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VALUE ADDED EXPERIMENTS

S.NO.	EXPERIMENT NAME	COURSE OUTCOME
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Experiment-01

Title: **1- Basic operations of ArrayList and HashMaps**

Problem – 1.1: Create a program to generate ArrayList to store, retrieve, and manipulate data.

Source Code:

```
import java.util.*;

public class Practical_1_1 {
    public static void main(String[] args) {
        ArrayList<String> names = new ArrayList<>();
        for(int i = 0 ; i < 10 ; i++){
            names.add("Name"+i);
        }
        System.out.println("the names are : "+names);
        names.set(3,"Updated Name 3");
        names.remove(8);
        names.add("New Name 1");
        System.err.println("The edited names are : "+names);

    }
}
```

Sample Output:

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS
PS X:\Program_files\OtherCodes\JAVA\Advance-Java-Practical-Programs>  & 'C:\Program Files\Java\jdk-17\bin\java.exe' '-XX:+ShowCodeDetail
sInExceptionMessages' '-cp' 'C:\Users\adpan\AppData\Roaming\Cursor\User\workspaceStorage\4151c95c4767e61141059cd9500f483c\redhat.java\jd
t_ws\Advance-Java-Practical-Programs_3e530e33\bin' 'Practical_1_1'
the names are : [Name0, Name1, Name2, Name3, Name4, Name5, Name6, Name7, Name8, Name9]
The edited names are : [Name0, Name1, Name2, Updated Name 3, Name4, Name5, Name6, Name7, Name9, New Name 1]
PS X:\Program_files\OtherCodes\JAVA\Advance-Java-Practical-Programs>
```

Problem – 1.2: Create a program to generate HashMap to store key-value pairs and perform operations like adding, retrieving, and checking for keys.

Source Code:

```
import java.util.*;
public class Practical_1_2 {
    public static void main(String[] args) {
        HashMap<String,Integer> nameAgeMap = new HashMap<>();
        nameAgeMap.put("John",25);
        nameAgeMap.put("Jane",30);
        nameAgeMap.put("Jim",35);
        nameAgeMap.put("Jill",40);
        System.out.println("Name and Age Map : "+nameAgeMap);

        int ageOfJohn = nameAgeMap.get("John");
        System.out.println("Age of John : "+ageOfJohn);

        boolean isJanePresent =
nameAgeMap.containsKey("Jane");
        if(isJanePresent){
            System.out.println("Jane is present in the map");
        }
        else{
            System.out.println("Jane is not present in the
map");
        }

        for(Map.Entry<String,Integer> eachName :
nameAgeMap.entrySet()){
            System.err.println("Name : "+eachName.getKey()+"
Age : "+eachName.getValue());
        }
    }
}
```

Sample Output:

```
ograms'; & 'C:\Program Files\Java\jdk-17\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\adpan\AppData\Roaming\C
ursor\User\workspaceStorage\4151c95c4767e61141059cd9500f483c\redhat.java\jdt_ws\Advance-Java-Practical-Programs_3e530e33\bin' 'Practical
_1_2'
Name and Age Map : {John=25, Jill=40, Jane=30, Jim=35}
Age of John : 25
Jane is present in the map
Name : John Age : 25
Name : Jill Age : 40
Name : Jane Age : 30
Name : Jim Age : 35
PS X:\Program_files\OtherCodes\JAVA\Advance-Java-Practical-Programs>
```

Experiment-02

Problem : **Create a program to illustrates the use of common implementations of the Set interface, such as HashSet, LinkedHashSet, and TreeSet.**

Source Code:

```
import java.util.HashSet;
import java.util.LinkedHashSet;
import java.util.Set;
import java.util.TreeSet;

public class SetExample {
    public static void main(String[] args) {
        // HashSet Example
        Set<String> hashSet = new HashSet<>();
        hashSet.add("Cherry");
        hashSet.add("Banana");
        hashSet.add("Apple");
        hashSet.add("Banana"); // Duplicate element
        System.out.println("HashSet (no specific order, no
duplicates): " + hashSet);

        // LinkedHashSet Example
        Set<String> linkedHashSet = new LinkedHashSet<>();
        linkedHashSet.add("Cherry");
        linkedHashSet.add("Banana");
        linkedHashSet.add("Banana"); // Duplicate element
        linkedHashSet.add("Apple");
        System.out.println("LinkedHashSet (insertion order, no
duplicates): " + linkedHashSet);

        // TreeSet Example
        Set<String> treeSet = new TreeSet<>();
        treeSet.add("Banana");
        treeSet.add("Apple");
        treeSet.add("Cherry");
        treeSet.add("Banana"); // Duplicate element
        System.out.println("TreeSet (sorted order, no
duplicates): " + treeSet);

        System.out.println("\nBehavior Comparison:");
        System.out.println("HashSet retains no order: " +
hashSet);
        System.out.println("LinkedHashSet retains insertion
order: " + linkedHashSet);
        System.out.println("TreeSet retains sorted order: " +
treeSet);
    }
}
```

Sample Output:

```
PS X:\Program_files\OtherCodes\JAVA\Advance-Java-Practical-Programs> cd "x:\Progr
($?) { java SetExample }
HashSet (no specific order, no duplicates): [Apple, Cherry, Banana]
LinkedHashSet (insertion order, no duplicates): [Cherry, Banana, Apple]
TreeSet (sorted order, no duplicates): [Apple, Banana, Cherry]

Behavior Comparison:
HashSet retains no order: [Apple, Cherry, Banana]
LinkedHashSet retains insertion order: [Cherry, Banana, Apple]
TreeSet retains sorted order: [Apple, Banana, Cherry]
PS X:\Program_files\OtherCodes\JAVA\Advance-Java-Practical-Programs>
```

Experiment-03

Title : Establish a CRUD operation using MySQL

Source Code:

```
package JDBC;

import java.sql.*;
import java.io.*;

public class CRUDOperations {
    private static final String URL =
"jdbc:mysql://127.0.0.1:3306/javasql";
    private static final String USER = "root";
    private static final String PASSWORD = "root";
    private static final BufferedReader reader = new
BufferedReader(new InputStreamReader(System.in));

    public static void main(String[] args) {
        while (true) {
            try {
                System.out.println("Select operation: \n1.
Create \n2. Read \n3. Update \n4. Delete \n5. Exit");
                int choice =
Integer.parseInt(reader.readLine());
                switch (choice) {
                    case 1: createRecord(); break;
                    case 2: readRecords(); break;
                    case 3: updateRecord(); break;
                    case 4: deleteRecord(); break;
                    case 5:
                        System.out.println("Exiting...");
                        reader.close();
                        return;
                    default: System.out.println("Invalid
choice, please try again.");
                }
            } catch (IOException e) {
                System.out.println("Error reading input: " +
e.getMessage());
                break;
            }
        }
    }

    public static void createRecord() {
        try (Connection con = DriverManager.getConnection(URL,
```

```
USER, PASSWORD)) {
            System.out.println("Connection established.");
        } catch (Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
    }

    public static void readRecords() {
        try (Connection con = DriverManager.getConnection(URL,
USER, PASSWORD)) {
            String query = "SELECT * FROM table1";
            PreparedStatement stmt =
con.prepareStatement(query);
            ResultSet rs = stmt.executeQuery();
            System.out.println("Person details:");
            while (rs.next()) {
                System.out.println(rs.getInt("id") + " " +
rs.getString("city"));
            }
        } catch (Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
    }

    public static void updateRecord() {
        try (Connection con = DriverManager.getConnection(URL,
USER, PASSWORD)) {
            System.out.println("Enter old city name:");
            String oldName = reader.readLine();
            System.out.println("Enter new city name:");
            String newName = reader.readLine();
            String query = "UPDATE table1 SET city=? WHERE
city=?";
            PreparedStatement stmt =
con.prepareStatement(query);
            stmt.setString(1, newName);
            stmt.setString(2, oldName);
            int rowsAffected = stmt.executeUpdate();
            System.out.println(rowsAffected > 0 ? "Record
updated successfully" : "No records updated.");
        } catch (Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
    }

    public static void deleteRecord() {
        try (Connection con = DriverManager.getConnection(URL,
```

```
USER, PASSWORD)) {
            System.out.println("Enter ID to delete:");
            int id = Integer.parseInt(reader.readLine());
            String query = "DELETE FROM table1 WHERE id=?";
            PreparedStatement stmt =
con.prepareStatement(query);
            stmt.setInt(1, id);
            int rowsAffected = stmt.executeUpdate();
            System.out.println(rowsAffected > 0 ? "Record
deleted successfully" : "Record not found.");
        } catch (Exception e) {
            System.out.println("Error: " + e.getMessage());
        }
    }
}
```

Sample Output:

```
"C:\Program Files\Java\jdk-21\bin\java.exe" "-javaagent:C
Select operation:
1. Create
2. Read
3. Update
4. Delete
5. Exit
1
Connection established.
Select operation:
1. Create
2. Read
3. Update
4. Delete
5. Exit
2
Person details:
1 Delhi
3 Los Angeles
4 Noida
5 Meerut
6 San Francisco
Select operation:
1. Create
2. Read
3. Update
4. Delete
5. Exit
3
Enter old city name:
Delhi
Enter new city name:
New Delhi
Record updated successfully
```

```
Record updated successfully
Select operation:
1. Create
2. Read
3. Update
4. Delete
5. Exit
4
Enter ID to delete:
6
Record deleted successfully
Select operation:
1. Create
2. Read
3. Update
4. Delete
5. Exit
2
Person details:
1 New Delhi
3 Los Angeles
4 Noida
5 Meerut
Select operation:
1. Create
2. Read
3. Update
4. Delete
5. Exit
5
Exiting...
```

Experiment-04

Title : Write a program to display all records of student table.

Source Code:

```
import java.sql.*;
import java.io.*;
import java.util.*;
public class SelectQuery {
    public static void main(String[]args){
        String url = "jdbc:mysql://127.0.0.1:3306/javasql";
        String user = "root";
        String password = "kcm@123";
        Scanner s  = new Scanner(System.in);
        try{
            Class.forName("com.mysql.cj.jdbc.Driver");

            // Establish the connection
            Connection con = DriverManager.getConnection(url,
user, password);
            if (con.isClosed()) {
                System.out.println("Connection is closed.");
            } else {
                System.out.println("Connection formed.");
            }
            String q = " select * from table1";
            PreparedStatement pt = con.prepareStatement(q);
            ResultSet set = pt.executeQuery();
            System.out.println("Person detail are as
follow:");
            while(set.next()){
                int Id = set.getInt("id");
                String city = set.getString("city");
                System.out.println(Id+" "+city);
            }
            con.close();
        }
        catch (Exception e) {
            System.out.println("error:" + e.getMessage());
        }
        s.close();
    }
}
```

Sample Output:

```
[mysql-explain] classPool: 55, jdk.internal.loader.ClassLoaders$AppClassLoader@76ed5528, [class path: jdk.internal.loader.ClassLoaders$AppClassLoader@76ed5528;]
[mysql-explain] visit method: com.mysql.cj.jdbc.ClientPreparedStatement.executeInternal(int,com.mysql.cj.protocol.Message,boolean,boolean,com.mysql.cj.protocol.ColumnDefinition,boolean)
Connection formed.
Person detail are as follow:
1  Noida
2 Greater Noida
3 Jammu
4 Jammu
5 Jammu
6 Jammu
7 Jammu
8 Noida
9 Kerla
10 YYY
```

Experiment-05

Title : Write a program to display "Hello, World!" using a Servlet

Description: This experiment demonstrates the creation of a basic servlet that outputs a "Hello, World!" message when accessed via a web browser.

HelloServlet.java

```
package com.JAVA;
import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

@WebServlet("/hello")
public class HelloServlet extends HttpServlet {
    private static final long serialVersionUID = 1L;

    @Override
    protected void doGet(HttpServletRequest request,
HttpServletResponse response)
            throws IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        out.println("<h1>Hello, World!</h1>");
    }
}
```

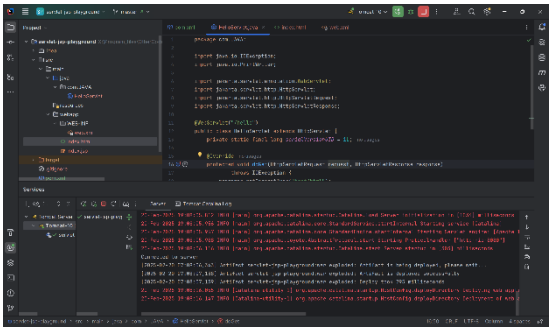
HTML FILE (index.html)

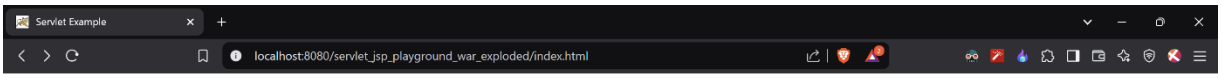
```
<!DOCTYPE html>

<html>

<head>

    <title>Servlet Example</title>

</head>

<body>

<h2>Click to see the servlet response</h2>

<a href="hello">Run Servlet</a>

</body>

</html>
```

Web.xml Configuration

```
<web-app xmlns="http://xmlns.jcp.org/xml/ns/javaee"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee

http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd"
         version="4.0">
  <!-- No servlet mapping required if using annotations -->
</web-app>
```

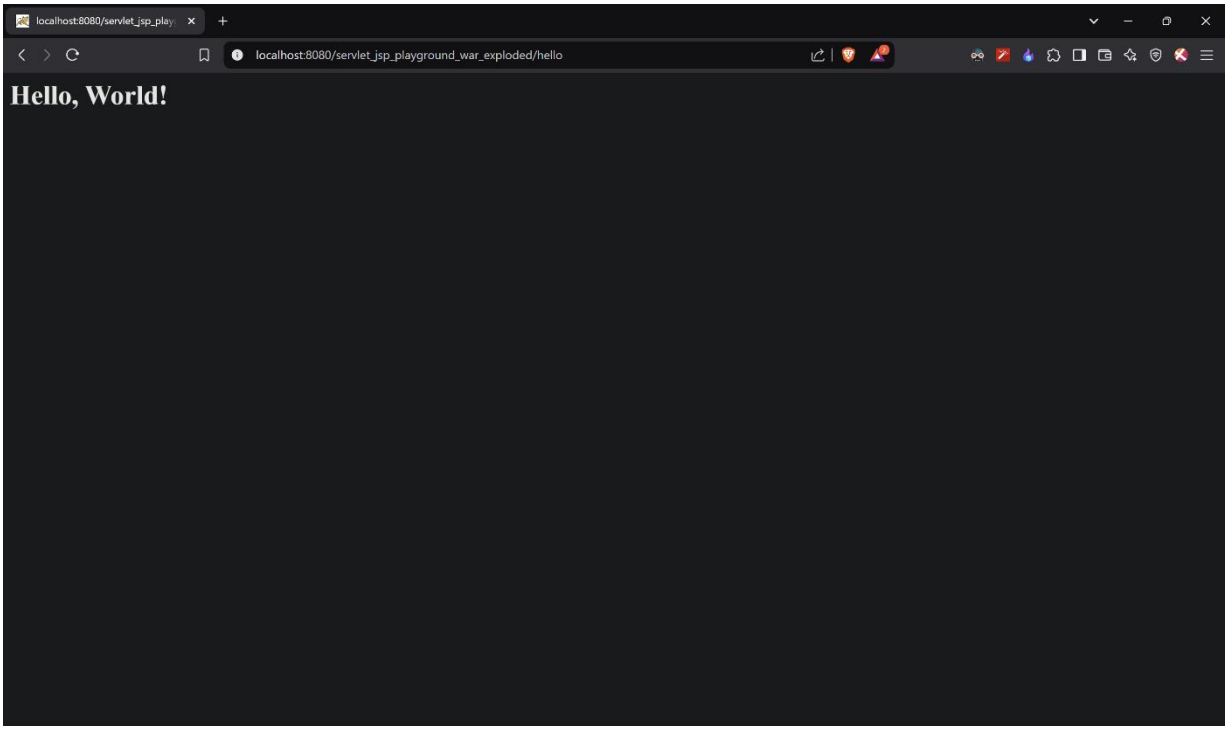
Output :





Click to see the servlet response

Run Servlet



Experiment-06

Program 1 : Write a program to greet the user by handling request parameters in a Servlet

Description: In this experiment, a servlet retrieves a request parameter (the user's name) from the URL query string and displays a personalized greeting.

ParameterServlet.java

```
package com.JAVA;

import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;
import java.io.IOException;
import java.io.PrintWriter;


@WebServlet("/greet")
public class ParameterServlet extends HttpServlet {
    @Override
    protected void doGet(HttpServletRequest request,
HttpServletResponse response) throws IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        String name = request.getParameter("name");
        if (name == null || name.isEmpty()) {
            name = "Guest";
        }
        out.println("<h1>Hello, " + name + "!</h1>");
    }
}
```

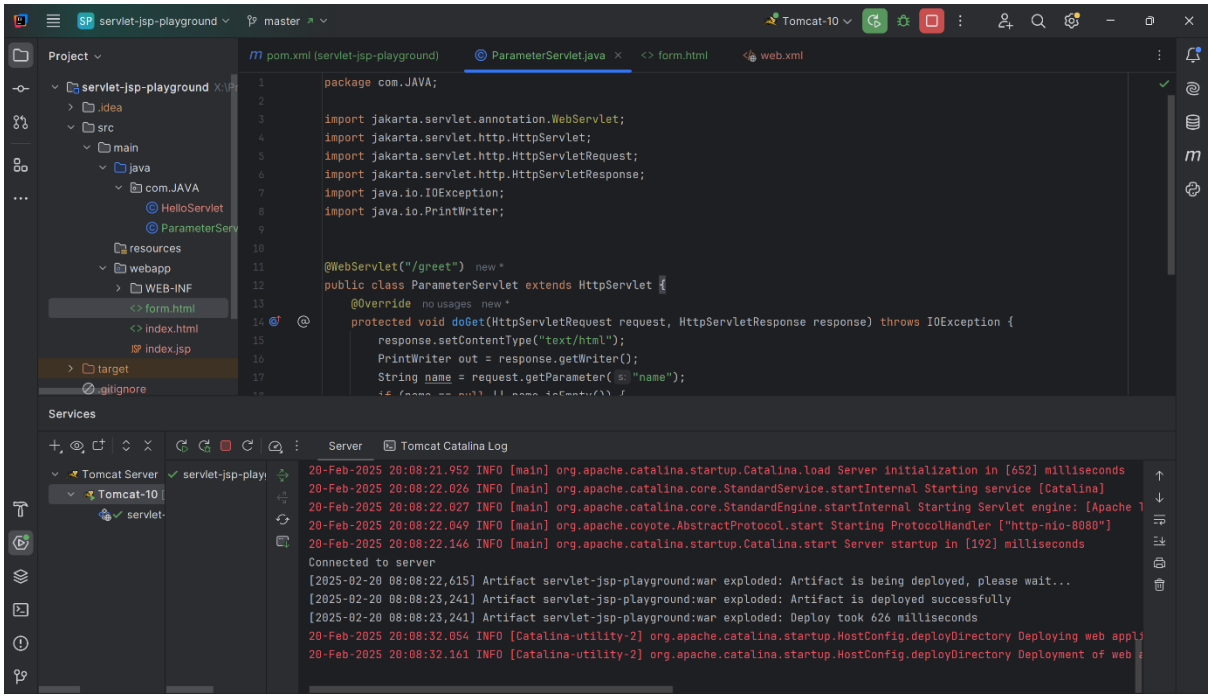
HTML FILE (form.html)

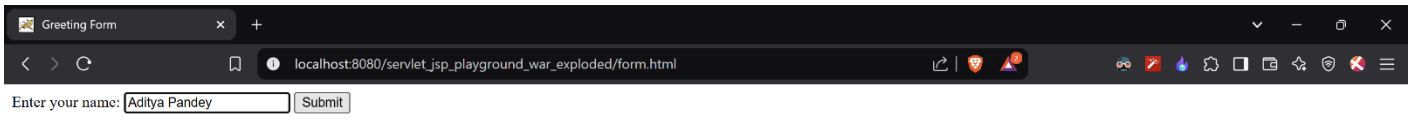
```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>Greeting Form</title>
</head>
<body>
<form action="greet">
    Enter your name: <input type="text" name="name">
    <input type="submit" value="Submit">
</form>
</body>
</html>
```

Web.xml Configuration

```
<web-app xmlns="http://xmlns.jcp.org/xml/ns/javaee"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee

http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd"
         version="4.0">
  <!-- No servlet mapping required if using annotations -->
</web-app>
```

Output :





Hello, Aditya Pandey !

Program 2 : Write a program to validate user login using a Servlet handling POST requests

Description: This experiment focuses on processing form data sent via a POST request. The servlet validates the username and password and returns a success or failure message.

PostServlet.java

```
package com.JAVA;
import java.io.IOException;
import java.io.PrintWriter;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.HttpServlet;
import jakarta.servlet.http.HttpServletRequest;
import jakarta.servlet.http.HttpServletResponse;

@WebServlet("/login")
public class PostServlet extends HttpServlet {
    @Override
    protected void doPost(HttpServletRequest request,
HttpServletResponse response)
            throws IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        String username = request.getParameter("username");
        String password = request.getParameter("password");
        if ("admin".equals(username) &&
"password123".equals(password)) {
            out.println("<h1>Login Successful</h1>");
        } else {
            out.println("<h1>Invalid Credentials</h1>");
        }
    }
}
```

HTML FILE (login.html)

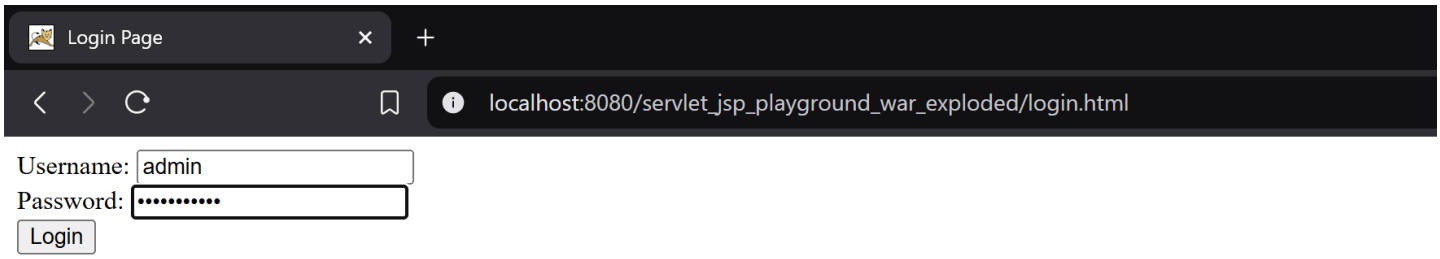
```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>Login Page</title>
</head>
<body>
<form method="post" action="login">
    Username: <input type="text" name="username"><br>
    Password: <input type="password" name="password"><br>
    <input type="submit" value="Login">
</form>
</body>
</html>
```

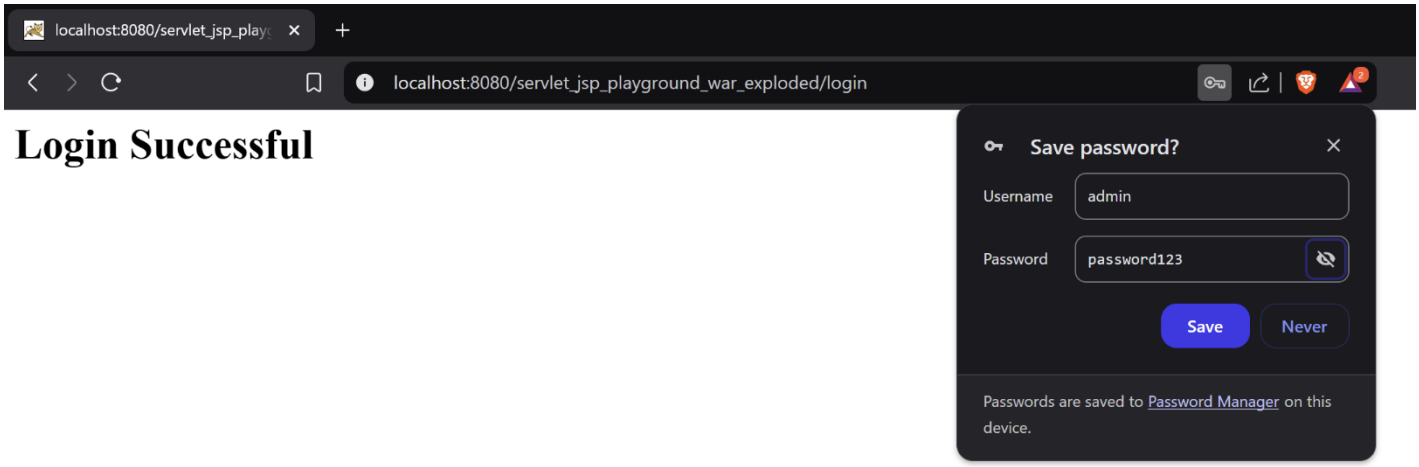
Web.xml Configuration

```
<web-app xmlns="http://xmlns.jcp.org/xml/ns/javaee"
```

```
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee

http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd"
        version="4.0">
  <!-- No servlet mapping required if using annotations -->
</web-app>
```

Output :





Experiment-07

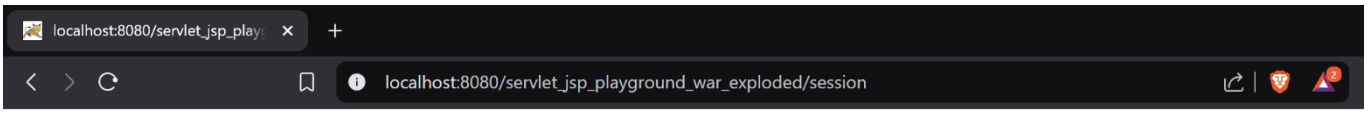
Program 1 : Write a program to demonstrate session management using a Servlet

Description: This experiment illustrates how to use HTTP sessions to manage user state across multiple requests within a servlet-based web application.

SessionServlet.java

```
package com.JAVA;
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 jakarta.servlet.http.HttpSession;

@WebServlet("/session")
public class SessionServlet extends HttpServlet {
    private static final long serialVersionUID = 1L;

    @Override
    protected void doGet(HttpServletRequest request,
HttpServletResponse response)
            throws ServletException, IOException {
        // Set the response content type
        response.setContentType("text/html");

        // Get or create the session for this user
        HttpSession session = request.getSession();

        // Retrieve the "username" attribute from the session
        String username = (String) session.getAttribute("username");

        // If not present, initialize it with a default value
        if (username == null) {
            username = "New User";
            session.setAttribute("username", username);
        }

        // Write the response including the session ID and username
        PrintWriter out = response.getWriter();
        out.println("<html><body>");
        out.println("<h1>Welcome, " + username + "!</h1>");
        out.println("<p>Your session ID is: " + session.getId() +
"</p>");
        out.println("</body></html>");
    }
}
```

Output :



Welcome, New User!

Your session ID is: 92D8A4FFF91353B530BDD624F56ED564

Experiment-07

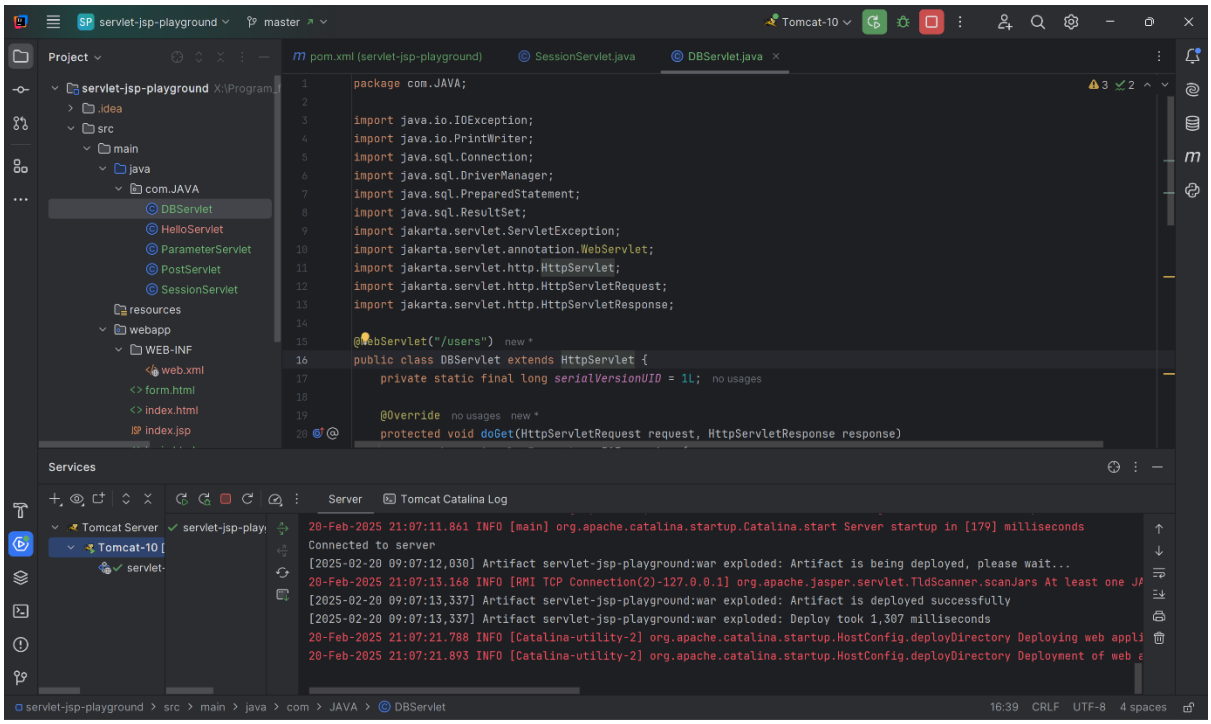
Program 2 : Write a program to display all records from the "users" table using a Servlet with Database Connectivity

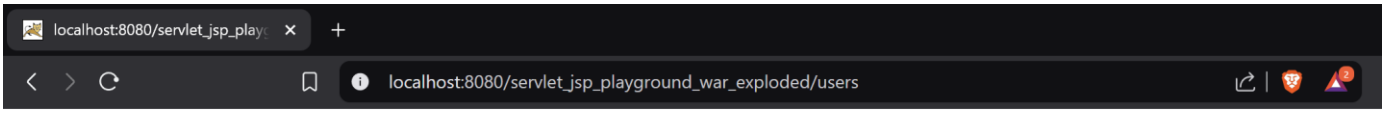
Description: In this experiment, the servlet connects to a MySQL database, retrieves all records from the "users" table, and displays them on a web page.

SessionServlet.java

```
package com.JAVA;

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

@WebServlet("/users")
public class DBServlet extends HttpServlet {
    private static final long serialVersionUID = 1L;

    @Override
    protected void doGet(HttpServletRequest request,
HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            Connection con = DriverManager.getConnection(
                    "jdbc:mysql://localhost:3306/adityapandey",
"root", "root"); // Use correct DB name here

            PreparedStatement ps = con.prepareStatement("SELECT *
FROM ADITYA_PANDEY");
            ResultSet rs = ps.executeQuery();

            out.println("<h2>Records from ADITYA_PANDEY
Table:</h2>");
            while (rs.next()) {
                out.println("<p>Record: " +
                        rs.getInt("ID") + " | " +
                        rs.getInt("ROLL_NUMBER") + " | " +
                        rs.getString("NAME") + " | " +
                        rs.getInt("AGE") + " | " +
                        rs.getLong("CONTACT_NUMBER") +
                        "</p>");
            }
            con.close();
        } catch (Exception e) {
            e.printStackTrace();
            out.println("<p>Error: " + e.getMessage() + "</p>");
        }
    }
}
```

Output :





Records from ADITYA_PANDEY Table:

Record: 1 | 1 | Aditya Pandey | 22 | 9876543210

Record: 2 | 2 | Ravi Verma | 23 | 9876543211

Record: 3 | 3 | Sanya Sharma | 21 | 9876543212

Record: 4 | 4 | Rajesh Singh | 24 | 9876543213

Record: 5 | 5 | Neha Gupta | 20 | 9876543214

Experiment-10

Title : Create REST APIs with Spring boot.

Entity Class

```
package com.example.demo.entity;

public class JournelEntity {
    private int id;
    private String title;
    private String content;
    public int getId() {
        return id;
    }
    public void setId(int id) {
        this.id = id;
    }
    public String getTitle() {
        return title;
    }
    public void setTitle(String title) {
        this.title = title;
    }
    public String getContent() {
        return content;
    }
    public void setContent(String content) {
        this.content = content;
    }
}
```

Controller Class:

```
package com.example.demo.controller;

import java.util.ArrayList;
import java.util.HashMap;
import java.util.List;
import java.util.Map;

import org.springframework.web.bind.annotation.DeleteMapping;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.PathVariable;
import org.springframework.web.bind.annotation.PostMapping;
import org.springframework.web.bind.annotation.PutMapping;
import org.springframework.web.bind.annotation.RequestBody;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

import com.example.demo.entity.JournelEntity;
@RestController
@RequestMapping("/journel")
```

```
public class JournelController {

    Map<Integer,JournelEntity> map = new HashMap<>();

    @GetMapping
    public List<JournelEntity> getAll(){
        if(map.containsKey(0)){
            return new ArrayList<>();
        }
        return new ArrayList<>(map.values());
    }

    @PostMapping
    public JournelEntity createNewEntity(@RequestBody
JournelEntity newEntity){
        map.put(newEntity.getId(),newEntity);
        return map.get(newEntity.getId());
    }

    @PutMapping("id/{id}")
    public String updateEntries(@PathVariable int id,
@RequestBody JournelEntity updateData){
        if(!map.containsKey(id)){
            return "Entry does n't exists";
        }
        map.put(id,updateData);
        return "Data update Sucessfully";
    }

    @DeleteMapping("id/{id}")
    public String deleteEntries(@PathVariable int id){
        if(!map.containsKey(id)){
            return "Data can't be deleted";
        }
        map.remove(id);
        return "Data delete Sucessfully";
    }
}
```

Main Java Class:

```
package com.example.demo;
import org.springframework.boot.SpringApplication;
import
org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication
public class DemoApplication {

     public static void main(String[] args) {
          SpringApplication.run(DemoApplication.class, args);
     }

}
```

Output:


```
[
    {
        "id": 1,
        "title": "happy",
        "content": "I am happy"
    },
    {
        "id": 2,
        "title": "ok",
        "content": "I am ok"
    },
    {
        "id": 3,
        "title": "alright",
        "content": "I am alright"
    },
    {
        "id": 4,
        "title": "good",
        "content": "I am good"
    }
]
```

Experiment-11

Title : Write programs to fetch details of students using spring framework.

Entity Class

```
package com.example.studentapp.model;

import jakarta.persistence.*;

@Entity
public class Student {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String name;
    private int age;
    private String course;

    public Student() {}

    public Student(String name, int age, String course) {
        this.name = name;
        this.age = age;
        this.course = course;
    }

    // Getters & Setters
    public Long getId() { return id; }
    public void setId(Long id) { this.id = id; }
    public String getName() { return name; }
    public void setName(String name) { this.name = name; }
    public int getAge() { return age; }
    public void setAge(int age) { this.age = age; }
    public String getCourse() { return course; }
    public void setCourse(String course) { this.course = course; }
}
```

StudentRepository

```
package com.example.studentapp.repository;

import com.example.studentapp.model.Student;
import org.springframework.data.jpa.repository.JpaRepository;

public interface StudentRepository extends JpaRepository<Student,
Long> {}
```

StudentService

```
package com.example.studentapp.service;

import com.example.studentapp.model.Student;
import com.example.studentapp.repository.StudentRepository;
import org.springframework.stereotype.Service;

import java.util.List;
import java.util.Optional;

@Service
public class StudentService {
    private final StudentRepository studentRepository;

    public StudentService(StudentRepository studentRepository) {
        this.studentRepository = studentRepository;
    }

    public List<Student> getAllStudents() {
        return studentRepository.findAll();
    }

    public Optional<Student> getStudentById(Long id) {
        return studentRepository.findById(id);
    }

    public Student saveStudent(Student student) {
        return studentRepository.save(student);
    }

    public void deleteStudent(Long id) {
        studentRepository.deleteById(id);
    }
}
```

StudentController

```
package com.example.studentapp.controller;

import com.example.studentapp.model.Student;
import com.example.studentapp.service.StudentService;
import org.springframework.web.bind.annotation.*;

import java.util.List;
import java.util.Optional;

@RestController
@RequestMapping("/api/students")
public class StudentController {
    private final StudentService studentService;

    public StudentController(StudentService studentService) {
        this.studentService = studentService;
    }
```

```
    @GetMapping
    public List<Student> getAllStudents() {
        return studentService.getAllStudents();
    }

    @GetMapping("/{id}")
    public Optional<Student> getStudentById(@PathVariable Long id) {
        return studentService.getStudentById(id);
    }

    @PostMapping
    public Student addStudent(@RequestBody Student student) {
        return studentService.saveStudent(student);
    }

    @DeleteMapping("/{id}")
    public void deleteStudent(@PathVariable Long id) {
        studentService.deleteStudent(id);
    }
}
```

StudentAppApplication

```
package com.example.studentapp;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication
public class StudentAppApplication {
    public static void main(String[] args) {
        SpringApplication.run(StudentAppApplication.class, args);
    }
}
```

application.properties

```
spring.datasource.url=jdbc:h2:mem:studentdb
spring.datasource.driverClassName=org.h2.Driver
spring.datasource.username=sa
spring.datasource.password=
spring.jpa.database-platform=org.hibernate.dialect.H2Dialect
spring.h2.console.enabled=true
spring.jpa.hibernate.ddl-auto=update
```

Output

```
{
  "name": "John Doe",
  "age": 20,
  "course": "Computer Science"
}
```

Experiment-12

Title : Create a service-based code in spring boot

UserEntity

```
package com.example.demo.model;

import jakarta.persistence.*;

@Entity
public class User {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String name;
    private String email;

    // Constructors
    public User() {}
    public User(String name, String email) {
        this.name = name;
        this.email = email;
    }

    // Getters & Setters
    public Long getId() { return id; }
    public String getName() { return name; }
    public String getEmail() { return email; }
    public void setId(Long id) { this.id = id; }
    public void setName(String name) { this.name = name; }
    public void setEmail(String email) { this.email = email; }
}
```

UserRepository

```
package com.example.demo.repository;

import com.example.demo.model.User;
import org.springframework.data.jpa.repository.JpaRepository;

public interface UserRepository extends JpaRepository<User, Long> {}
```

UserService

```
package com.example.demo.service;

import com.example.demo.model.User;
import com.example.demo.repository.UserRepository;
import org.springframework.stereotype.Service;
```

```
import java.util.List;
import java.util.Optional;

@Service
public class UserService {
    private final UserRepository userRepository;

    public UserService(UserRepository userRepository) {
        this.userRepository = userRepository;
    }

    public List<User> getAllUsers() {
        return userRepository.findAll();
    }

    public Optional<User> getUserById(Long id) {
        return userRepository.findById(id);
    }

    public User createUser(User user) {
        return userRepository.save(user);
    }

    public void deleteUser(Long id) {
        userRepository.deleteById(id);
    }
}
```

UserController

```
package com.example.demo.controller;

import com.example.demo.model.User;
import com.example.demo.service.UserService;
import org.springframework.web.bind.annotation.*;

import java.util.List;
import java.util.Optional;

@RestController
@RequestMapping("/api/users")
public class UserController {
    private final UserService userService;

    public UserController(UserService userService) {
        this.userService = userService;
    }

    @GetMapping
    public List<User> getAllUsers() {
        return userService.getAllUsers();
    }

    @GetMapping("/{id}")
    public Optional<User> getUserById(@PathVariable Long id) {
```

```
        return userService.getUserById(id);
    }

    @PostMapping
    public User createUser(@RequestBody User user) {
        return userService.createUser(user);
    }

    @DeleteMapping("/{id}")
    public void deleteUser(@PathVariable Long id) {
        userService.deleteUser(id);
    }
}
```

application.properties

```
spring.datasource.url=jdbc:h2:mem:testdb
spring.datasource.driverClassName=org.h2.Driver
spring.datasource.username=sa
spring.datasource.password=
spring.jpa.database-platform=org.hibernate.dialect.H2Dialect
spring.h2.console.enabled=true
```

MainClass

```
package com.example.demo;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication
public class DemoApplication {
    public static void main(String[] args) {
        SpringApplication.run(DemoApplication.class, args);
    }
}
```

Output

Request:

```json
{
  "name": "Alice",
  "email": "alice@example.com"
}
```

Response:

```json
{
  "id": 1,
  "name": "Alice",
  "email": "alice@example.com"
}
```