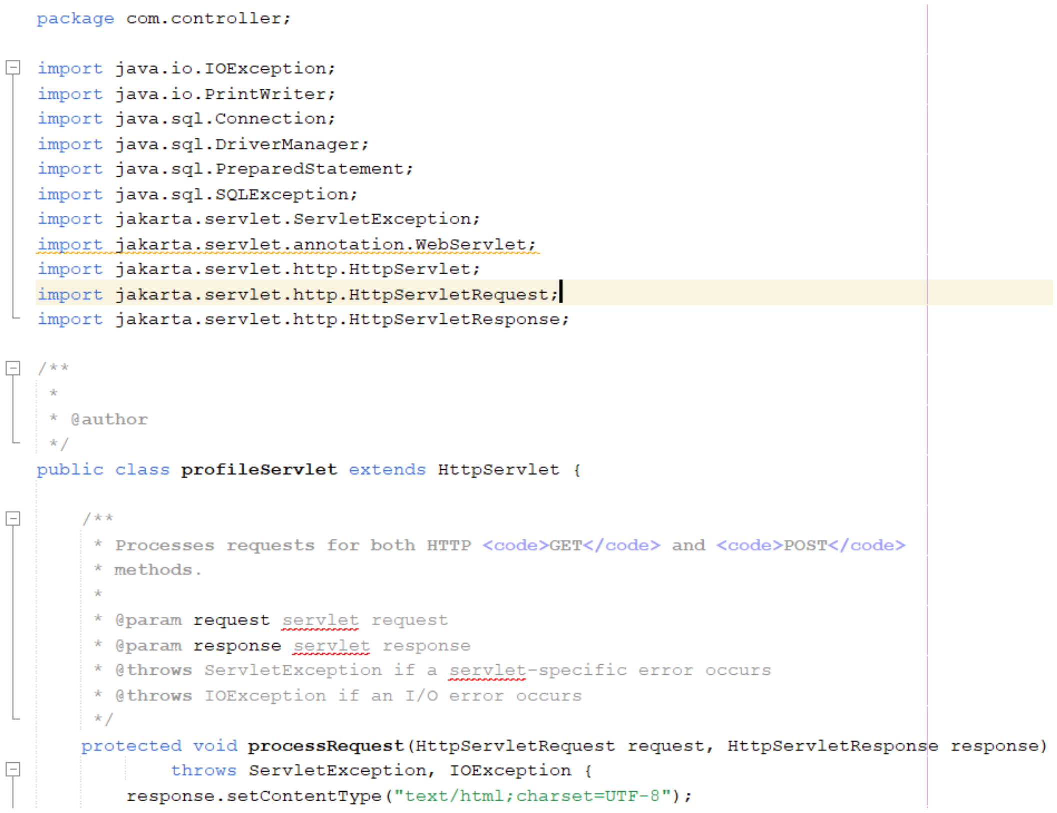
1. Create main interface for student registration; studentid, name. (*studentRegister.jsp)*
2. When student click Submit button, it will redirect to confirmation page (*confirmRegister.jsp*)
3. When user click Proceed button, current page will forward notification to end user via Notification page (*notificationRegister.jsp*)

Code:
Userprofile2 Table(mySQL):

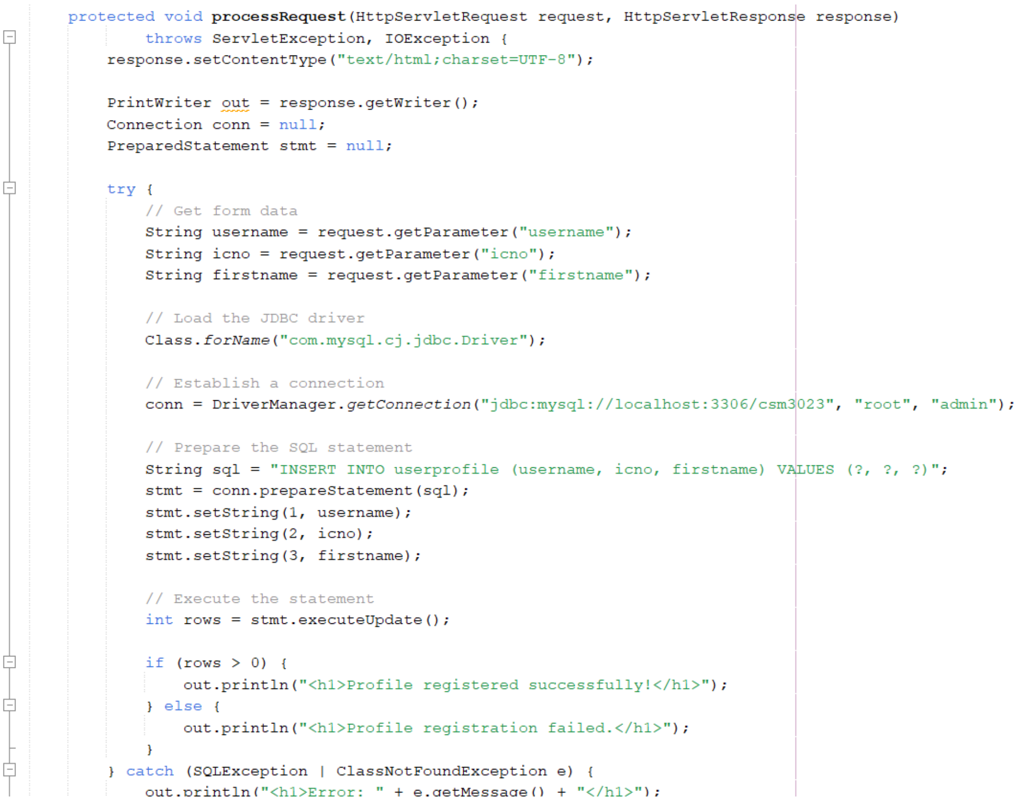


```
CREATE TABLE userprofile2(
username VARCHAR(15) PRIMARY KEY,
icno VARCHAR(15),
firstname VARCHAR(50)
);
```

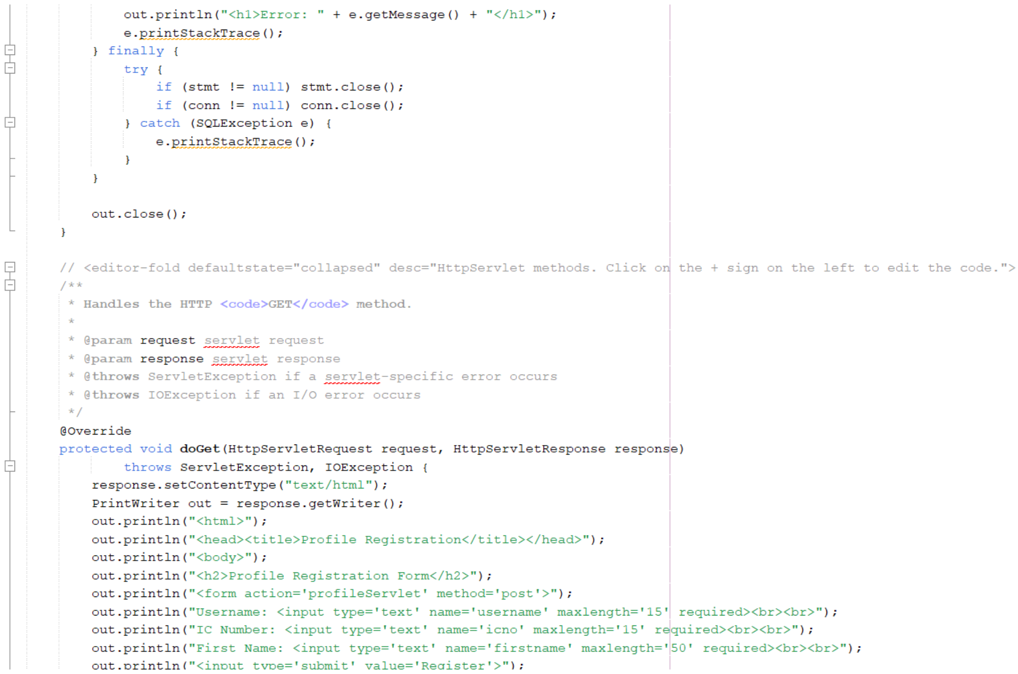
profileServlet.java



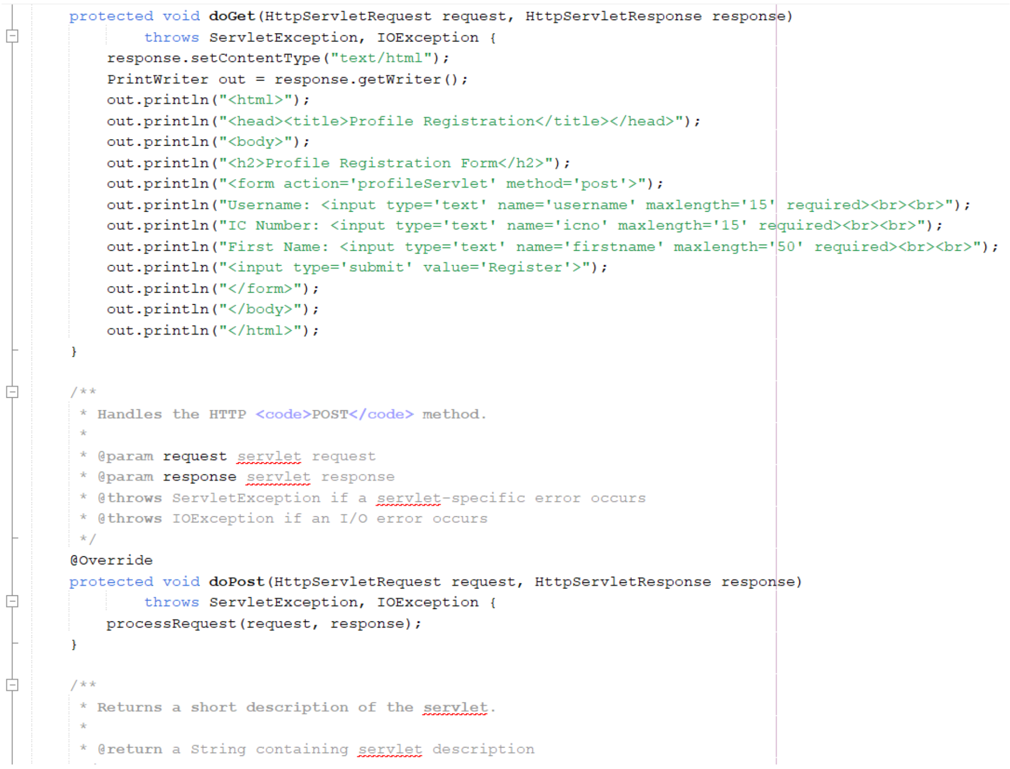
```
package com.controller;

import java.io.IOException;
import java.io.PrintWriter;
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.SQLException;
import jakarta.servlet.ServletException;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

/**
 *
 * @author
 */
public class profileServlet 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
     */
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");
```



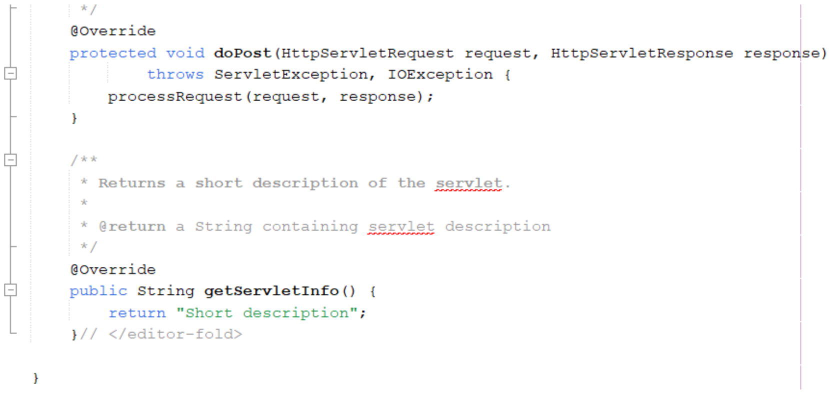
```
    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");

        PrintWriter out = response.getWriter();
        Connection conn = null;
        PreparedStatement stmt = null;

        try {
            // Get form data
            String username = request.getParameter("username");
            String icno = request.getParameter("icno");
            String firstname = request.getParameter("firstname");

            // Load the JDBC driver
            Class.forName("com.mysql.cj.jdbc.Driver");

            // Establish a connection
            conn = DriverManager.getConnection("jdbc:mysql://localhost:3306/csm3023", "root", "admin");

            // Prepare the SQL statement
            String sql = "INSERT INTO userprofile (username, icno, firstname) VALUES (?, ?, ?)";
            stmt = conn.prepareStatement(sql);
            stmt.setString(1, username);
            stmt.setString(2, icno);
            stmt.setString(3, firstname);

            // Execute the statement
            int rows = stmt.executeUpdate();

            if (rows > 0) {
                out.println("<h1>Profile registered successfully!</h1>");
            } else {
                out.println("<h1>Profile registration failed.</h1>");
            }
        } catch (SQLException | ClassNotFoundException e) {
            out.println("<h1>Error: " + e.getMessage() + "</h1>");
```



```
            out.println("<h1>Error: " + e.getMessage() + "</h1>");
            e.printStackTrace();
        } finally {
            try {
                if (stmt != null) stmt.close();
                if (conn != null) conn.close();
            } catch (SQLException e) {
                e.printStackTrace();
            }
        }

        out.close();
    }

    // <editor-fold defaultstate="collapsed" desc="HttpServlet methods. Click on the + sign on the left to edit the code.">
    /**
     * Handles the HTTP <code>GET</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 doGet(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        out.println("<html>");
        out.println("<head><title>Profile Registration</title></head>");
        out.println("<body>");
        out.println("<h2>Profile Registration Form</h2>");
        out.println("<form action='profileServlet' method='post'>");
        out.println("Username: <input type='text' name='username' maxlength='15' required><br><br>");
        out.println("IC Number: <input type='text' name='icno' maxlength='15' required><br><br>");
        out.println("First Name: <input type='text' name='firstname' maxlength='50' required><br><br>");
        out.println("<input type='submit' value='Register'>");
```

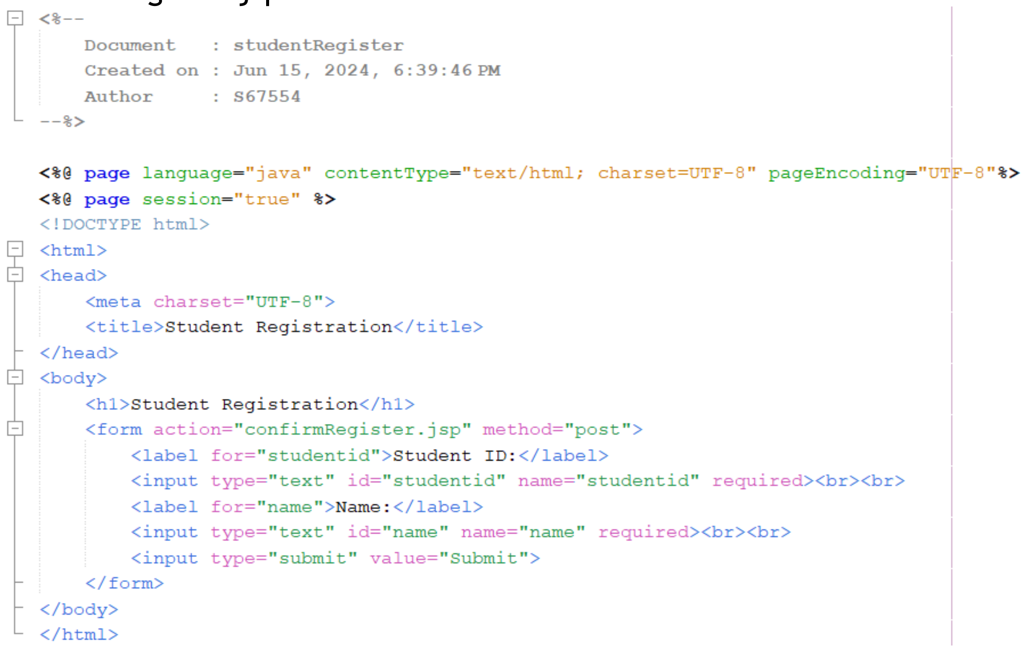


```
    protected void doGet(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        out.println("<html>");
        out.println("<head><title>Profile Registration</title></head>");
        out.println("<body>");
        out.println("<h2>Profile Registration Form</h2>");
        out.println("<form action='profileServlet' method='post'>");
        out.println("Username: <input type='text' name='username' maxlength='15' required><br><br>");
        out.println("IC Number: <input type='text' name='icno' maxlength='15' required><br><br>");
        out.println("First Name: <input type='text' name='firstname' maxlength='50' required><br><br>");
        out.println("<input type='submit' value='Register'>");
        out.println("</form>");
        out.println("</body>");
        out.println("</html>");
    }

    /**
     * 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 {
        processRequest(request, response);
    }

    /**
     * Returns a short description of the servlet.
     *
     * @return a String containing servlet description
```



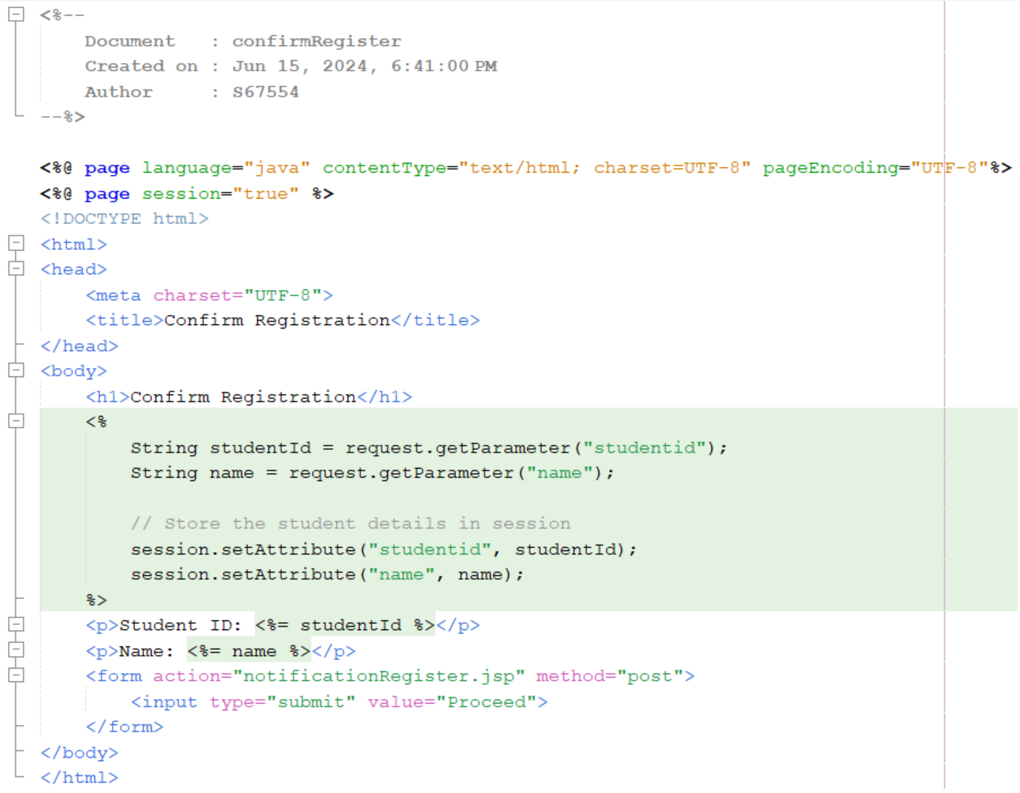
```
     */
    @Override
    protected void doPost(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        processRequest(request, response);
    }

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

}
```

studentRegister.jsp



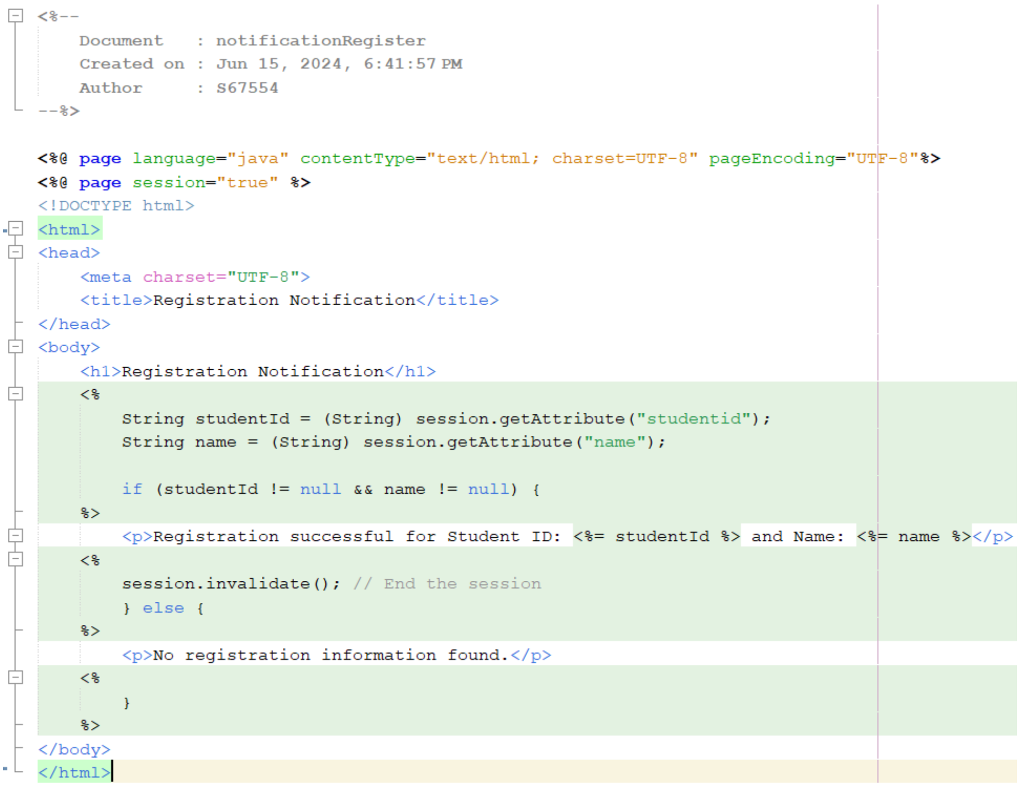
```
<%--
    Document   : studentRegister
    Created on : Jun 15, 2024, 6:39:46 PM
    Author     : S67554
--%>

<%@ page language="java" contentType="text/html; charset=UTF-8" pageEncoding="UTF-8"%>
<%@ page session="true" %>
<!DOCTYPE html>
<html>
<head>
    <meta charset="UTF-8">
    <title>Student Registration</title>
</head>
<body>
    <h1>Student Registration</h1>
    <form action="confirmRegister.jsp" method="post">
        <label for="studentid">Student ID:</label>
        <input type="text" id="studentid" name="studentid" required><br><br>
        <label for="name">Name:</label>
        <input type="text" id="name" name="name" required><br><br>
        <input type="submit" value="Submit">
    </form>
</body>
</html>
```

confirmRegister.jsp



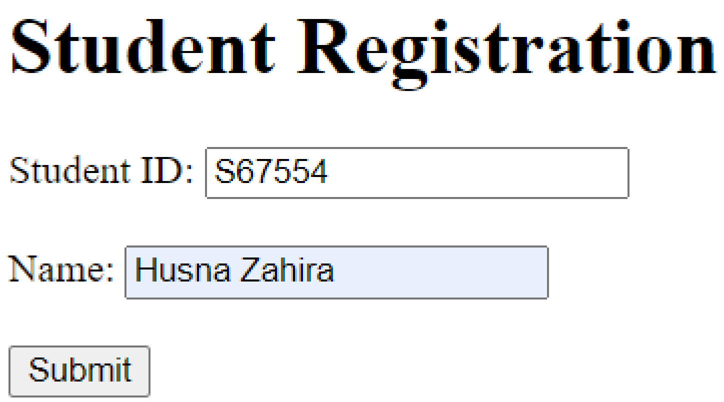
```
<%--
    Document   : confirmRegister
    Created on : Jun 15, 2024, 6:41:00 PM
    Author     : S67554
--%>

<%@ page language="java" contentType="text/html; charset=UTF-8" pageEncoding="UTF-8"%>
<%@ page session="true" %>
<!DOCTYPE html>
<html>
<head>
    <meta charset="UTF-8">
    <title>Confirm Registration</title>
</head>
<body>
    <h1>Confirm Registration</h1>
    <%
        String studentId = request.getParameter("studentid");
        String name = request.getParameter("name");

        // Store the student details in session
        session.setAttribute("studentid", studentId);
        session.setAttribute("name", name);
    %>
    <p>Student ID: <%= studentId %></p>
    <p>Name: <%= name %></p>
    <form action="notificationRegister.jsp" method="post">
        <input type="submit" value="Proceed">
    </form>
</body>
</html>
```

notificationRegister.jsp



```
<%--
    Document   : notificationRegister
    Created on : Jun 15, 2024, 6:41:57 PM
    Author     : S67554
--%>

<%@ page language="java" contentType="text/html; charset=UTF-8" pageEncoding="UTF-8"%>
<%@ page session="true" %>
<!DOCTYPE html>
<html>
<head>
    <meta charset="UTF-8">
    <title>Registration Notification</title>
</head>
<body>
    <h1>Registration Notification</h1>
    <%
        String studentId = (String) session.getAttribute("studentid");
        String name = (String) session.getAttribute("name");

        if (studentId != null && name != null) {
    %>
        <p>Registration successful for Student ID: <%= studentId %> and Name: <%= name %></p>
    <%
        session.invalidate(); // End the session
        } else {
    %>
        <p>No registration information found.</p>
    <%
        }
    %>
</body>
</html>
```

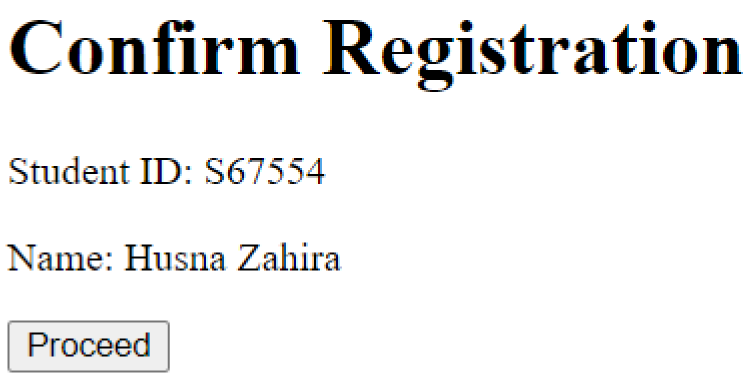
Output:



Student Registration

Student ID: S67554

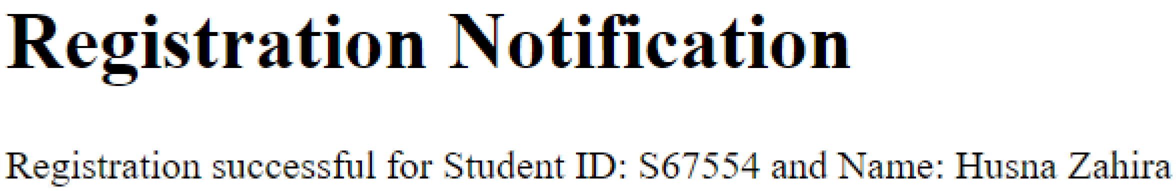
Name: Husna Zahira



Confirm Registration

Student ID: S67554

Name: Husna Zahira



Registration Notification

Registration successful for Student ID: S67554 and Name: Husna Zahira