# MIT ART DESIGN & TECHNOLOGY UNIVERSITY

# MIT College of Management (MITCOM), Pune

**PROGRAMME: MASTER OF COMPUTER APPLICATION (MCA CC /DS)**
**ADVANCED JAVA**

## CERTIFICATE

This is to certify that, **Mr.___________________________________** has submitted a Practical Report on **Advanced Java** to MIT – ADT University, Pune for the partial fulfillment of Master in Computer Application

(Data Science/ Cloud Computing) submitted during the academic year 2024-25.

**PRN No.:- ___________________________. MCA Year :- II. MCA Sem :- III**

| | | |
|---|---|---|
| Subject Incharge | Dr.Alkawati Magadum | Dr.Sangita Phunde |
| | HOD MCA | Principal |

**1.External Examiner** **Sign of Examiners:**

**2.Internal Examiner** **Sign of Examiners:**

MIT ART DESIGN & TECHNOLOGY UNIVERSITY

# MIT College of Management (MITCOM), Pune

## **Declaration**

I undersigned hereby declares that, the Journal of assignments solved by me and it is executed as per the course requirement of MCA program of MIT-ADT University, Pune. This report has not submitted by me or any other person to any other University or Institution for a degree or diploma course. This is my own and original work.

Place: MITCOM, Pune
Date:

Sign of the student: ---------------------------

Name of the Student____________________

## MIT ART DESIGN & TECHNOLOGY UNIVERSITY
## MIT College of Management (MITCOM), Pune

**Sub:- Advanced Java**

**Name:-**______________________________ Div:- MCA (DS-B)

| Sr No. | Name Of The Practical | Page | Date | Record Sign |
|---|---|---|---|---|
| **1** | Write a Java program to connect to a specific database (e.g., MySQL, workbench etc.) using JDBC. Create a table in the database using JDBC and insert some sample data. and retrieve all data from a specific table and display it on the console | | | |
| **2** | Implement a program to update a specific record in a table based on a given condition. and delete a record from a table based on a specific criteria. | | | |
| **3** | Write a program to utilize transactions in JDBC, demonstrating both commit and rollback functionalities. | | | |
| **4** | Implement a program to handle different types of JDBC exceptions effectively. Write JDBC Program to calculate Employee salary and print the salary statement in tabular form by selecting the details from database table (Emp_Sal) using Prepared Statement | | | |
| **5** | Write a program to perform aggregation functions (e.g., COUNT, SUM,AVERAGE) on data retrieved from a database. | | | |
| **6** | Write a program to create a simple Java application that interacts with a database to perform CRUD operations (Create, Read, Update, Delete) on a specific table. | | | |

|  |  |  |  |  |
|---|---|---|---|---|
| **7** | Design a simple servlet that displays a welcome message with the user's name retrieved from request parameters. |  |  |  |
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|  |  |  |  |  |
|---|---|---|---|---|
| **9** | Create a servlet that utilizes session management to maintain a shopping cart for an online store |  |  |  |
| **10** | Write a servlet Program to calculate the addition of two numbers and print the result.(Eg:Addition of two numbers=50) |  |  |  |
| **11** | Write a Servlet Program to create a registration form using in html and CSS and print the message Registration is successful |  |  |  |
| **12** | Write a servlet Program for student information and display the information in tabular form by selecting the details from student database table |  |  |  |
| **13** | Write a Java Servlet program to read employee details including employee number (empno), name, designation, basic pay, deductions, and allowances, and then calculate and display the net salary. display the information in tabular form by selecting the details from Emp_sal database table |  |  |  |
| **14** | Write a JSP program calculates factorial of an integer number, while the input is taken from an HTML form. |  |  |  |
| **15** | Write a JSP program to generate the Fibonacci series up to a particular term, while the input is taken from an HTML form |  |  |  |

|  |  |  |  |  |
|---|---|---|---|---|
| **16** | Write a JSP program to display the System date and time. |  |  |  |
| **17** | Write a JSP program to display a Sample shopping Order calculation Form and display output in tabular form. |  |  |  |
| **18** | Write a JSP program to perform Arithmetic operations such as Addition, Subtraction, Multiplication and Division. Design a HTML to accept two numbers in text box and radio buttons to display operations. On submit display result as per the selected operation on next page using JSP |  |  |  |
| **19** | Define and illustrate the concept of entity mapping in JPA.Explain how JPA maps Java classes (entities) to database tables.Provide an example of an entity class with annotations and its corresponding database table schema |  |  |  |
| **20** | Describe the different types of relationships between entities (one-to-one, one-to-many, many-to-one, many-to-many).Explain how JPA represents these relationships using annotations.Provide code examples for each type of relationship |  |  |  |
| **21** | Create a JPA application to perform CRUD operations on a simple entity (e.g., Product).<br><br>Include methods for creating, retrieving, updating, and deleting Product entities.<br>Demonstrate the use of EntityManager for persistence operations. |  |  |  |

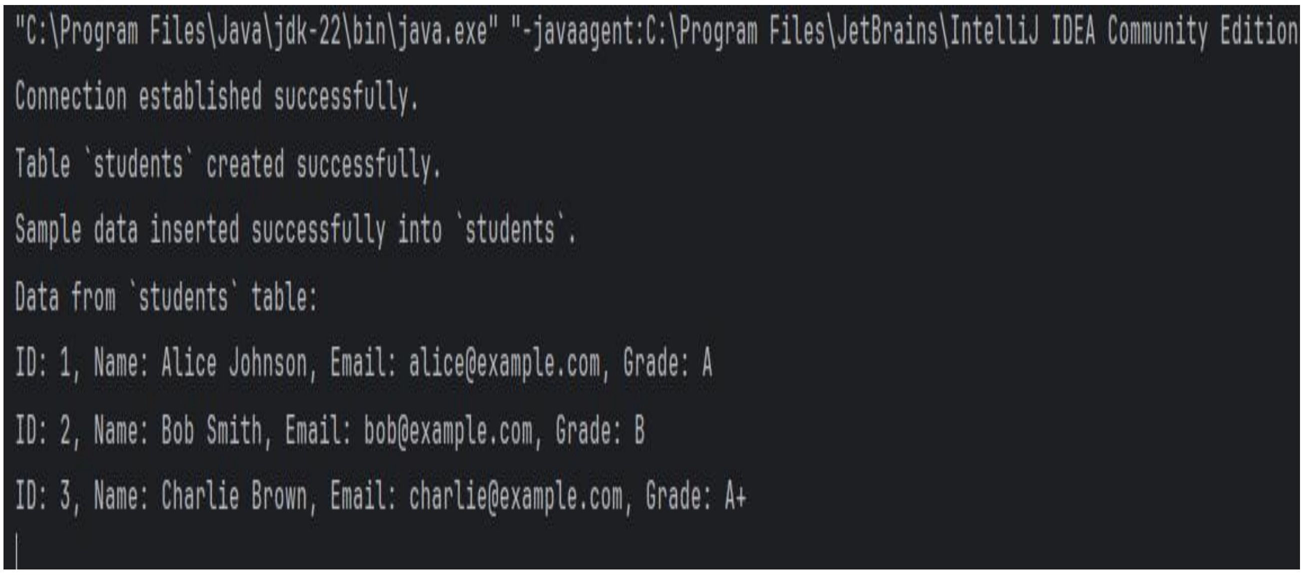
| | | | | |
|---|---|---|---|---|
| **22** | Configure a Spring Boot application to connect to a specific MySQL database without explicitly defining beans for connection pool, DataSource, etc.<br>Use only the necessary dependencies and demonstrate how auto-configuration sets up the connection.<br>Explore using application.properties to customize connection details (URL, username, password). | | | |
| **23** | Create a Spring Boot application that utilizes JPA repositories. Persist and retrieve data from an in-memory database (e.g., H2) without manual configuration.<br><br>Focus on the simplicity achieved through auto-configuration for JPA and repositories. Implement basic CRUD operations using JPA repositories.<br><br>Develop a Spring Boot application with a RESTful API that exposes an endpoint to retrieve a list of products. Utilize Spring MVC annotations like @RestController and @GetMapping.<br>Implement a service layer to interact with a product repository (in-memory or database). | | | |
| | Return the list of products in JSON format using @ResponseBody. | | | |
| **25** | Write a Hibernate program to create the product table (product id,product name,product category,product price) and delete the specific product record.(using through the product id) | | | |
| **26** | Write a Hibernate program to update the product price data from product table.(Using HQL) | | | |
| **27** | Write a Hibernate Program for product information and display the information by selecting the details from product database table | | | |

# Assignment 1: Programs On JAVA JDBC

**1.1 Write a Java program to connect to a specific database (e.g., MySQL, workbench etc.) using JDBC. Create a table in the database using JDBC and insert some sample data. and retrieve all data from a specific table and display it on the console.**

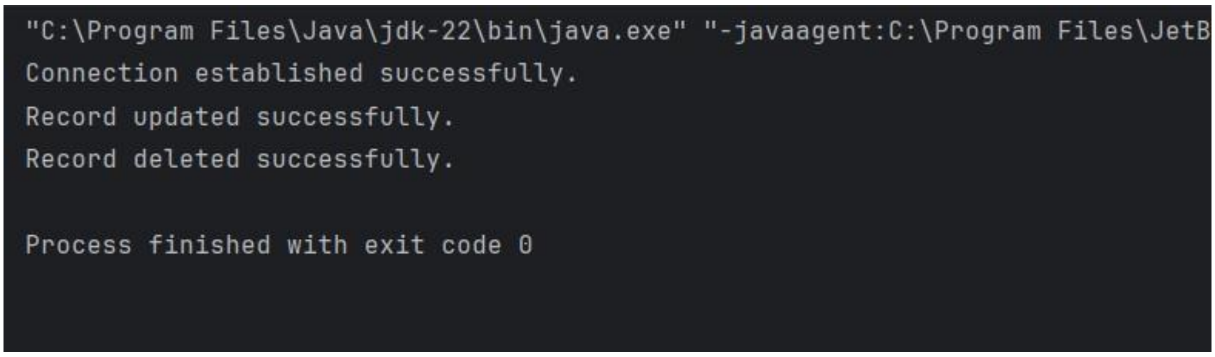
**Ans:-**

```
import      java.sql.Connection;
import
java.sql.DriverManager;
import       java.sql.Statement;
import java.sql.ResultSet;

public class Practical { public static void
   main(String[] args) {
      // Database credentials
      String url = "jdbc:mysql://localhost:3306/college"; // Replace with your
database name
      String username = "root"; // Replace with your MySQL username
      String password = "1234567890"; // Replace with your MySQL password

      // JDBC objects
      Connection conn = null;
      Statement stmt = null;

      try {
         // 1. Register JDBC Driver
         Class.forName("com.mysql.cj.jdbc.Driver");

         // 2. Open Connection conn = DriverManager.getConnection(url,
         username,      password);      System.out.println("Connection
         established successfully.");

         // 3. Create Statement stmt =
         conn.createStatement();


         // 4. Create Table
         String createTableSQL = "CREATE TABLE IF NOT EXISTS students ("
+
               "id INT AUTO_INCREMENT PRIMARY KEY, " +
             "name VARCHAR(50), " + "email
             VARCHAR(50), " +
             "grade VARCHAR(10))"; stmt.executeUpdate(createTableSQL);
         System.out.println("Table `students` created successfully.");


         // 5. Insert Sample Data
         String insertSQL = "INSERT INTO students (name, email, grade)
VALUES " +
             "('Alice Johnson', 'alice@example.com', 'A'), " +
             "('Bob Smith', 'bob@example.com', 'B'), " +
             "('Charlie     Brown',     'charlie@example.com',     'A+')";
         stmt.executeUpdate(insertSQL);
         System.out.println("Sample data inserted successfully into `students`.");

         // 6. Retrieve and Display Data
         String selectSQL = "SELECT * FROM students";
         ResultSet rs = stmt.executeQuery(selectSQL);

         System.out.println("Data from `students` table:");
         while (rs.next()) { int id = rs.getInt("id");
           String name = rs.getString("name");
           String email = rs.getString("email");
           String grade = rs.getString("grade");
           System.out.printf("ID: %d, Name: %s, Email: %s, Grade: %s%n", id,
name, email, grade);
         }

         // Close the ResultSet rs.close();
      } catch (Exception e) {
         e.printStackTrace();
      } finally {
         try {
           // Close the Statement and Connection
           if (stmt != null) stmt.close(); if
           (conn != null) conn.close();
         } catch (Exception ex) { ex.printStackTrace();
         }
      }
   }
}
```
OUTPUT:


```
"C:\Program Files\Java\jdk-22\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition
Connection established successfully.
Table `students` created successfully.
Sample data inserted successfully into `students`.
Data from `students` table:
ID: 1, Name: Alice Johnson, Email: alice@example.com, Grade: A
ID: 2, Name: Bob Smith, Email: bob@example.com, Grade: B
ID: 3, Name: Charlie Brown, Email: charlie@example.com, Grade: A+
|
```

**1.2 Implement a program to update a specific record in a table based on a given condition and delete a record from a table based on a specific criteria**. **Ans:-**

```
import java.sql.Connection; import
java.sql.DriverManager;      import
java.sql.PreparedStatement;

public class Practical2 { public static void
    main(String[] args) {
        // Database credentials
        String url = "jdbc:mysql://localhost:3306/college"; // Replace with your
database name
        String username = "root"; // Replace with your MySQL username
        String password = "1234567890"; // Replace with your MySQL password

        // JDBC objects
        Connection conn = null;

        try {
            // 1. Register JDBC Driver
            Class.forName("com.mysql.cj.jdbc.Driver");

            // 2. Open Connection conn = DriverManager.getConnection(url,
            username, password);
            System.out.println("Connection established successfully.");
            // 3. Update Record
            String updateSQL = "UPDATE students SET grade = ? WHERE id = ?";
            PreparedStatement updateStmt = conn.prepareStatement(updateSQL);
            updateStmt.setString(1, "A+"); // New grade updateStmt.setInt(2, 2); //
            ID of the student to update int updateCount =
            updateStmt.executeUpdate(); if (updateCount > 0) {
               System.out.println("Record updated successfully.");
            } else {
               System.out.println("No record found to update."); }

            // 4. Delete Record
            String deleteSQL = "DELETE FROM students WHERE id = ?";
            PreparedStatement deleteStmt = conn.prepareStatement(deleteSQL);
            deleteStmt.setInt(1, 3); // ID of the student to delete
            int deleteCount = deleteStmt.executeUpdate(); if
            (deleteCount > 0) {
               System.out.println("Record deleted successfully.");
            } else {
               System.out.println("No record found to delete."); }

            // Close statements
            updateStmt.close();
            deleteStmt.close();
         } catch (Exception e) {
            e.printStackTrace();
         } finally {
             try {
               // Close Connection
               if (conn != null) conn.close();
            } catch (Exception ex) { ex.printStackTrace();
            }
         }
      }
   }
```
**Output:-**



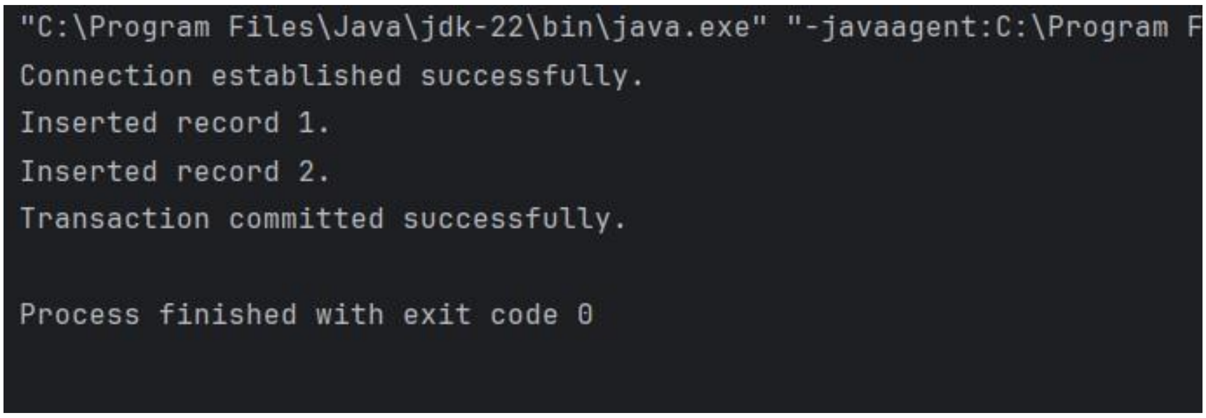
```
"C:\Program Files\Java\jdk-22\bin\java.exe" "-javaagent:C:\Program Files\JetB
Connection established successfully.
Record updated successfully.
Record deleted successfully.

Process finished with exit code 0
```

**1.3 Write a program to utilize transactions in JDBC, demonstrating both commit and rollback functionalities**.

Ans:- import java.sql.Connection;

```
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.SQLException;

public class Practical3_TransactionExample { public
    static void main(String[] args) {
        // Database credentials
        String url = "jdbc:mysql://localhost:3306/college"; // Replace with your
database name
        String username = "root"; // Replace with your MySQL username
        String password = "1234567890"; // Replace with your MySQL password

        Connection conn = null;

        try {
            // 1. Register JDBC Driver
            Class.forName("com.mysql.cj.jdbc.Driver");

            // 2. Open Connection conn = DriverManager.getConnection(url,
            username, password); System.out.println("Connection
            established successfully.");

            // 3. Disable Auto-commit Mode conn.setAutoCommit(false);

            // 4. Insert Record 1
            String insertSQL1 = "INSERT INTO students (id, name, email, grade)
VALUES (?, ?, ?, ?)";
            PreparedStatement stmt1 = conn.prepareStatement(insertSQL1);
            stmt1.setString(2, "David Adams"); // Name
            stmt1.setString(3, "david@example.com"); // Email
            stmt1.setString(4,          "B+");          //          Grade
            stmt1.executeUpdate();
            System.out.println("Inserted record 1.");

            // 5. Insert Record 2
            String insertSQL2 = "INSERT INTO students (id, name, email, grade)
VALUES (?, ?, ?, ?)";
            PreparedStatement     stmt2     =     conn.prepareStatement(insertSQL2);
            stmt2.setInt(1, 5); // ID
            stmt2.setString(2, "Eva Green"); // Name stmt2.setString(3,
            "eva@example.com"); // Email
            stmt2.setString(4, "A"); // Grade stmt2.executeUpdate();
            System.out.println("Inserted record 2.");

            // Commit transaction if no error
            conn.commit();
            System.out.println("Transaction committed successfully.");

        } catch (SQLException e) {
            System.err.println("Error occurred, rolling back transaction.");
            e.printStackTrace(); try { if (conn != null) { conn.rollback(); //
            Rollback transaction
                System.out.println("Transaction rolled back successfully."); }
            } catch (SQLException rollbackEx) { rollbackEx.printStackTrace();
            }
        } catch (ClassNotFoundException e) {
            e.printStackTrace();
        } finally { try { if (conn != null) { conn.setAutoCommit(true); //
            Restore default auto-commit
behavior
                conn.close();
              }

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

OUTPUT :

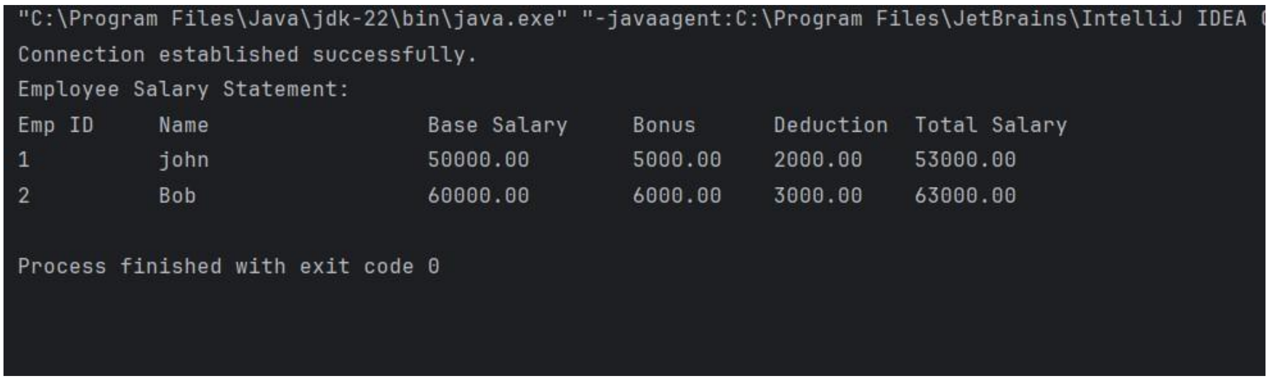


```
"C:\Program Files\Java\jdk-22\bin\java.exe" "-javaagent:C:\Program F
Connection established successfully.
Inserted record 1.
Inserted record 2.
Transaction committed successfully.

Process finished with exit code 0
```

**1.4 Implement a program to handle different types of JDBC exceptions effectively. Write JDBC Program to calculate Employee salary and print the salary statement in tabular form by selecting the details from database table (Emp_Sal) using Prepared Statement Ans:-** import java.sql.*; public class practical4 { public static void main(String[] args) {

```
        String url = "jdbc:mysql://localhost:3306/company_db"; // Replace with your
database name
        String username = "root"; // Replace with your MySQL username
        String password = "1234567890"; // Replace with your MySQL password

        Connection conn = null;
        PreparedStatement pstmt = null;
        ResultSet rs = null;

        try {
            // 1. Register JDBC Driver
            Class.forName("com.mysql.cj.jdbc.Driver");

            // 2. Open Connection conn = DriverManager.getConnection(url,
            username,      password);      System.out.println("Connection
            established successfully.");

            // 3. Prepare SQL Query with PreparedStatement
            String selectSQL = "SELECT emp_id, emp_name, base_salary, bonus,
deduction FROM Emp_Sal"; pstmt = conn.prepareStatement(selectSQL);
            // 4. Execute the query rs =
            pstmt.executeQuery();

            // 5. Display salary statement in tabular form
            System.out.println("Employee Salary Statement:");
            System.out.printf("%-10s %-20s %-15s %-10s %-10s %-10s%n",
            "Emp ID", "Name", "Base Salary", "Bonus", "Deduction", "Total
Salary");

          // 6. Process the ResultSet while
          (rs.next()) { int empId =
          rs.getInt("emp_id");
            String empName = rs.getString("emp_name");
            double baseSalary = rs.getDouble("base_salary");
            double bonus = rs.getDouble("bonus"); double
            deduction = rs.getDouble("deduction");

            // Calculate the total salary
            double totalSalary = baseSalary + bonus - deduction;


            // Print the salary statement
            System.out.printf("%-10d %-20s %-15.2f %-10.2f %-10.2f %-10.2f%n",
          empId, empName, baseSalary, bonus, deduction, totalSalary); }
        } catch (SQLException e) {
          // Handle SQL exceptions
          System.err.println("SQL Error: " + e.getMessage()); e.printStackTrace();
        } catch (ClassNotFoundException e) {
          // Handle ClassNotFound exception (for JDBC Driver)
          System.err.println("JDBC Driver not found: " + e.getMessage());
          e.printStackTrace();
        } catch (Exception e) {
          // Catch any other exceptions
          System.err.println("Unexpected error: " + e.getMessage());
          e.printStackTrace();
        } finally {
          try {
            // 7. Close resources if (rs !=
            null) rs.close(); if (pstmt !=
            null) pstmt.close(); if (conn !=
            null) conn.close();
          } catch (SQLException e) {
            System.err.println("Error closing resources: " + e.getMessage());
            e.printStackTrace();}
        }
    }
}
```

OUTPUT:



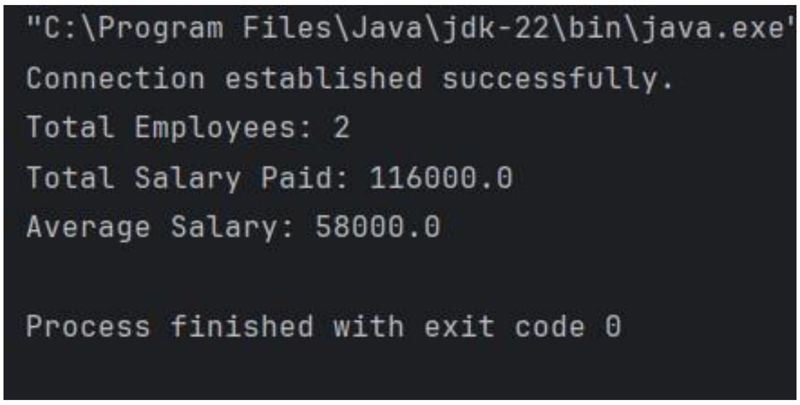
```
"C:\Program Files\Java\jdk-22\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA
Connection established successfully.
Employee Salary Statement:
Emp ID     Name                 Base Salary     Bonus      Deduction  Total Salary
1          john                 50000.00        5000.00    2000.00    53000.00
2          Bob                  60000.00        6000.00    3000.00    63000.00

Process finished with exit code 0
```

**1.5. Write a program to perform aggregation functions (e.g., COUNT, SUM,AVERAGE) on data retrieved from a database.**

**Ans:-** import java.sql.*;

```
public class practical5 {

    public static void main(String[] args) {
        String url = "jdbc:mysql://localhost:3306/company_db"; // Replace with your
database name
        String username = "root"; // Replace with your MySQL username
        String password = "1234567890"; // Replace with your MySQL password

        Connection conn = null;
        Statement stmt = null;
        ResultSet rs = null;

        try {
            // 1. Register JDBC Driver
            Class.forName("com.mysql.cj.jdbc.Driver");

            // 2. Open Connection conn = DriverManager.getConnection(url,
            username,      password);      System.out.println("Connection
            established successfully.");

            // 3. Create Statement stmt =
            conn.createStatement(); // 4.
            Perform Aggregation Queries
            // Count the number of employees
            String countSQL = "SELECT COUNT(*) AS total_employees FROM
Emp_Sal"; rs = stmt.executeQuery(countSQL); if (rs.next()) { int
            totalEmployees = rs.getInt("total_employees");
            System.out.println("Total Employees: " + totalEmployees); }
            // Sum of all salaries (Base salary + Bonus - Deduction)
            String sumSQL = "SELECT SUM(base_salary + bonus - deduction) AS
    total_salary FROM Emp_Sal"; rs = stmt.executeQuery(sumSQL);
            if      (rs.next())     {     double     totalSalary      =
            rs.getDouble("total_salary");   System.out.println("Total
            Salary Paid: " + totalSalary); }

            // Average Salary (Base salary + Bonus - Deduction)
            String avgSQL = "SELECT AVG(base_salary + bonus - deduction) AS
    avg_salary FROM Emp_Sal"; rs = stmt.executeQuery(avgSQL); if (rs.next()) {
    double avgSalary = rs.getDouble("avg_salary"); System.out.println("Average
    Salary: " + avgSalary); }
        } catch (SQLException e) {
            // Handle SQL exceptions
            System.err.println("SQL Error: " + e.getMessage()); e.printStackTrace();
        } catch (ClassNotFoundException e) {
            // Handle ClassNotFoundException (for JDBC Driver)
            System.err.println("JDBC  Driver  not  found:  "  +  e.getMessage());
            e.printStackTrace();
        } catch (Exception e) {
            // Catch any other exceptions
            System.err.println("Unexpected     error:     "     +     e.getMessage());
            e.printStackTrace();
        } finally {
            try {
              // 5. Close resources if (rs !=
              null)  rs.close();  if  (stmt  !=
              null) stmt.close(); if (conn !=
              null)  conn.close();  }  catch
              (SQLException e) {
              System.err.println("Error closing resources: " + e.getMessage());
              e.printStackTrace();
            }
        }
      }
    }
```

**OUTPUT:-**



```
"C:\Program Files\Java\jdk-22\bin\java.exe'
Connection established successfully.
Total Employees: 2
Total Salary Paid: 116000.0
Average Salary: 58000.0

Process finished with exit code 0
```

` `

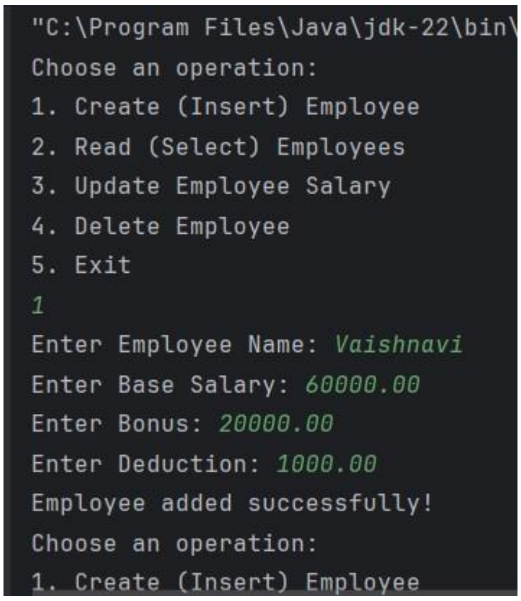
**1.6. Write a program to create a simple Java application that interacts with a database to perform CRUD operations (Create, Read, Update, Delete) on a specific table. Ans:-** import java.sql.*; import java.util.Scanner;

```
public class practical6 {

   // Database connection details
   private static final String URL = "jdbc:mysql://localhost:3306/company_db"; //
Replace with your database URL private static final String USER = "root";
   // Replace with your MySQL
username private static final String PASSWORD = "1234567890"; // Replace
   with your
MySQL password
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      Connection conn = null;
      PreparedStatement pstmt = null;
      Statement stmt = null;

      ResultSet rs = null; try

      {

         // Establish connection
         conn = DriverManager.getConnection(URL, USER, PASSWORD); stmt
         = conn.createStatement();

         // Show menu for CRUD operations
         while (true) {
            System.out.println("Choose an operation:");
            System.out.println("1. Create (Insert) Employee");
            System.out.println("2. Read (Select) Employees");
            System.out.println("3. Update Employee Salary");
```

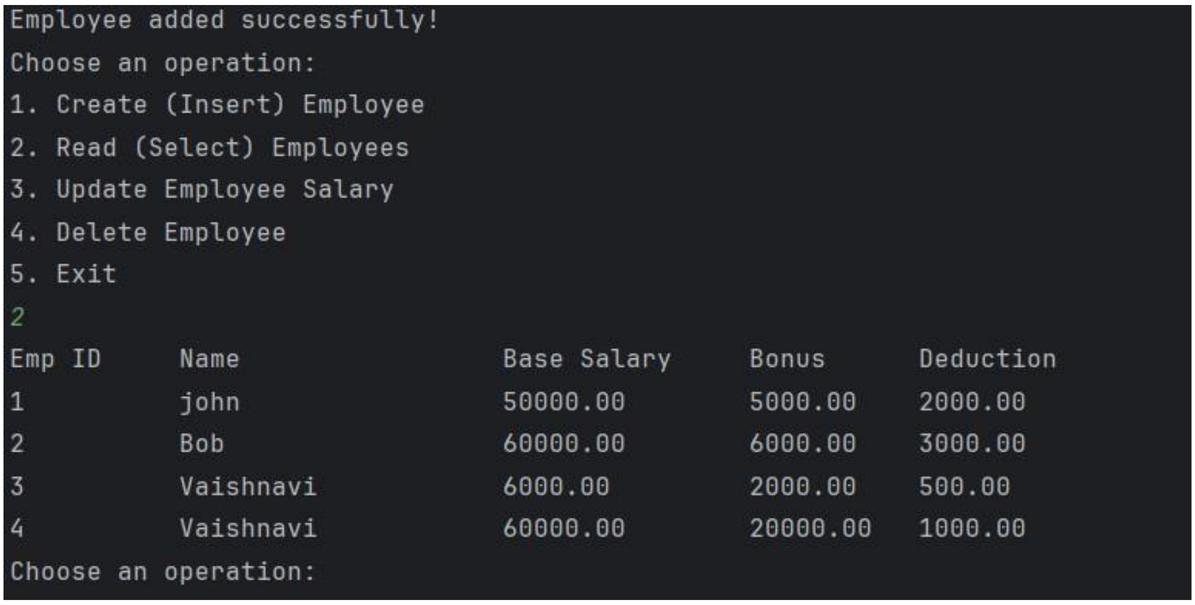
```
          System.out.println("4. Delete Employee");
          System.out.println("5. Exit"); int choice =
          scanner.nextInt();

          switch (choice) { case 1: // Create
             (Insert)       insertEmployee(conn,
             scanner); break;
             case 2: // Read (Select) readEmployees(stmt);
                break;
             case 3: // Update updateEmployee(conn,
                scanner);
                break;
             case 4: // Delete deleteEmployee(conn,
                scanner);
                break;
             case 5: // Exit
                System.out.println("Exiting...");
                return;
             default:
                System.out.println("Invalid choice! Try again."); }
       }

    } catch (SQLException e) {
       System.err.println("SQL Exception: " + e.getMessage());
    }  finally  {  try  {  if  (rs  !=  null)
       rs.close();   if   (pstmt   !=   null)
       pstmt.close();  if  (stmt  !=  null)
       stmt.close();  if  (conn  !=  null)
       conn.close();
       } catch (SQLException e) {
          System.err.println("Error closing resources: " + e.getMessage());
    }
 }

 // Create (Insert)
 private static void insertEmployee(Connection conn, Scanner scanner) { try
    {
       System.out.print("Enter Employee Name: ");
       String name = scanner.next();
       System.out.print("Enter   Base   Salary:   ");
       double baseSalary = scanner.nextDouble();
       System.out.print("Enter  Bonus:  ");  double
```

```
            bonus          =          scanner.nextDouble();
            System.out.print("Enter    Deduction:    ");
            double deduction = scanner.nextDouble();

            String insertSQL = "INSERT INTO Emp_Sal (emp_name, base_salary,
bonus, deduction) VALUES (?, ?, ?, ?)";
            PreparedStatement pstmt = conn.prepareStatement(insertSQL);
            pstmt.setString(1,    name);   pstmt.setDouble(2,    baseSalary);
            pstmt.setDouble(3,   bonus);   pstmt.setDouble(4,   deduction);
            pstmt.executeUpdate();
            System.out.println("Employee added successfully!");
        } catch (SQLException e) {
            System.err.println("Error while inserting: " + e.getMessage());
        }
    }
    // Read (Select)
    private static void readEmployees(Statement stmt) { try
        {
            String selectSQL = "SELECT * FROM Emp_Sal"; ResultSet
            rs = stmt.executeQuery(selectSQL);
            System.out.printf("%-10s %-20s %-15s %-10s %-10s%n", "Emp ID",
"Name",  "Base  Salary",  "Bonus",  "Deduction");  while
            (rs.next()) { int empId = rs.getInt("emp_id"); String
            name     =     rs.getString("emp_name");     double
            baseSalary  =  rs.getDouble("base_salary");  double
            bonus = rs.getDouble("bonus"); double deduction =
            rs.getDouble("deduction");
               System.out.printf("%-10d %-20s %-15.2f %-10.2f %-10.2f%n", empId,
name, baseSalary, bonus, deduction);
            }
        } catch (SQLException e) {
            System.err.println("Error while reading: " + e.getMessage());
        }
    }
    private static void updateEmployee(Connection conn, Scanner scanner) { try
        {
            System.out.print("Enter Employee ID to Update: "); int
            empId = scanner.nextInt();
            System.out.print("Enter New Base Salary: ");
            double baseSalary = scanner.nextDouble();
            System.out.print("Enter New Bonus: ");
            double bonus = scanner.nextDouble();
            System.out.print("Enter New Deduction: ");
            double deduction = scanner.nextDouble();
            String updateSQL = "UPDATE Emp_Sal SET base_salary = ?, bonus = ?,
    deduction = ? WHERE emp_id = ?";
            PreparedStatement pstmt = conn.prepareStatement(updateSQL);
            pstmt.setDouble(1,   baseSalary);   pstmt.setDouble(2,   bonus);
            pstmt.setDouble(3, deduction); pstmt.setInt(4, empId);
            int rowsUpdated = pstmt.executeUpdate();
            if (rowsUpdated > 0) {
               System.out.println("Employee salary updated successfully!");
            } else {
               System.out.println("No employee found with that ID."); }
         } catch (SQLException e) {
            System.err.println("Error while updating: " + e.getMessage());
         }
      }
      private static void deleteEmployee(Connection conn, Scanner scanner) { try
         {
            System.out.print("Enter Employee ID to Delete: "); int
            empId = scanner.nextInt();
            String deleteSQL = "DELETE FROM Emp_Sal WHERE emp_id = ?";
            PreparedStatement   pstmt   =   conn.prepareStatement(deleteSQL);
            pstmt.setInt(1, empId);
            int rowsDeleted = pstmt.executeUpdate();
            if (rowsDeleted > 0) {
               System.out.println("Employee deleted successfully!");
            } else {
               System.out.println("No employee found with that ID."); }
         } catch (SQLException e) {
            System.err.println("Error while deleting: " + e.getMessage());
         }
      }
   }
```

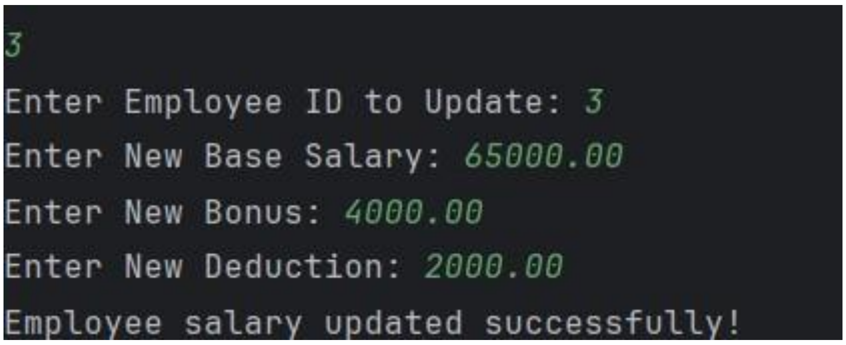
OUTPUT:-



```
"C:\Program Files\Java\jdk-22\bin\
Choose an operation:
1. Create (Insert) Employee
2. Read (Select) Employees
3. Update Employee Salary
4. Delete Employee
5. Exit
1
Enter Employee Name: Vaishnavi
Enter Base Salary: 60000.00
Enter Bonus: 20000.00
Enter Deduction: 1000.00
Employee added successfully!
Choose an operation:
1. Create (Insert) Employee
```



```
Employee added successfully!
Choose an operation:
1. Create (Insert) Employee
2. Read (Select) Employees
3. Update Employee Salary
4. Delete Employee
5. Exit
2
Emp ID     Name                 Base Salary     Bonus      Deduction
1          john                 50000.00        5000.00    2000.00
2          Bob                  60000.00        6000.00    3000.00
3          Vaishnavi            6000.00         2000.00    500.00
4          Vaishnavi            60000.00        20000.00   1000.00
Choose an operation:
```



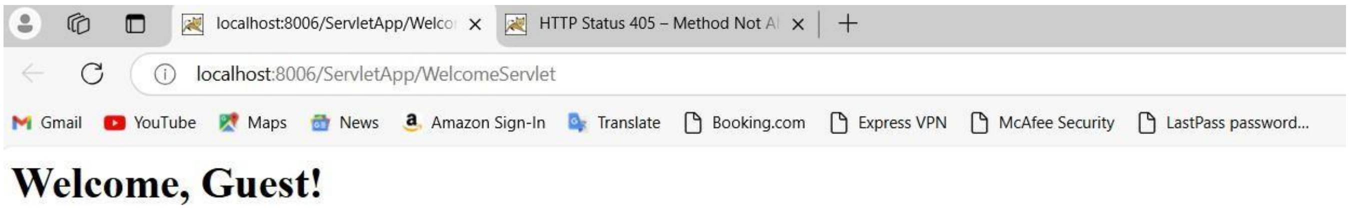
```
3
Enter Employee ID to Update: 3
Enter New Base Salary: 65000.00
Enter New Bonus: 4000.00
Enter New Deduction: 2000.00
Employee salary updated successfully!
```

## Assignment 2 : Programs On JAVA Servlet

**1.Design a simple servlet that displays a welcome message with the user's name retrieved from request parameters Ans:-**

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

/**
    *       Servlet implementation class WelcomeServlet
 */
@WebServlet("/welcome") // Maps this servlet to the /welcome URL
public class WelcomeServlet extends HttpServlet { private static final
long serialVersionUID = 1L;

   /**
    *       @see HttpServlet#HttpServlet()
    */
   public WelcomeServlet() { super();
   }

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

      // Retrieve the user's name from request parameters String
      name = request.getParameter("name"); if (name == null ||
      name.trim().isEmpty()) { name = "Guest"; // Default to "Guest"
      if no name is provided
      }
      // Generate a welcome message
      response.getWriter().append("<html><body>");
```

```
        response.getWriter().append("<h1>Welcome, " + name + "!</h1>");
        response.getWriter().append("</body></html>");
    }


    /**
     *      @see      HttpServlet#doPost(HttpServletRequest      request,
HttpServletResponse response)
     */
    protected void doPost(HttpServletRequest request, HttpServletResponse
response) throws ServletException, IOException { doGet(request,
        response); // Reuse doGet for POST requests
    }
}
```



localhost:8006/ServletApp/Welco × HTTP Status 405 – Method Not A ×

localhost:8006/ServletApp/WelcomeServlet

Gmail YouTube Maps News Amazon Sign-In Translate Booking.com Express VPN McAfee Security LastPass password...

Welcome, Guest!

**2 Implement a servlet that handles a login form and validates user credentials against a database.**

**Ans:-**

**LoginServlet.java**

```
package com.loginapp;

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

```
//@WebServlet("/login")        public        class
LoginServlet extends HttpServlet {

    protected void doPost(HttpServletRequest request, HttpServletResponse
    response) throws ServletException, IOException {
        String username = request.getParameter("username");
        String password = request.getParameter("password");

        // Database credentials and connection details
        String dbURL = "jdbc:mysql://localhost:3306/yourdb";
        String dbUser = "yourusername";
        String dbPass = "yourpassword";

        // SQL query to check the credentials
        String sql = "SELECT * FROM users WHERE username = ? AND
password = ?";

        // Initialize response writer response.setContentType("text/html");
        PrintWriter out = response.getWriter();

        // Database connection and validation try
        {
            // Connect to the database
            Connection connection = DriverManager.getConnection(dbURL,
dbUser, dbPass);
            PreparedStatement stmt = connection.prepareStatement(sql);
            stmt.setString(1, username); stmt.setString(2, password);

            // Execute query
            ResultSet rs = stmt.executeQuery();

            // Check if user exists if
            (rs.next()) {
                // Successful login
                out.println("<h2>Login Successful</h2>");
            } else {
                // Invalid credentials
                out.println("<h2>Invalid Username or Password</h2>");
            }

            // Close the connection
            rs.close();
            stmt.close();
            connection.close();
        }  catch  (Exception  e)  {  out.println("<h2>Error:  "  +
            e.getMessage() + "</h2>");
        }
    }
}
```

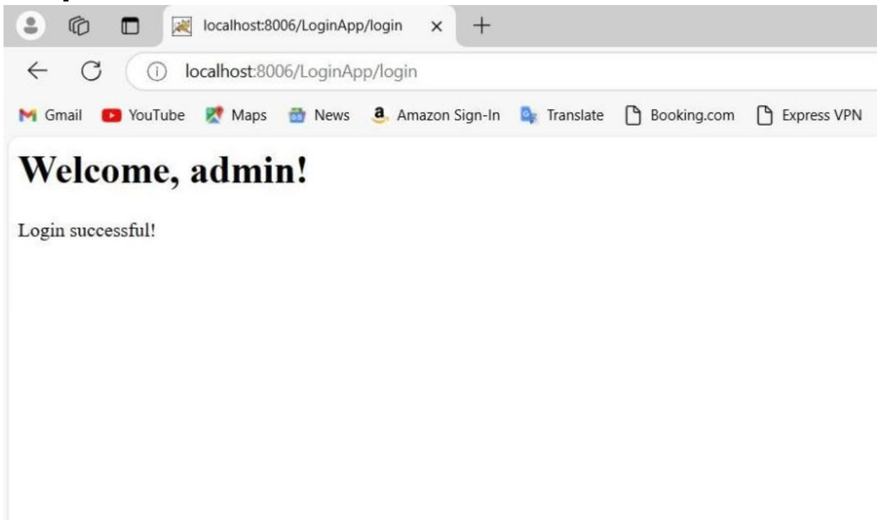
**Login.html**

```
<!DOCTYPE html>
<html lang="en">

<body>
    <h2>Login</h2>
    <form action="/LoginApp/login" method="POST">
        <label for="username">Username:</label><br>
        <input type="text" id="username" name="username" required><br><br>

        <label for="password">Password:</label><br>
        <input        type="password"        id="password"        name="password"
required><br><br>

        <input type="submit" value="Login">
    </form>
</body>
</html>
```

**Web.xml**

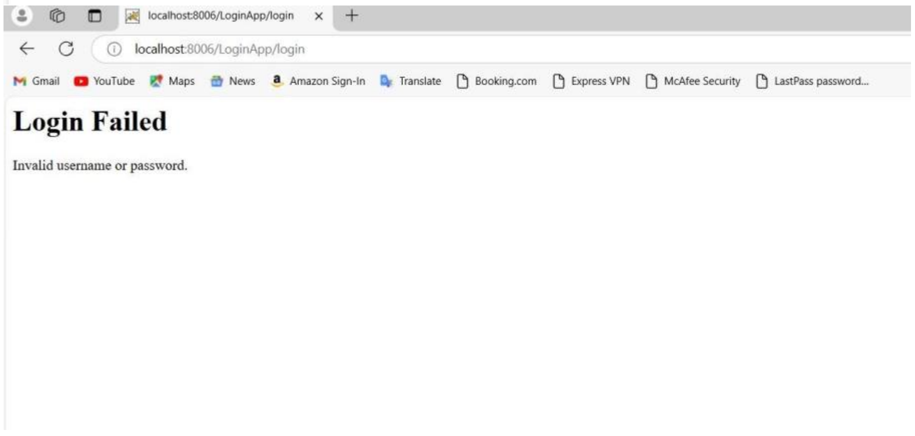
```
<element>
<web-app>

    <servlet>
        <servlet-name>LoginServlet</servlet-name>
        <servlet-class>com.loginapp.LoginServlet</servlet-class>
    </servlet>
    <servlet-mapping>
        <servlet-name>LoginServlet</servlet-name>
        <url-pattern>/login</url-pattern>
    </servlet-mapping>
</web-app>
</element>
```

**Outputs:-**



Welcome, admin!

Login successful!



Login Failed

Invalid username or password.

**3 Create a servlet that utilizes session management to maintain a shopping cart for an online store.**

**Ans:-**

**Loginservlet.java**

```
package com.shoppingcart;

import      jakarta.servlet.*;
import
jakarta.servlet.http.*;
import java.io.*;

public   class   LoginServlet   extends   HttpServlet   {   protected   void
   doPost(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
      String username = request.getParameter("username");
```

```
        String password = request.getParameter("password"); //
        Simple validation (use database for production)
        if ("admin".equals(username) && "password123".equals(password)) {
            HttpSession session = request.getSession(); session.setAttribute("user",
            username);
            response.sendRedirect("cart"); // Redirect to the shopping cart page
        } else { response.sendRedirect("login.html"); // Redirect to login
            page if
authentication fails
        }
    }
}
```

**Cartservleyt.java**

```
package  com.shoppingcart;
import      jakarta.servlet.*;
import
jakarta.servlet.http.*;
import  java.io.*;  import
java.util.*;

public class CartServlet extends HttpServlet {
    @SuppressWarnings("unchecked")              protected               void
        doGet(HttpServletRequest request, HttpServletResponse
response) throws ServletException, IOException { HttpSession
        session = request.getSession(false); if (session == null ||
        session.getAttribute("user")         ==         null)         {
        response.sendRedirect("login.html"); return;
        }

        // Fetch the shopping cart from the session
        List<String> cart = (List<String>) session.getAttribute("cart");
        if   (cart   ==   null)   {   cart   =   new   ArrayList<>();
        session.setAttribute("cart", cart);
        }
        //   Display   the   shopping   cart
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        out.println("<html><body>");
        out.println("<h1>Welcome,  "  +  session.getAttribute("user")  +  "</h1>");
        out.println("<h3>Your     Shopping     Cart</h3>");     out.println("<table
        border='1'><tr><th>Product</th><th>Action</th></tr>");       for       (String
        product   :   cart)   {   out.println("<tr><td>"   +   product   +   "</td><td><a
        href='cart?remove=" +
product + "'>Remove</a></td></tr>");
        }
        out.println("</table>");
        out.println("<br><a             href='index.html'>Continue             Shopping</a>");
        out.println("</body></html>");
    }

    @SuppressWarnings("unchecked")                  protected                  void
         doPost(HttpServletRequest request, HttpServletResponse
response) throws ServletException, IOException {
        // Adding item to cart
        String product = request.getParameter("product");
        HttpSession session = request.getSession();
        List<String> cart = (List<String>) session.getAttribute("cart");
        if   (cart   ==   null)   {   cart   =   new   ArrayList<>();
        session.setAttribute("cart", cart); }

        if (product != null) { cart.add(product); // Add selected
        product to the cart }


        response.sendRedirect("cart"); // Redirect to the cart page to view updated cart
    }
}
```

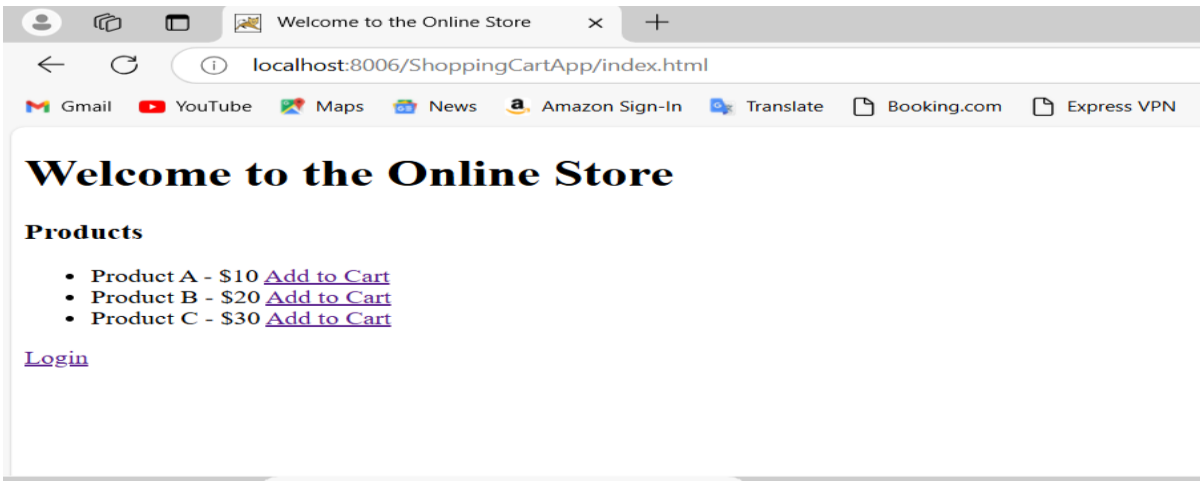
**Index.html**

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Welcome to the Online Store</title>
</head>
<body>
   <h1>Welcome to the Online Store</h1>
   <h3>Products</h3>
   <ul>
      <li>Product A - $10 <a href="cart?product=Product A">Add to
Cart</a></li>
      <li>Product B - $20 <a href="cart?product=Product B">Add to
```

```
Cart</a></li>
        <li>Product C - $30 <a href="cart?product=Product C">Add to
Cart</a></li>
    </ul>
    <a href="login.html">Login</a>
</body>
</html>
```

**Login.html**

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Login</title>
</head>
<body>
    <h1>Login to Your Account</h1>
    <form action="login" method="POST">
        <label for="username">Username:</label>
        <input type="text" id="username" name="username" required><br><br>
        <label for="password">Password:</label>
        <input type="password" id="password" name="password"
required><br><br>
        <button type="submit">Login</button>
    </form>
</body>
</html>
```


Welcome to the Online Store

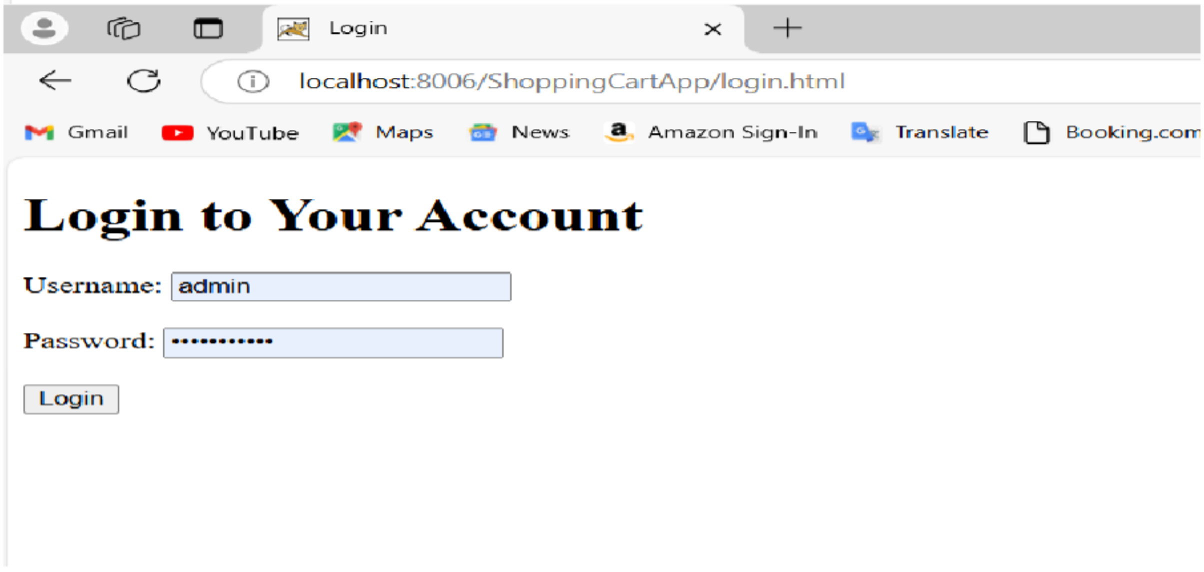
localhost:8006/ShoppingCartApp/index.html

Welcome to the Online Store

Products

- Product A - $10 Add to Cart
- Product B - $20 Add to Cart
- Product C - $30 Add to Cart

Login


Login

localhost:8006/ShoppingCartApp/login.html

Login to Your Account

Username: admin

Password: ••••••••••••

Login

**4 Write a servlet Program to calculate the addition of two numbers and print the result.(Eg:Addition of two numbers=50)**

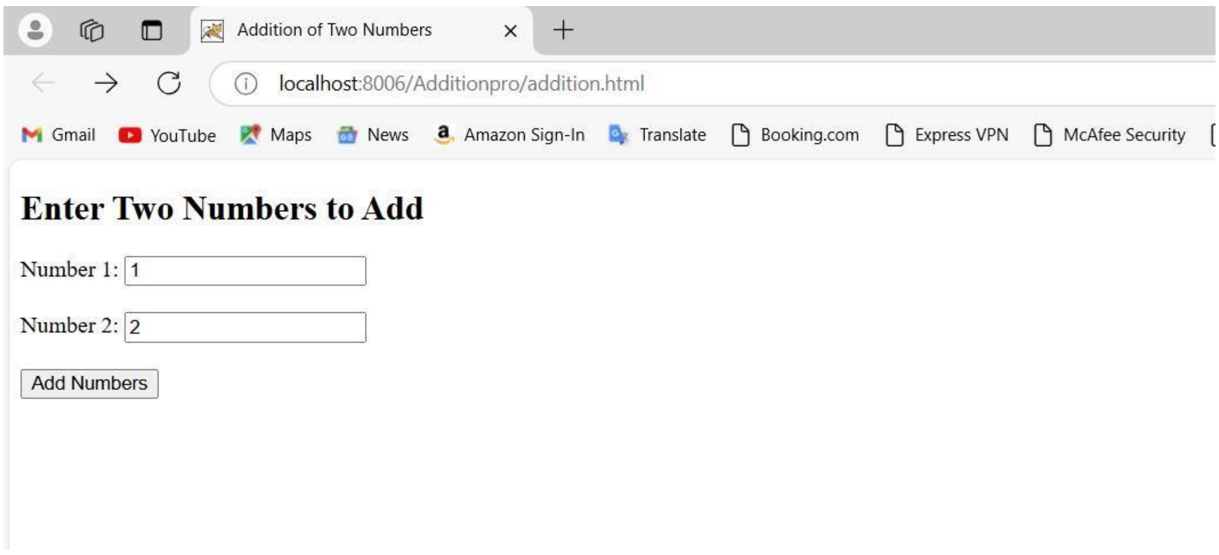
**Ans:-**

**Additionservlet.java**

```
package  com.addition;
import jakarta.servlet.*;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.*; import
java.io.*;
@WebServlet("/AdditionServlet")    public    class
AdditionServlet extends HttpServlet {


    @Override
    protected void doPost(HttpServletRequest request, HttpServletResponse
response) throws ServletException, IOException {
        String num1Str = request.getParameter("num1");
        String num2Str = request.getParameter("num2");
        int num1 = Integer.parseInt(num1Str); int
        num2 = Integer.parseInt(num2Str);

        int sum = num1 + num2;

        response.setContentType("text/html"); PrintWriter
        out = response.getWriter();


        out.println("<html><body>");
        out.println("<h2>Result</h2>");
        out.println("Addition of " + num1 + " and " + num2 + " = " + sum);
        out.println("<br><br>");
        out.println("<a          href='addition.html'>Go          back</a>");
        out.println("</body></html>");
    }
}
```

**Addition.html**

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta  name="viewport"  content="width=device-width,  initial-scale=1.0">
    <title>Addition of Two Numbers</title>
</head>
<body>
    <h2>Enter Two Numbers to Add</h2>
    <form action="AdditionServlet" method="POST">
        <label for="num1">Number 1:</label>
        <input type="number" id="num1" name="num1" required><br><br>

        <label for="num2">Number 2:</label>
        <input type="number" id="num2" name="num2" required><br><br>

        <input type="submit" value="Add Numbers"> </form>
</body>
</html>
```

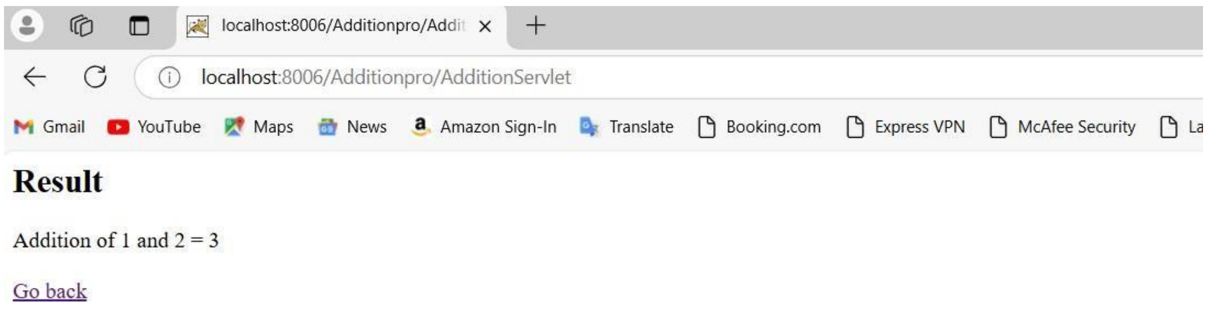

Addition of Two Numbers

localhost:8006/Additionpro/addition.html

Enter Two Numbers to Add

Number 1: 1

Number 2: 2


localhost:8006/Additionpro/AdditionServlet

Result

Addition of 1 and 2 = 3

Go back

**5. Write a Servlet Program to create a registration form using in html and CSS and print the message Registration is successful Ans:-**

**RegistrationServlet.java**

```
package com.registration;
import jakarta.servlet.*;
import jakarta.servlet.annotation.WebServlet;
import jakarta.servlet.http.*; import
java.io.*;

@WebServlet("/RegistrationServlet")    public    class
RegistrationServlet extends HttpServlet {


   @Override
   protected void doPost(HttpServletRequest request, HttpServletResponse
response) throws ServletException, IOException {
       // Get form data
       String name = request.getParameter("name");
       String email = request.getParameter("email");
```

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

        // Process registration (you can store it in a database or session, for now
    we just show success)

        // Set the response content type to HTML
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();

        // Display success message out.println("<html><body>");
        out.println("<h2>Registration Successful!</h2>");
        out.println("<p>Thank you, " + name + "! Your registration was
    successful.</p>"); out.println("<br><br>");
        out.println("<a href='register.html'>Go back to Registration</a>");
        out.println("</body></html>");
      }
    }
```

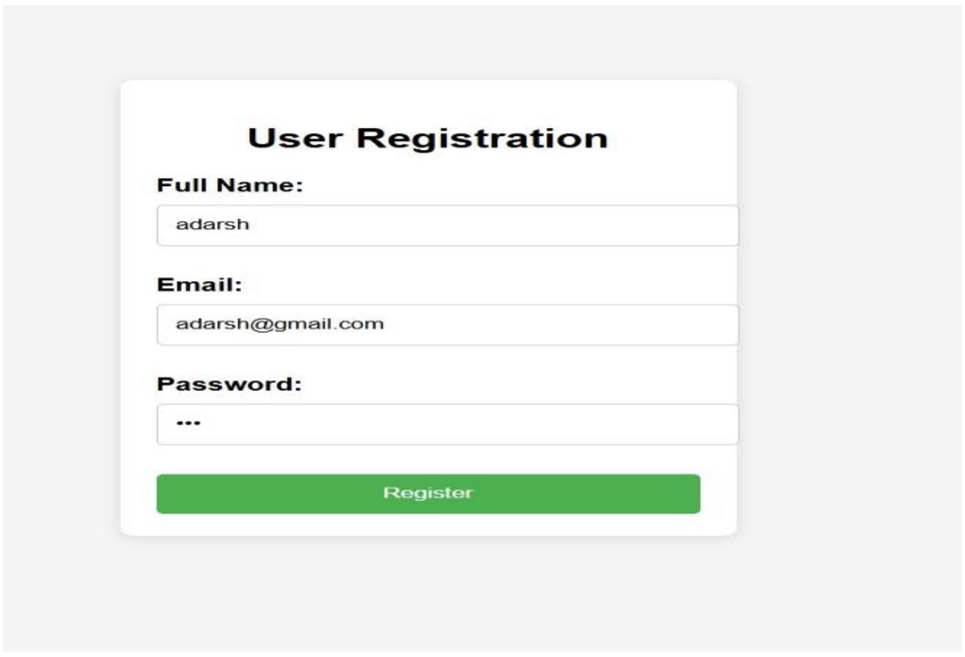
**Register.html**

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>User Registration</title>
  <link rel="stylesheet" href="style.css">
</head>
<body>
  <div class="container">
    <h2>User Registration</h2>
    <form action="RegistrationServlet" method="POST"> <label
      for="name">Full Name:</label>
      <input type="text" id="name" name="name" required><br><br>

      <label for="email">Email:</label>
      <input type="email" id="email" name="email" required><br><br>

      <label for="password">Password:</label>
      <input type="password" id="password" name="password"
required><br><br>
      <input type="submit" value="Register">
    </form>
  </div>
```

```
</body>
</html>
```

**Style.css body** { font-family: *Arial, sans-serif*; background-color: *#f4f4f4*; display: *flex*; justify-content: *center*; align-items: *center*; height: *100vh*;
    margin: *0*;
}

```
.container { background-color: #fff; padding:
    20px; border-radius: 8px; box-shadow: 0
    2px 10px rgba(0, 0, 0, 0.1); width: 300px;
}

h2  {  text-align:  center;
    margin-bottom: 20px;
}

label  {  font-weight:
    bold;
}
input[type="text"], input[type="email"], input[type="password"] {
    width: 100%; padding: 10px; margin: 8px 0;
    border: 1px solid #ccc;
    border-radius: 4px;
}
input[type="submit"] {
    width: 100%; padding: 10px;
    background-color: #4CAF50;
    color:            white;
    border:           none;
    border-radius: 4px;
    cursor: pointer;
}
input[type="submit"]:hover {
    background-color: #45a049;
}
```

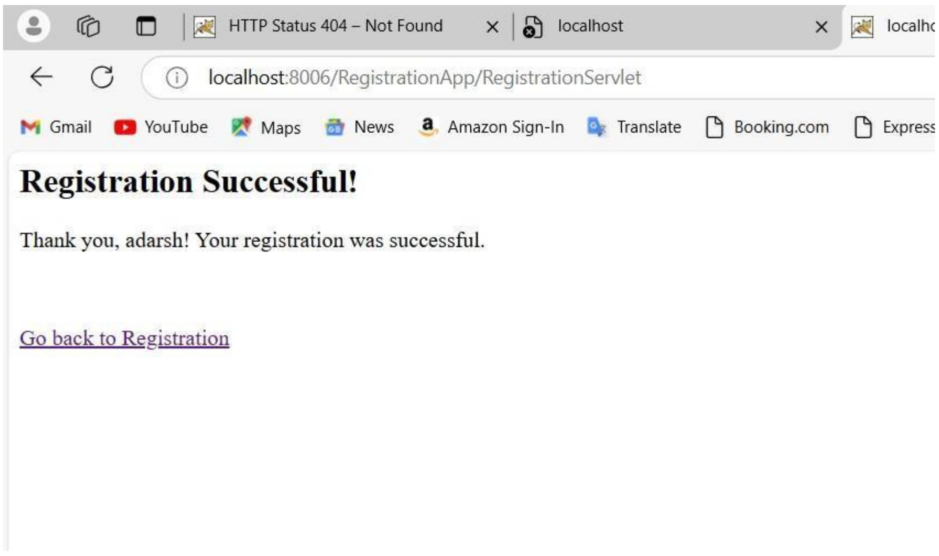


User Registration

Full Name: adarsh

Email: adarsh@gmail.com

Password: •••



HTTP Status 404 – Not Found
localhost
localhc
localhost:8006/RegistrationApp/RegistrationServlet
Gmail
YouTube
Maps
News
Amazon Sign-In
Translate
Booking.com
Express

Registration Successful!

Thank you, adarsh! Your registration was successful.

Go back to Registration

# Assignment 3: Java Server Pages(JSP)

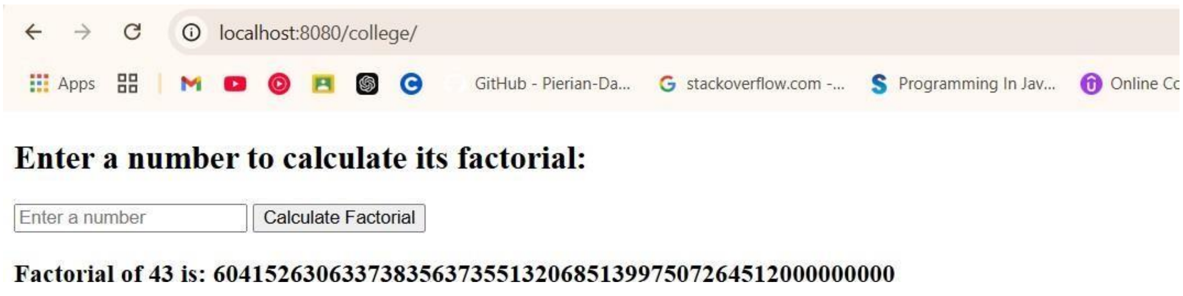
**1. Write a JSP program calculates factorial of an integer number, while the input is taken from an HTML form**

**Ans:-**

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"%>
<%@ page import="java.math.BigInteger" %>
<!DOCTYPE html>
<html>
<head>
   <title>Factorial Calculator</title>
</head>
<body>
   <h2>Enter a number to calculate its factorial:</h2>
   <form action="" method="POST">
      <input type="number" name="number" placeholder="Enter a number"
required>
      <button type="submit">Calculate Factorial</button> </form>

   <%
      // Get the number from the request parameter
      String numberStr = request.getParameter("number");

      // Check if the number parameter is provided if
      (numberStr != null && !numberStr.isEmpty()) {
      try {
            // Convert the input to an integer int
            number = Integer.parseInt(numberStr);

            // Initialize the factorial result as 1
            BigInteger factorial = BigInteger.ONE;

            // Loop to calculate the factorial for (int i = 1; i <=
            number; i++) { factorial =
            factorial.multiply(BigInteger.valueOf(i)); }


            // Display the result
out.println("<h3>Factorial of " + number + " is: " + factorial.toString() + "</h3>");
```

```
        }      catch      (NumberFormatException      e)      {
        out.println("<h3>Please enter a valid integer.</h3>"); }
        out.println("<h3>Please enter a number to calculate its factorial.</h3>"); }
    %>
</body>
</html>
```

**OUTPUT:**


localhost:8080/college/

**Enter a number to calculate its factorial:**

Enter a number | Calculate Factorial

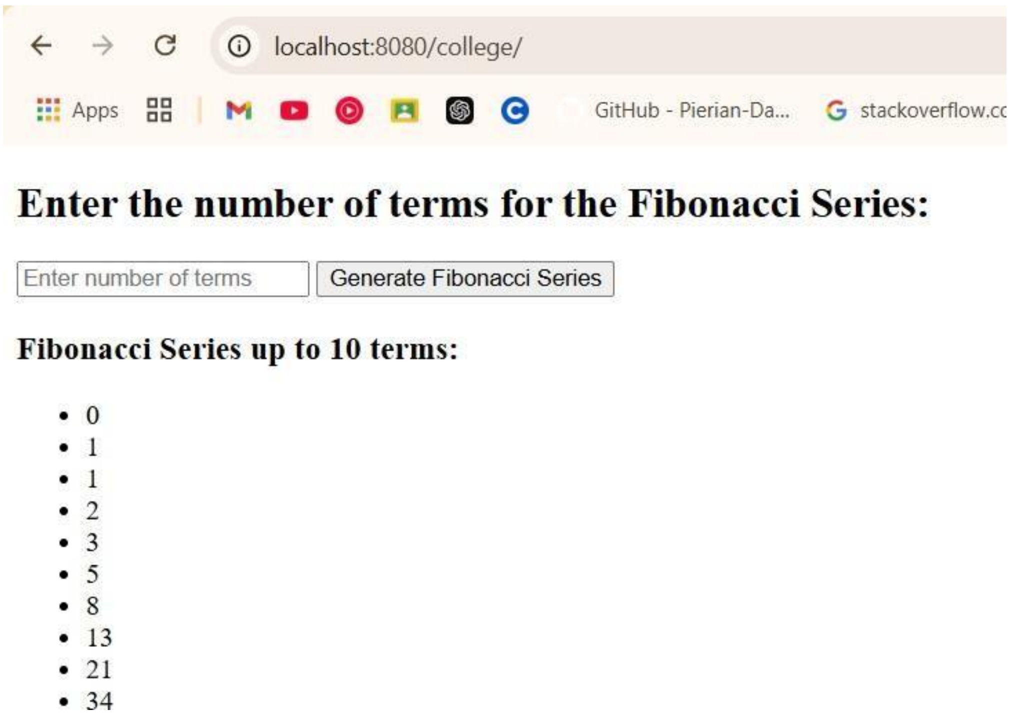
**Factorial of 43 is: 60415263063373835637355132068513997507264512000000000**

**2. Write a JSP program to generate the Fibonacci series up to a particular term, while the input is taken from an HTML form.**

**Ans:-**

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"%>
<!DOCTYPE html>
<html>
<head>
    <title>Fibonacci Series Generator</title>
</head>
<body>
    <h2>Enter the number of terms for the Fibonacci Series:</h2>
    <form action="" method="POST">
        <input type="number" name="terms" placeholder="Enter number of terms"
required>
        <button type="submit">Generate Fibonacci Series</button> </form>

    <%
        // Get the number of terms from the request parameter String
        termsStr = request.getParameter("terms");

        // Check if the terms parameter is provided if
        (termsStr != null && !termsStr.isEmpty()) {
        try {
            // Convert the input to an integer int
            terms = Integer.parseInt(termsStr); //
            Initialize the first two Fibonacci
            numbers long first = 0, second = 1;

            // Print the Fibonacci series
            out.println("<h3>Fibonacci Series up to " + terms + "
            terms:</h3>"); out.println("<ul>"); for (int i = 1; i <= terms; i++) {
            out.println("<li>" + first + "</li>");
                long next = first + second; // next number in the series
                first = second; second = next;
            }
            out.println("</ul>");
        }     catch     (NumberFormatException     e)     {
        out.println("<h3>Please enter a valid integer.</h3>"); }
    } else { out.println("<h3>Please enter a number to generate the
        Fibonacci
series.</h3>");
    }
  %>
</body>
</html>
```

**OUTPUT:**

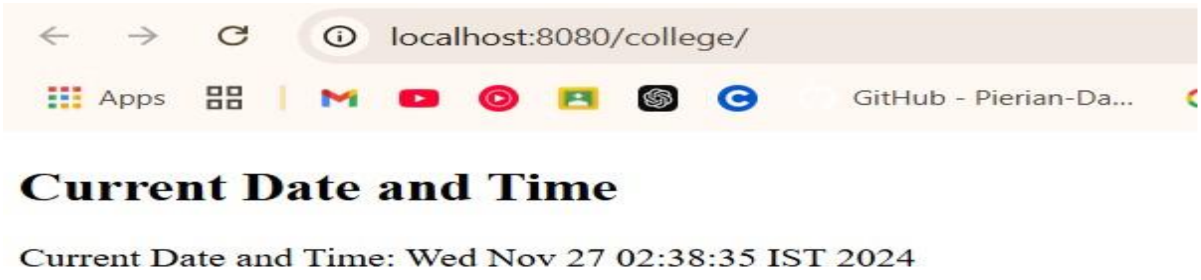


```
localhost:8080/college/

Enter the number of terms for the Fibonacci Series:

[Enter number of terms] [Generate Fibonacci Series]

Fibonacci Series up to 10 terms:

  • 0
  • 1
  • 1
  • 2
  • 3
  • 5
  • 8
  • 13
  • 21
  • 34
```

**3. Write a JSP program to display the System date and time.**
**Ans:-**

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1" %>
<!DOCTYPE html>
<html>
<head>
   <title>Current Date and Time</title>
</head>
<body>
   <h2>Current Date and Time</h2>
   <%
      // Get the current system date and time java.util.Date
      date = new java.util.Date();

      // Display the current date and time
      out.println("<p>Current Date and Time: " + date.toString() + "</p>");
   %>
</body>
</html>
```

**OUTPUT:**



Current Date and Time

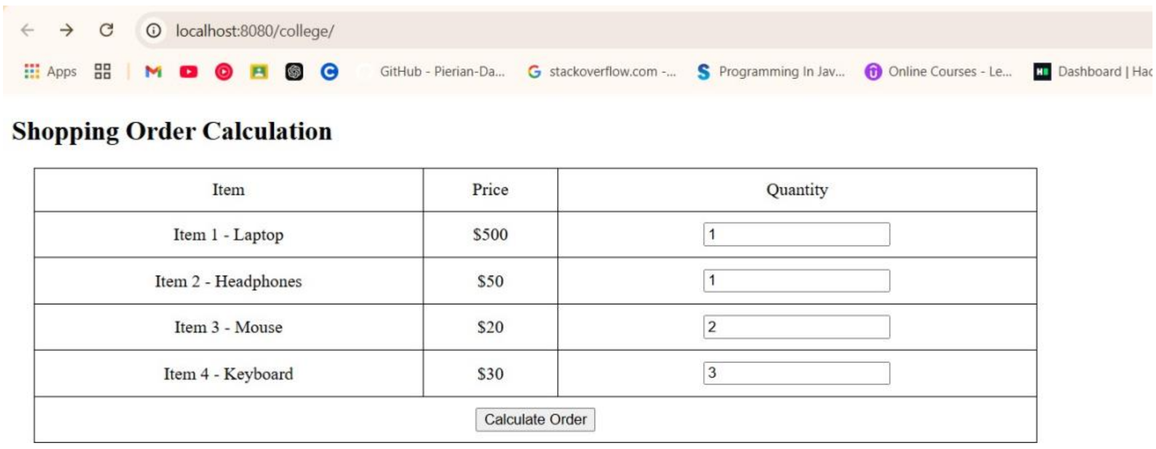
Current Date and Time: Wed Nov 27 02:38:35 IST 2024

**4. Write a JSP program to display a**
**Sample shopping Order calculation Form and display output in tabular form.**
**Ans:-**

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1" %>
<!DOCTYPE html>
<html>
<head>
   <title>Shopping Order Calculation</title>
   <style>    table    {
      width:       60%;
      margin: 20px;
```

```
            border-collapse: collapse;
        }
        table, th, td {
            border: 1px solid black;
        }  th,  td  {  padding:
        10px;      text-align:
        center;
        }
    </style>
</head>
<body>
    <h2>Shopping Order Calculation</h2>
    <!-- Shopping Form -->
    <form action="order.jsp" method="post">
        <table>
            <tr>
                <td>Item</td>
                <td>Price</td>
                <td>Quantity</td>
            </tr>
            <tr>
                <td>Item 1 - Laptop</td>
                <td>$500</td>
                <td><input  type="number"  name="item1"  value="0"  min="0"  /></td>
            </tr>
            <tr>
                <td>Item 2 - Headphones</td>
                <td>$50</td>
                <td><input  type="number"  name="item2"  value="0"  min="0"  /></td>
            </tr>
            <tr>
                <td>Item 3 - Mouse</td>
                <td>$20</td>
                <td><input type="number" name="item3" value="0" min="0" /></td>
            </tr>
            <tr>
                <td>Item 4 - Keyboard</td>
                <td>$30</td>
                <td><input type="number" name="item4" value="0" min="0" /></td>
            </tr>
            <tr>
                <td colspan="3" style="text-align: center;">
                <input type="submit" value="Calculate Order" /> </td>
            </tr>
        </table>
    </form>
    <%
        // Retrieving form values and calculating order total
        String item1Qty = request.getParameter("item1");
        String item2Qty = request.getParameter("item2"); String
        item3Qty = request.getParameter("item3");
        if (item1Qty != null && item2Qty != null && item3Qty != null && item4Qty
!= null) {
            // Converting to integers int item1 =
            Integer.parseInt(item1Qty); int item2
            = Integer.parseInt(item2Qty); int
            item3 = Integer.parseInt(item3Qty);
            int item4 =
            Integer.parseInt(item4Qty);
            //        Prices        int
            priceItem1 = 500; int
            priceItem2  =  50;  int
            priceItem3  =  20;  int
            priceItem4 = 30;
            // Calculating total cost for each item
            int totalItem1 = item1 * priceItem1;
            int totalItem2 = item2 * priceItem2;
            int totalItem3 = item3 * priceItem3;
            int totalItem4 = item4 * priceItem4;
            // Calculating final order total
            int totalOrder = totalItem1 + totalItem2 + totalItem3 + totalItem4;
    %>
    <!-- Displaying the order summary in tabular form -->
    <h3>Your Order Summary</h3>
    <table>
        <tr>
            <th>Item</th>
            <th>Quantity</th>
            <th>Price</th>
            <th>Total</th>
        </tr>
        <tr>
            <td>Item 1 - Laptop</td>
            <td><%= item1 %></td>
            <td>$500</td>
            <td>$<%= totalItem1 %></td>
        </tr>
        <tr>
            <td>Item 2 - Headphones</td>
            <td><%= item2 %></td>
            <td>$50</td>
            <td>$<%= totalItem2 %></td>
        </tr>
        <tr>
            <td>Item 3 - Mouse</td> <td><%=
            item3 %></td>
            <td>$20</td>
            <td>$<%= totalItem3 %></td>
        </tr>
        <tr>
            <td>Item 4 - Keyboard</td>
            <td><%= item4 %></td>
            <td>$30</td>
            <td>$<%= totalItem4 %></td>
        </tr>
        <tr>
            <td colspan="3"><strong>Total Order Cost</strong></td>
            <td><strong>$<%= totalOrder %></strong></td> </tr>
    </table>
    <% } %>
</body>
</html>
```

**OUTPUT:**



**Shopping Order Calculation**

| Item | Price | Quantity |
|---|---|---|
| Item 1 - Laptop | $500 | 1 |
| Item 2 - Headphones | $50 | 1 |
| Item 3 - Mouse | $20 | 2 |
| Item 4 - Keyboard | $30 | 3 |
| | Calculate Order | |

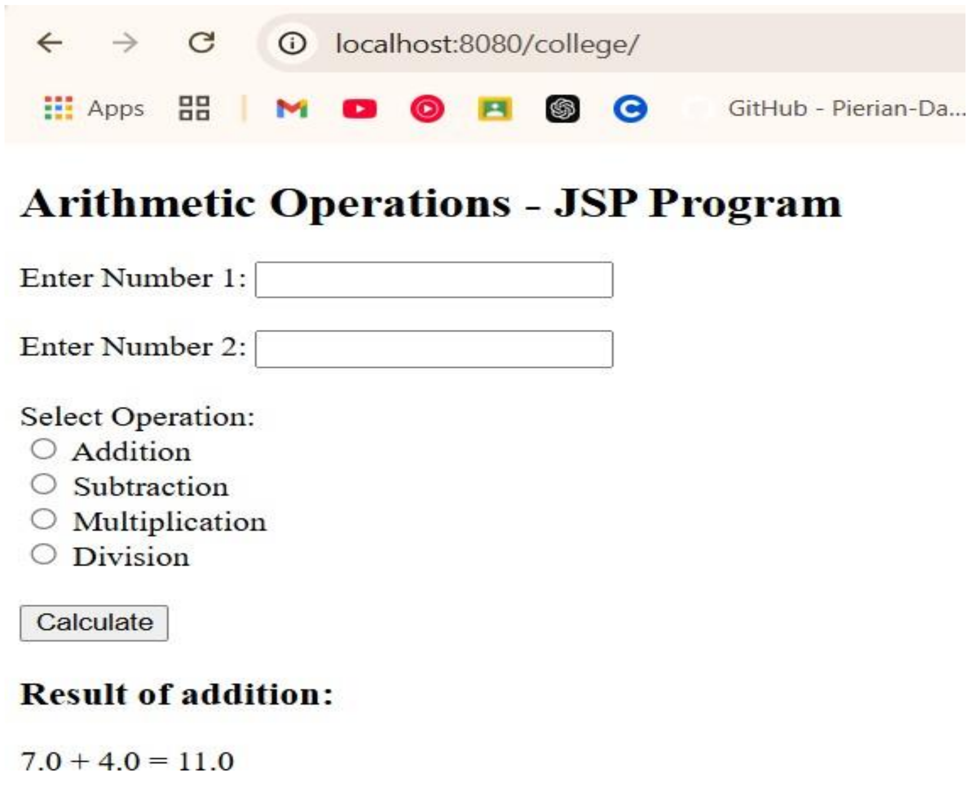
**5. Write a JSP program to perform Arithmetic operations such as Addition, Subtraction, Multiplication and Division. Design a HTML to accept two numbers in text box and radio buttons to display operations. On submit display result as per the selected operation on next page using JSP**

**Ans:-**

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
pageEncoding="ISO-8859-1"%>
<!DOCTYPE html>
<html>
<head>
   <title>Arithmetic Operations</title>
</head>
<body>
   <h2>Arithmetic Operations - JSP Program</h2>

   <form method="post">
      <!-- Input Fields -->
      <label for="num1">Enter Number 1:</label>
      <input type="number" name="num1" required><br><br>

      <label for="num2">Enter Number 2:</label>
      <input type="number" name="num2" required><br><br>

      <!-- Radio Buttons for Operations -->
      <label>Select Operation:</label><br>
      <input type="radio" name="operation" value="addition" required>
Addition<br>
      <input type="radio" name="operation" value="subtraction"> Subtraction<br>
      <input type="radio" name="operation" value="multiplication">
Multiplication<br>
      <input type="radio" name="operation" value="division"> Division<br><br>

      <input type="submit" value="Calculate">
   </form>
   <%
      // Only perform calculation if the form is submitted if
      (request.getMethod().equalsIgnoreCase("POST")) {
         // Retrieve numbers and operation from the form
         String num1Str = request.getParameter("num1");
         String num2Str = request.getParameter("num2");
         String operation = request.getParameter("operation");
```

```
          // Convert input values to numbers double
          num1 = Double.parseDouble(num1Str);
          double num2 =
          Double.parseDouble(num2Str); double result
          = 0; String errorMessage = "";

          // Perform arithmetic operation based on the selected radio button
          switch (operation) { case "addition":
                result = num1 + num2;
                break; case
             "subtraction":
             result = num1 -
             num2; break;
             case "multiplication": result
                = num1 * num2;
                break;
             case "division":
                if (num2 != 0) { result =
                   num1 / num2;
                } else { errorMessage = "Error: Division by zero is not
                   allowed!";
                } break;
             default:
                errorMessage = "Invalid operation."; }


          // Display the result or error message if
          (errorMessage.isEmpty()) {
   %>
             <h3>Result of <%= operation %>:</h3>
             <p><%= num1 %> <%= (operation.equals("addition") ? "+" :
operation.equals("subtraction") ? "-" : operation.equals("multiplication") ? "*" : "/")
%> <%= num2 %> = <%= result %></p>
   <%
          } else {
   %>
             <h3><%= errorMessage %></h3> <%
          }
      }
   %>


</body>
</html>
```

**OUTPUT:**


localhost:8080/college/

Arithmetic Operations - JSP Program

Enter Number 1:

Enter Number 2:

Select Operation:
○ Addition
○ Subtraction
○ Multiplication
○ Division

Calculate

Result of addition:

```
7.0 + 4.0 = 11.0
```

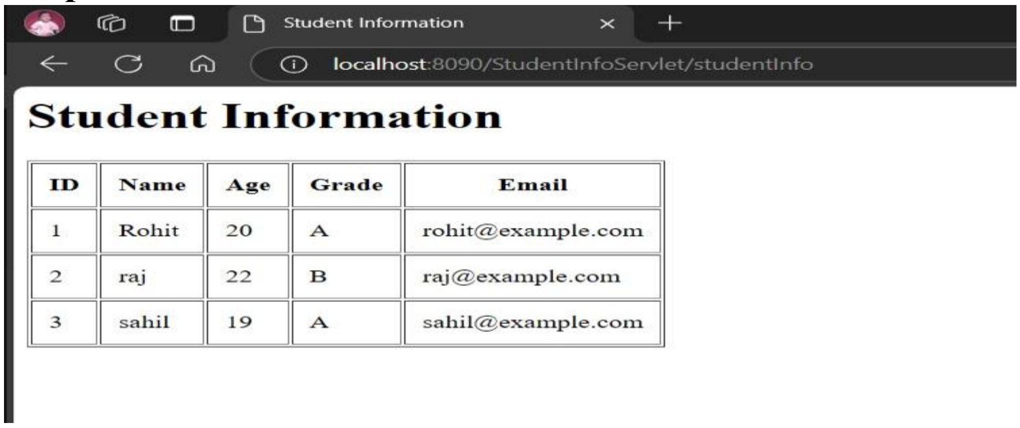
**6. Write a servlet Program for student information and display the information in tabular form by selecting the details from student database table. Studt.java**

**Ans:-** package com.example; import java.io.PrintWriter; import java.sql.Connection; import java.sql.DriverManager; import java.sql.ResultSet; import java.sql.Statement; import jakarta.servlet.ServletException; import jakarta.servlet.annotation.WebServlet; import jakarta.servlet.http.HttpServlet; import jakarta.servlet.http.HttpServletRequest; import jakarta.servlet.http.HttpServletResponse;

```
import java.io.IOException; import
java.sql.SQLException;
/**
 * Servlet implementation class StudentInfoServlet */
@WebServlet("/studentInfo")
public class StudentInfoServlet 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();

        // JDBC setup
        String jdbcURL = "jdbc:mysql://localhost:3306/student_db";
        String jdbcUsername = "root";
        String jdbcPassword = "Rohit@0801"; // Replace with your MySQL password

        try {
            // Establish connection
          Class.forName("com.mysql.cj.jdbc.Driver");
            Connection      connection      =       DriverManager.getConnection(jdbcURL,
jdbcUsername, jdbcPassword);

            // Query student details
            String sql = "SELECT * FROM students";
            Statement statement = connection.createStatement();
            ResultSet resultSet = statement.executeQuery(sql);

            // Display student details in a table out.println("<html><head><title>Student
Information</title></head><body>");
            out.println("<h1>Student      Information</h1>");
            out.println("<table                              border='1'
            cellpadding='10'>");

out.println("<tr><th>ID</th><th>Name</th><th>Age</th><th>Grade</th><th>Em
ail</th></tr>");

            while (resultSet.next()) { int id
                = resultSet.getInt("id");
                String name = resultSet.getString("name"); int
                age = resultSet.getInt("age");
                String grade = resultSet.getString("grade");
                String email = resultSet.getString("email");
                out.println("<tr>"); out.println("<td>" + id
                + "</td>"); out.println("<td>" + name +
                "</td>");   out.println("<td>"   +   age   +
                "</td>");   out.println("<td>"   +   grade   +
                "</td>");   out.println("<td>"   +   email   +
                "</td>"); out.println("</tr>");
            }
            out.println("</table>");
            out.println("</body></html>");

            resultSet.close();
            statement.close();
            connection.close();

        } catch (Exception e) {
            e.printStackTrace(); out.println("<p>Error: Unable to fetch data from
            the database.</p>"); out.println("<p>Details: " + e + "</p>");
        }
        }


    }
```

**Output:-**


Student Information

localhost:8090/StudentInfoServlet/studentInfo

**Student Information**

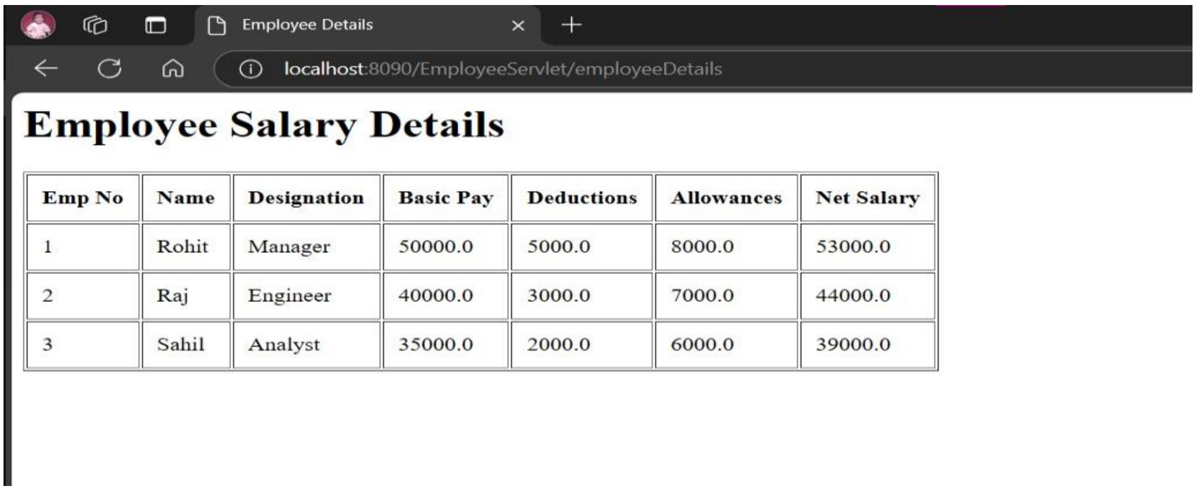
| ID | Name | Age | Grade | Email |
|---|---|---|---|---|
| 1 | Rohit | 20 | A | rohit@example.com |
| 2 | raj | 22 | B | raj@example.com |
| 3 | sahil | 19 | A | sahil@example.com |

**7. Write a Java Servlet program to read employee details including employee number (empno), name, designation, basic pay, deductions, and allowances, and then calculate and display the net salary. display the information in tabular form by selecting the details from Emp_sal database table.**

**Ans:- Emp.java** package com.example;

```
import      java.io.IOException;      import
java.io.PrintWriter;                  import
java.sql.Connection;                  import
java.sql.DriverManager;               import
java.sql.ResultSet;                   import
java.sql.Statement;                   import
jakarta.servlet.ServletException;     import
jakarta.servlet.annotation.WebServlet;
import      jakarta.servlet.http.HttpServlet;
import
```

```
jakarta.servlet.http.HttpServletRequest;
import
jakarta.servlet.http.HttpServletResponse;
import java.io.IOException;

/**
 * Servlet implementation class EmployeeServlet
 */
@WebServlet("/employeeDetails")
public class EmployeeServlet 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();

        // Database credentials
        String jdbcURL = "jdbc:mysql://localhost:3306/employee_db";
        String jdbcUsername = "root";
        String jdbcPassword = "Rohit@0801"; // Replace with your MySQL password

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

            // Establish connection
            Connection     connection     =     DriverManager.getConnection(jdbcURL,
jdbcUsername, jdbcPassword);

            // Query the employee salary details
            String sql = "SELECT * FROM Emp_sal";
            Statement statement = connection.createStatement();
            ResultSet resultSet = statement.executeQuery(sql);

            // Display employee details in a table
            out.println("<html><head><title>Employee
            Details</title></head><body>");     out.println("<h1>Employee     Salary
            Details</h1>");     out.println("<table     border='1'     cellpadding='10'>");
            out.println("<tr><th>Emp
No</th><th>Name</th><th>Designation</th><th>Basic
Pay</th><th>Deductions</th><th>Allowances</th><th>Net
        Salary</th></tr>"); while (resultSet.next()) { int empno =
        resultSet.getInt("empno");
          String name = resultSet.getString("name");
          String designation = resultSet.getString("designation");
          double basicPay = resultSet.getDouble("basic_pay");
          double deductions = resultSet.getDouble("deductions");
          double allowances = resultSet.getDouble("allowances");

          // Calculate net salary
          double netSalary = basicPay + allowances - deductions;


          // Display employee data
          out.println("<tr>"); out.println("<td>" +
          empno + "</td>"); out.println("<td>" +
          name + "</td>"); out.println("<td>" +
          designation + "</td>"); out.println("<td>"
          + basicPay + "</td>"); out.println("<td>" +
          deductions + "</td>"); out.println("<td>" +
          allowances + "</td>"); out.println("<td>" +
          netSalary + "</td>"); out.println("</tr>");
        }

        out.println("</table>");
        out.println("</body></html>");

        resultSet.close();
        statement.close();
        connection.close();
      } catch (Exception e) {
        e.printStackTrace(); out.println("<p>Error: Unable to fetch
        employee details.</p>"); out.println("<p>Details: " +
        e.getMessage() + "</p>");
      }}}
```
**Output:-**



## Employee Salary Details

| Emp No | Name | Designation | Basic Pay | Deductions | Allowances | Net Salary |
|---|---|---|---|---|---|---|
| 1 | Rohit | Manager | 50000.0 | 5000.0 | 8000.0 | 53000.0 |
| 2 | Raj | Engineer | 40000.0 | 3000.0 | 7000.0 | 44000.0 |
| 3 | Sahil | Analyst | 35000.0 | 2000.0 | 6000.0 | 39000.0 |

# Assignment 4: Java Persistence API

**4.1 Define and illustrate the concept of entity mapping in JPA.Explain how JPA maps Java classes (entities) to database tables.Provide an example of an entity class with annotations and its corresponding database table schema**

**ANS:**

**Entity Mapping in JPA (Java Persistence API)**

**Entity Mapping** in JPA refers to the process of linking a Java class (often called an **entity class**) to a database table. This mapping allows Java objects to be stored in and retrieved from a relational database. JPA provides a set of annotations to specify how the fields of the Java class correspond to the columns in the database table.

**How JPA Maps Java Classes to Database Tables**

1. **Entity Class**:
   ○ An entity class in JPA is a Java class that is mapped to a database table. ○ Each instance of the class represents a row in the corresponding table. ○ The class must be annotated with the @Entity annotation to indicate that it is an entity.
2. **Primary Key**:
   ○ Every entity class must have a primary key, which uniquely identifies each row. This is typically represented by a field annotated with @Id. ○ The @GeneratedValue annotation can be used to auto-generate the primary key values.
3. **Field to Column Mapping**:
   ○ Fields in the Java class represent columns in the database table. By default, JPA assumes that the field names correspond to column names, but this can be customized using the @Column annotation.
4. **Table Mapping**:
   ○ The @Table annotation allows you to specify the table name in the database if it differs from the class name.
5. **Relationships**:
   ○ JPA also supports mapping relationships between entities, such as One-to- One, One-to-Many, Many-to-One, and Many-to-Many, using annotations like @OneToMany, @ManyToOne, etc.

**Example of an Entity Class with Annotations**

Let's consider an entity class called Customer, which is mapped to a customers table in the database.

**Java Class (Entity):**

```
import javax.persistence.*;
@Entity
@Table(name = "customers") // Specifies the table name in the database public
class Customer {
```

```
@Id // Marks this field as the primary key
@GeneratedValue(strategy = GenerationType.IDENTITY) // Auto-generate the
            primary key value
private Long id;

@Column(name = "first_name", nullable = false) // Maps this field to the
            'first_name' column in the table
private String firstName;

@Column(name = "last_name", nullable = false) // Maps this field to the
            'last_name' column in the table
private String lastName;

@Column(name = "email", unique = true) // Maps this field to the 'email' column
            in the table
private String email;

// Constructors, Getters, and Setters
public Customer() {}

public Customer(String firstName, String lastName, String email) {
   this.firstName = firstName; this.lastName = lastName; this.email
   = email;
}

public Long getId() { return
   id;
}

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

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;
    }

    public String getEmail() { return
        email;
    }

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

**Explanation of the Annotations:**

1. **@Entity**: Specifies that the class is an entity and should be mapped to a database table.
2. **@Table(name = "customers")**: Maps the Customer class to the customers table in the database.
3. **@Id**: Specifies the field id as the primary key of the entity.
4. **@GeneratedValue(strategy = GenerationType.IDENTITY)**: Configures the primary key to be generated automatically using an identity column (auto-increment).
5. **@Column**: Used to specify column details (e.g., nullable, unique).
   - name: Specifies the column name in the database.
   - nullable: Indicates whether the column can accept null values.
   - unique: Ensures that values in this column are unique.

**Corresponding Database Table Schema**

After mapping the Customer class to the customers table, the corresponding database table schema would look like this:

```
CREATE   TABLE   customers   (   id   BIGINT   AUTO_INCREMENT
    PRIMARY KEY, -- Maps to @Id and
                @GeneratedValue first_name VARCHAR(100) NOT NULL,   --
    Maps to @Column(name =
                "first_name")
    last_name VARCHAR(100) NOT NULL,       -- Maps to @Column(name =
                "last_name")
    email VARCHAR(100) UNIQUE              -- Maps to @Column(name = "email")
```

);

**4.2 Describe the different types of relationships between entities (one-to-one, one-to- many, many-to-one, many-to-many).**

- **Explain how JPA represents these relationships using annotations.**
- **Provide code examples for each type of relationship.**

**ANS:**

**Different Types of Relationships between Entities in JPA**

In Java Persistence API (JPA), entities can be related to each other in different ways. These relationships help model real-world associations between objects and allow for complex data structures in relational databases. JPA provides annotations to define these relationships. The four main types of relationships between entities in JPA are:

1. One-to-One (1:1)
2. One-to-Many (1:M)
3. Many-to-One (M:1)
4. Many-to-Many (M:M)

Each of these relationships can be mapped using JPA annotations to represent the database schema.

**1. One-to-One Relationship (1:1)**

A **one-to-one relationship** means that one entity is associated with exactly one other entity. For example, a **Person** might have one **Passport**.

**JPA Representation:**

- **@OneToOne** annotation is used to represent a one-to-one relationship.
- **@JoinColumn** is used to specify the foreign key column.

**Example:**

```
import javax.persistence.*;
```

```
@Entity public class

Person { @Id


@GeneratedValue(strategy = GenerationType.IDENTITY)

private Long id; private String name;

@OneToOne

@JoinColumn(name = "passport_id") // Foreign key column in the 'person' table

private Passport passport;

// Getters and Setters

}

@Entity

public class Passport {

@Id

@GeneratedValue(strategy = GenerationType.IDENTITY)

private Long id; private String passportNumber;


// Getters and Setters

}
```
**Explanation:**

- The **Person** entity has a @OneToOne relationship with the **Passport** entity.
- **@JoinColumn** indicates that the foreign key (passport_id) is present in the **Person** table.
- In the database, **person** will have a column passport_id that references the **passport** table.

**2. One-to-Many Relationship (1:M)**

A **one-to-many relationship** means that one entity is associated with multiple other entities. For example, one **Department** can have many **Employees**.

**JPA Representation:**

- **@OneToMany** is used in the "one" side of the relationship.
- **@ManyToOne** is used in the "many" side of the relationship.
- **@JoinColumn** is used on the "many" side to specify the foreign key column.

**Example:**

```
import javax.persistence.*;

import java.util.List;

@Entity    public    class

Department {

    @Id

    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String departmentName;
    @OneToMany(mappedBy = "department") // 'department' is the field in Employee
class

    private List<Employee> employees;

    // Getters and Setters

}

@Entity

public class Employee {

    @Id

    @GeneratedValue(strategy = GenerationType.IDENTITY)

    private Long id; private String name;

    @ManyToOne

    @JoinColumn(name = "department_id") // Foreign key in Employee table private

    Department department;

    // Getters and Setters

}
```
**Explanation:**

- The **Department** entity has a @OneToMany relationship with the **Employee**□ entity.
- The **Employee** entity has a @ManyToOne relationship to **Department**.□

- The foreign key department_id is stored in the **Employee** table.▯

## 3. Many-to-One Relationship (M:1)

A **many-to-one relationship** means that multiple entities are associated with a single entity. For example, many **Employees** belong to one **Department**.

**JPA Representation:**

- **@ManyToOne** is used to map the relationship from the "many" side.▯
- **@OneToMany** is used from the "one" side (reverse side).▯

**Example:**

This relationship is essentially the reverse of the **One-to-Many** example:

```
@Entity

public class Employee {

   @Id

   @GeneratedValue(strategy = GenerationType.IDENTITY) private

   Long id;

   private String name;

   @ManyToOne

   @JoinColumn(name = "department_id") // Foreign key in Employee table private

   Department department;
```

```
    // Getters and Setters


}
```

- **Employee** is mapped to **Department** using @ManyToOne.
- **Department** is mapped to **Employee** using @OneToMany, and the foreign key (department_id) is stored in **Employee**.

**4. Many-to-Many Relationship (M:M)**

A **many-to-many relationship** means that many entities are associated with many other entities. For example, a **Student** can enroll in many **Courses**, and each **Course** can have many **Students**.

**JPA Representation:**

- **@ManyToMany** annotation is used on both sides of the relationship.
- **@JoinTable** is used to specify the intermediary table that stores the relationships (because many-to-many relationships require an association table).

**Example:**

```
import javax.persistence.*;
import java.util.List;

@Entity  public  class

Student {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)

    private Long id; private String name;

    @ManyToMany

    @JoinTable( name = "student_course", // Join table name joinColumns =

        @JoinColumn(name = "student_id"), // Foreign key in join table

        inverseJoinColumns = @JoinColumn(name = "course_id") // Foreign key for
Course

    )
    private List<Course> courses;

    // Getters and Setters

}

@Entity

public class Course {
    @Id

    @GeneratedValue(strategy = GenerationType.IDENTITY) private

    Long id;

    private String courseName;

    @ManyToMany(mappedBy = "courses") // 'courses' is the field in the Student class

    private List<Student> students;
    // Getters and Setters

}
```

**Explanation:**

- The **Student** entity has a @ManyToMany relationship with the **Course** entity.
- The **@JoinTable** annotation specifies the join table student_course, which will have two foreign keys: student_id and course_id.
- The **Course** entity has the reverse @ManyToMany annotation, with mappedBy specifying that the relationship is already mapped by the **Student** entity.

**4.3 Create a JPA application to perform CRUD operations on a simple entity (e.g., Product).**

- **Include methods for creating, retrieving, updating, and deleting Product entities.**
- **Demonstrate the use of `EntityManager` for persistence operations.**

  Ans:

**Product.java**

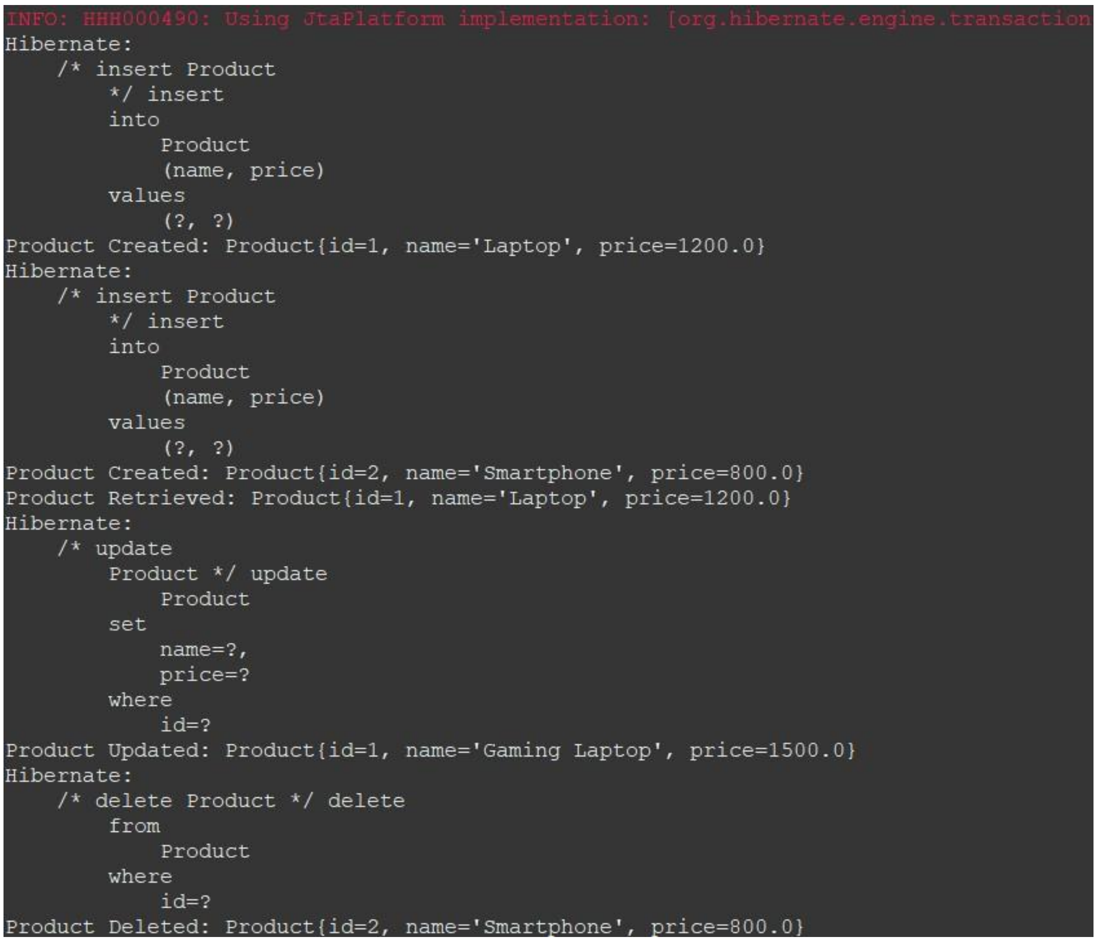
```
import javax.persistence.Entity; import

      javax.persistence.GeneratedValue;

import

      javax.persistence.GenerationType;

import javax.persistence.Id;

@Entity

public class Product {

   @Id

   @GeneratedValue(strategy = GenerationType.IDENTITY)

   private Long id; private String name; private double price;

   // Constructors public Product() {
```

```
public Product(String name, double price) {
    this.name = name; this.price = price;


}
// Getters and 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 double getPrice() { return
    price;
}
public void setPrice(double price) { this.price
    = price;
}
@Override
public String toString() { return "Product{id=" + id + ", name='" + name +
    "', price=" + price + "}";
    }
}
```

**ProductService.java**

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

public class ProductService { private static
    EntityManagerFactory emf =
            Persistence.createEntityManagerFactory("productPU");
    private static EntityManager em = emf.createEntityManager();


    // Create Product
    public void createProduct(Product product) {
        em.getTransaction().begin();
        em.persist(product);
        em.getTransaction().commit();
        System.out.println("Product Created: " + product); }

    // Retrieve Product by ID
    public Product getProduct(Long id) {
        Product product = em.find(Product.class, id);
        System.out.println("Product Retrieved: " + product);
        return product;
    }

    // Update Product
    public void updateProduct(Long id, String newName, double newPrice) {
        em.getTransaction().begin();
        Product product = em.find(Product.class, id);
        if (product != null) {
            product.setName(newName);
            product.setPrice(newPrice);
            em.getTransaction().commit();
            System.out.println("Product Updated: " + product); }
    }

    // Delete Product
    public void deleteProduct(Long id) { em.getTransaction().begin();
        Product product = em.find(Product.class, id);
        if (product != null) {
            em.remove(product); em.getTransaction().commit();
            System.out.println("Product Deleted: " + product); }
    }

    // Close EntityManager
    public void close() {
    em.close(); emf.close();
    }
}


Main.java     public
class Main {
    public static void main(String[] args) {
        ProductService productService = new ProductService();
        // Create products
        Product product1 = new Product("Laptop", 1200.0);
        Product product2 = new Product("Smartphone", 800.0);
        productService.createProduct(product1);
        productService.createProduct(product2);
        // Retrieve product by ID
        Product retrievedProduct = productService.getProduct(1L);
        // Update product
        productService.updateProduct(1L, "Gaming Laptop", 1500.0);
        // Delete product
        productService.deleteProduct(2L);
        // Close resources productService.close();
    }
}
```

**OUTPUT:**



```
INFO: HHH000490: Using JtaPlatform implementation: [org.hibernate.engine.transaction
Hibernate:
    /* insert Product
        */ insert
        into
            Product
            (name, price)
        values
            (?, ?)
Product Created: Product{id=1, name='Laptop', price=1200.0}
Hibernate:
    /* insert Product
        */ insert
        into
            Product
            (name, price)
        values
            (?, ?)
Product Created: Product{id=2, name='Smartphone', price=800.0}
Product Retrieved: Product{id=1, name='Laptop', price=1200.0}
Hibernate:
    /* update
        Product */ update
            Product
        set
            name=?,
            price=?
        where
            id=?
Product Updated: Product{id=1, name='Gaming Laptop', price=1500.0}
Hibernate:
    /* delete Product */ delete
        from
            Product
        where
            id=?
Product Deleted: Product{id=2, name='Smartphone', price=800.0}
```

**Assignment 5:Spring Boot**

1. **Configure a Spring Boot application to connect to a specific MySQL database without explicitly defining beans for connection pool, DataSource, etc.**
   - ○ **Use only the necessary dependencies and demonstrate how auto-configuration sets up the connection.**
   - ○ **Explore using application.properties to customize connection details (URL, username, password).**

Main Application Class

**File Name**: `SpringbootFirstApplication.java`

**Location**:

`src/main/java/com/java/springboot` package

com.java.springboot;

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

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

**2. Entity Class**
**File Name**: User.java
**Location**: src/main/java/com/java/springboot/model

package com.java.springboot.Model;

```
import jakarta.persistence.Entity; import
jakarta.persistence.Id;

@Entity
public class User {
   @Id
```

```
        private    Long    id;
        private String name;
        private String email;

        // Getters and 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 String getEmail() { return
           email;
        }

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

**3. Repository Interface**
**File Name**: UserRepository.java
**Location**: src/main/java/com/java/springboot/repository

```
package com.java.springboot.repository;

     import    org.springframework.data.jpa.repository.JpaRepository;
     import com.java.springboot.Model.User;

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

**4. Controller**
**File Name**: UserController.java

**Location**: src/main/java/com/java/springboot/controller

```
package com.java.springboot.controller;

        import    com.java.springboot.Model.User;    import
        com.java.springboot.repository.UserRepository;
        import  org.springframework.web.bind.annotation.*;
        import java.util.List;


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

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

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

          @PostMapping
          public User createUser(@RequestBody User user) {
          return userRepository.save(user); }
        }
```

**5. Application Properties**

**File Name**: application.properties

**Location**: src/main/resourc

```
# MySQL database connection
        spring.datasource.url=jdbc:mysql://localhost:3306/company_db
        spring.datasource.username=root
        spring.datasource.password=1234567890

        # JPA and Hibernate settings spring.jpa.hibernate.ddl-
        auto=update spring.jpa.show-sql=true
        spring.jpa.properties.hibernate.dialect=org.hibernate.dialect.MySQLDia
        lect
```

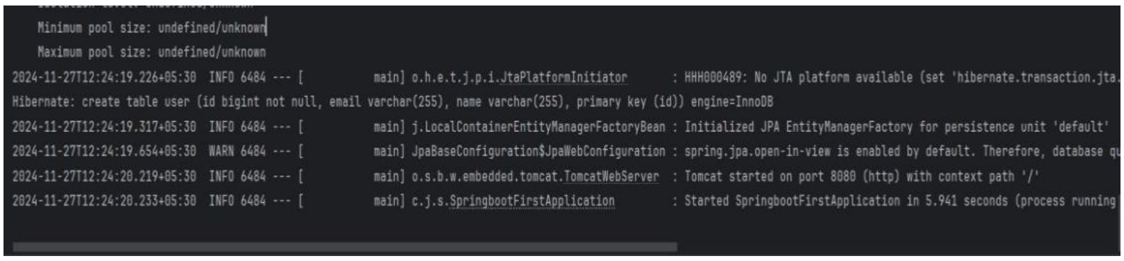
6) pom.xml

```
<?xml version="1.0" encoding="UTF-8"?>
```

```xml
<project xmlns="http://maven.apache.org/POM/4.0.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
https://maven.apache.org/xsd/maven-4.0.0.xsd">
   <modelVersion>4.0.0</modelVersion>
   <parent>
      <groupId>org.springframework.boot</groupId>
      <artifactId>spring-boot-starter-parent</artifactId>
      <version>3.4.0</version>
      <relativePath/> <!-- lookup parent from repository -->
   </parent>
   <groupId>com.java</groupId>
   <artifactId>springboot-first</artifactId>
   <version>0.0.1-SNAPSHOT</version>
   <name>springboot-first</name>
   <description>Demo project for Spring Boot</description>
   <url/>
   <licenses>
      <license/>
   </licenses>
   <developers>
      <developer/>
   </developers>
   <scm>
      <connection/>
      <developerConnection/>
      <tag/>
      <url/>
   </scm>
   <properties>
      <java.version>17</java.version>
   </properties>
   <dependencies>
      <dependency>
         <groupId>org.springframework.boot</groupId>
         <artifactId>spring-boot-starter-data-jpa</artifactId>
      </dependency>
      <dependency>
         <groupId>org.springframework.boot</groupId>
         <artifactId>spring-boot-starter-web</artifactId>
      </dependency>
      <dependency>
```

```
            <groupId>com.mysql</groupId>
            <artifactId>mysql-connector-j</artifactId>
            <scope>runtime</scope>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-test</artifactId>
            <scope>test</scope>
        </dependency>


    </dependencies>

    <build>
        <plugins>
            <plugin>
                <groupId>org.springframework.boot</groupId>
                <artifactId>spring-boot-maven-plugin</artifactId> </plugin>
        </plugins>
    </build>

</project>
```

**OUTPUT**:



```
    Minimum pool size: undefined/unknown
    Maximum pool size: undefined/unknown
2024-11-27T12:24:19.226+05:30  INFO 6484 --- [           main] o.h.e.t.j.p.i.JtaPlatformInitiator       : HHH000489: No JTA platform available (set 'hibernate.transaction.jta.
Hibernate: create table user (id bigint not null, email varchar(255), name varchar(255), primary key (id)) engine=InnoDB
2024-11-27T12:24:19.317+05:30  INFO 6484 --- [           main] j.LocalContainerEntityManagerFactoryBean : Initialized JPA EntityManagerFactory for persistence unit 'default'
2024-11-27T12:24:19.654+05:30  WARN 6484 --- [           main] JpaBaseConfiguration$JpaWebConfiguration : spring.jpa.open-in-view is enabled by default. Therefore, database qu
2024-11-27T12:24:20.219+05:30  INFO 6484 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port 8080 (http) with context path '/'
2024-11-27T12:24:20.233+05:30  INFO 6484 --- [           main] c.j.s.SpringbootFirstApplication         : Started SpringbootFirstApplication in 5.941 seconds (process running
```

**2. Create a Spring Boot application that utilizes JPA repositories. Persist and retrieve data from an in-memory database (e.g., H2) without manual configuration.**

- **Focus on the simplicity achieved through auto-configuration for JPA and repositories.**
- **Implement basic CRUD operations using JPA repositorie**

```
ProductController.java              package
com.example.project2.controller;

import          com.example.project2.model.Product;
import
com.example.project2.service.ProductService;
import    org.springframework.http.ResponseEntity;
import org.springframework.web.bind.annotation.*;

import java.util.List;
@RestController
@RequestMapping("/products")
public class ProductController {
private final ProductService
productService;

   public ProductController(ProductService productService) {
   this.productService = productService; }

   @GetMapping
   public List<Product> getAllProducts() {
   return  productService.getAllProducts();
   }

   @GetMapping("/{id}")
   public ResponseEntity<Product> getProductById(@PathVariable Long id) { return
      productService.getProductById(id)
            .map(ResponseEntity::ok)
            .orElse(ResponseEntity.notFound().build());
   }
   @PostMapping
   public Product addProduct(@RequestBody Product product) {
   return productService.addProduct(product); }

   @PutMapping("/{id}")
   public ResponseEntity<Product> updateProduct(@PathVariable Long id,
@RequestBody Product product) {
      try    {     return     ResponseEntity.ok(productService.updateProduct(id,
         product));
      }  catch  (RuntimeException  e)  {  return
      ResponseEntity.notFound().build(); }
   }
```

```
    @DeleteMapping("/{id}")
    public ResponseEntity<Void> deleteProduct(@PathVariable Long id) {
    productService.deleteProduct(id);                                    return
    ResponseEntity.noContent().build(); }
}

Product.java                    package
com.example.project2.model;

import jakarta.persistence.Entity; import
jakarta.persistence.GeneratedValue; import
jakarta.persistence.GenerationType; import
jakarta.persistence.Id;

@Entity  public  class
Product {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY) private
    Long id;

    private String name; private
    double price;

    public Product() {}

    public Product(String name, double price) {
        this.name = name; this.price
        = price;
    }

    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 double getPrice() {
        return price;
    }

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

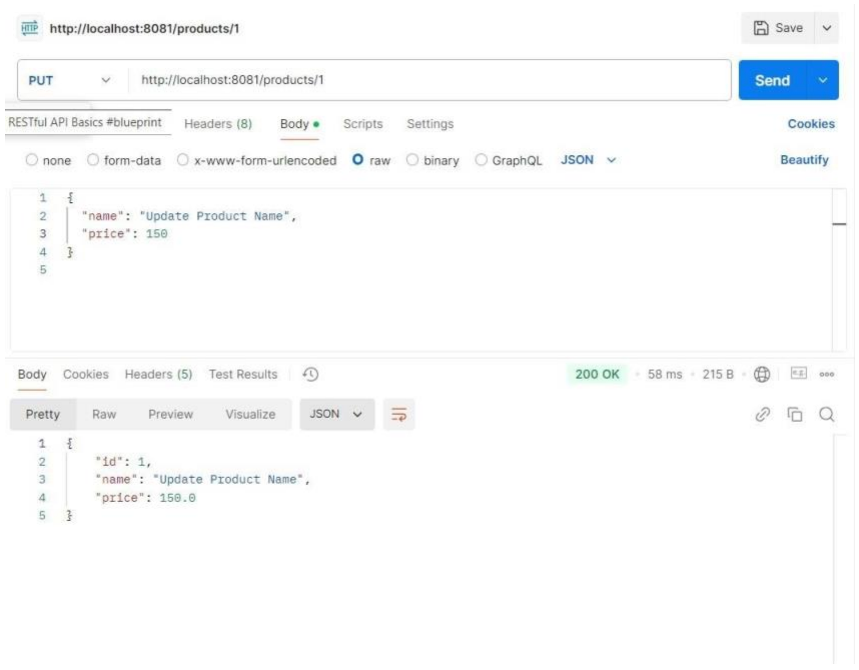
ProductRespository.java

```
package com.example.project2.repository;

import          com.example.project2.model.Product;          import
org.springframework.data.jpa.repository.JpaRepository;

public interface ProductRepository extends JpaRepository<Product, Long> { }
```

ProductService.java                    package
com.example.project2.service;

```
import       com.example.project2.model.Product;       import
com.example.project2.repository.ProductRepository; import
org.springframework.stereotype.Service;

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

@Service      public      class
ProductService {

    private final ProductRepository productRepository;

    public ProductService(ProductRepository productRepository) {
    this.productRepository = productRepository; }

    public List<Product> getAllProducts() {
    return productRepository.findAll(); }
    public Optional<Product> getProductById(Long id)
    { return productRepository.findById(id); }

    public Product addProduct(Product product) { return
        productRepository.save(product);
    }
    public Product updateProduct(Long id, Product updatedProduct) {
        return     productRepository.findById(id).map(product     ->     {
        product.setName(updatedProduct.getName());
        product.setPrice(updatedProduct.getPrice());                  return
        productRepository.save(product);
        }).orElseThrow(() -> new RuntimeException("Product not found"));
    }

    public void deleteProduct(Long id) { productRepository.deleteById(id);
    }
}
```

```
application.properties # H2 Database settings
spring.datasource.url=jdbc:h2:mem:DEMO
spring.datasource.driverClassName=org.h2.Dri
ver spring.datasource.username=root
spring.datasource.password=12345
spring.h2.console.enabled=true
spring.jpa.show-sql=true
spring.jpa.hibernate.ddl-auto=update
server.port=8081
```



http://localhost:8081/products/1

Save

PUT http://localhost:8081/products/1

Send

RESTful API Basics #blueprint    Headers (8)    Body ●    Scripts    Settings    Cookies

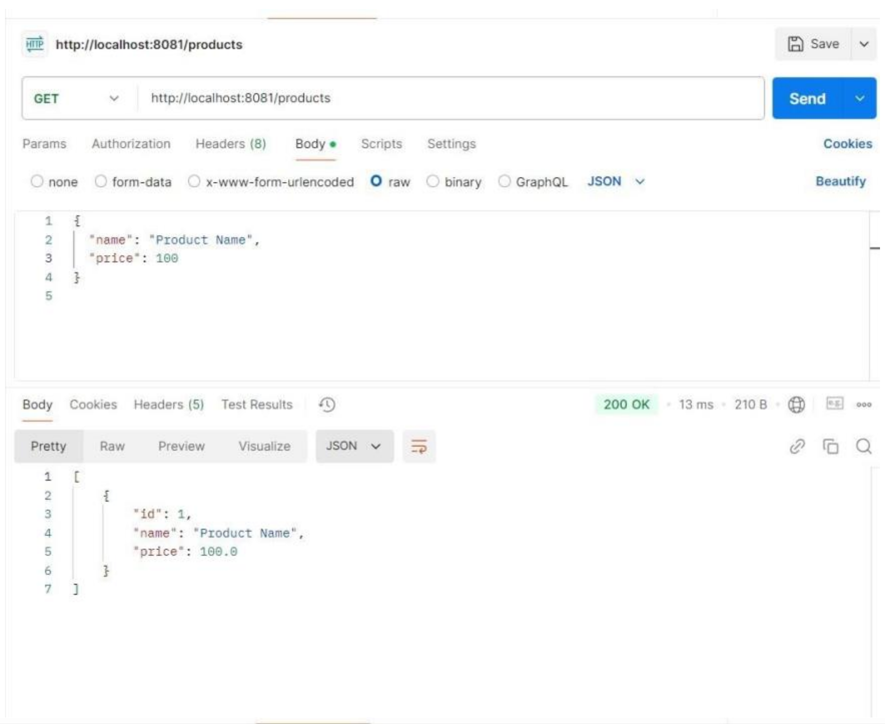
○ none ○ form-data ○ x-www-form-urlencoded ● raw ○ binary ○ GraphQL JSON    Beautify

```
{
  "name": "Update Product Name",
  "price": 150
}

```

Body    Cookies    Headers (5)    Test Results    200 OK • 58 ms • 215 B

Pretty    Raw    Preview    Visualize    JSON

```
{
    "id": 1,
    "name": "Update Product Name",
    "price": 150.0
}
```



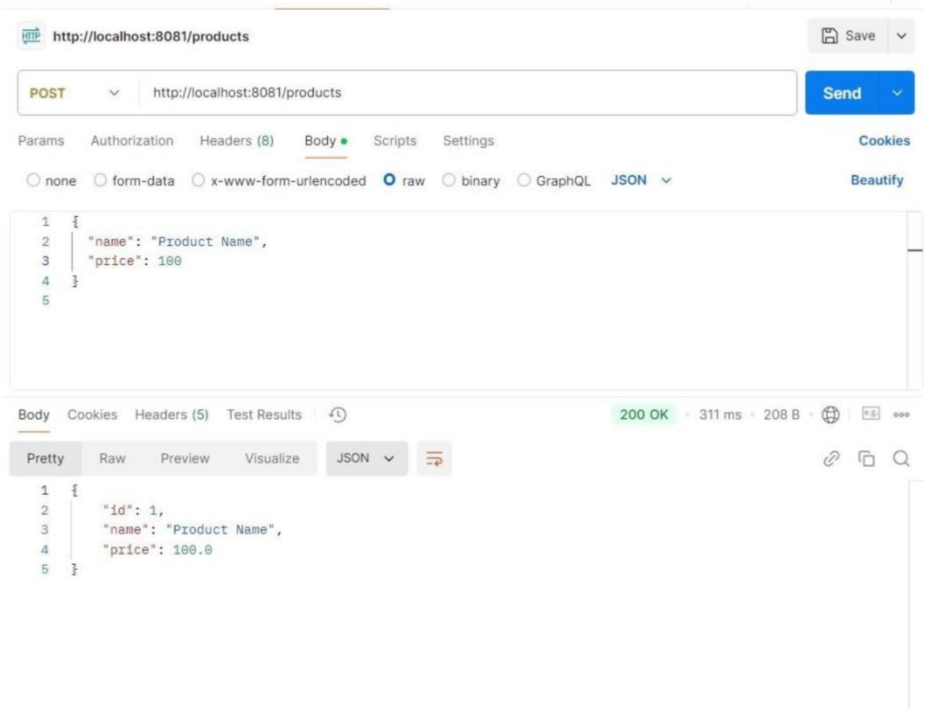
GET http://localhost:8081/products

Body: none | form-data | x-www-form-urlencoded | [✓ raw] | binary | GraphQL | JSON

```
{
  "name": "Product Name",
  "price": 100
}
```

200 OK · 13 ms · 210 B

```
[
    {
        "id": 1,
        "name": "Product Name",
        "price": 100.0
    }
]
```



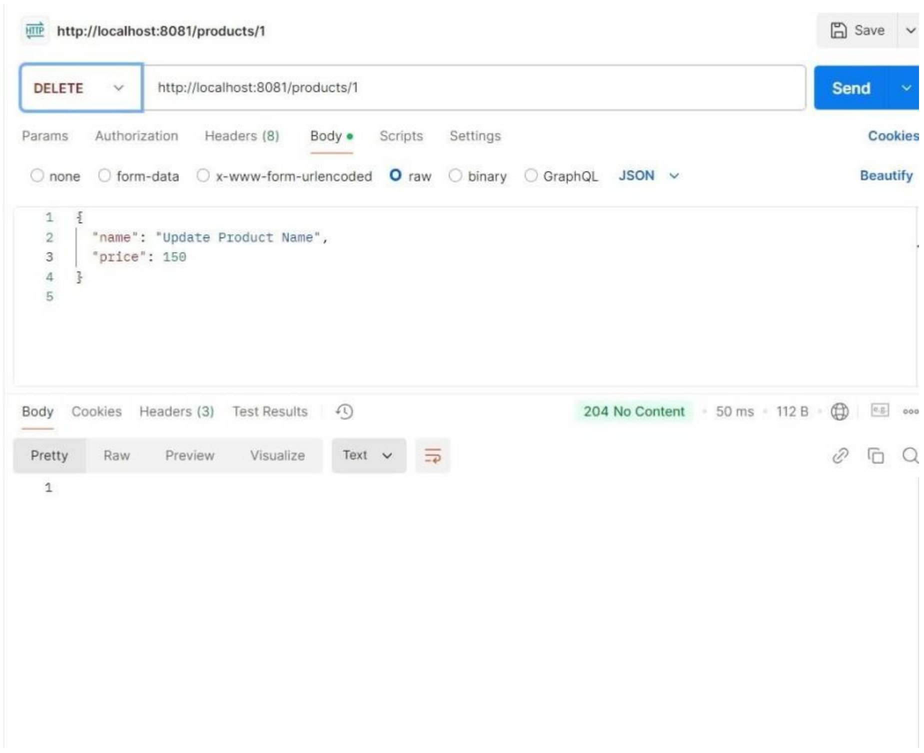
POST http://localhost:8081/products

Body: none | form-data | x-www-form-urlencoded | [✓ raw] | binary | GraphQL | JSON

```
{
  "name": "Product Name",
  "price": 100
}
```

200 OK · 311 ms · 208 B

```
{
    "id": 1,
    "name": "Product Name",
    "price": 100.0
}
```



http://localhost:8081/products/1

```
{
  "name": "Update Product Name",
  "price": 150
}

```

204 No Content · 50 ms · 112 B

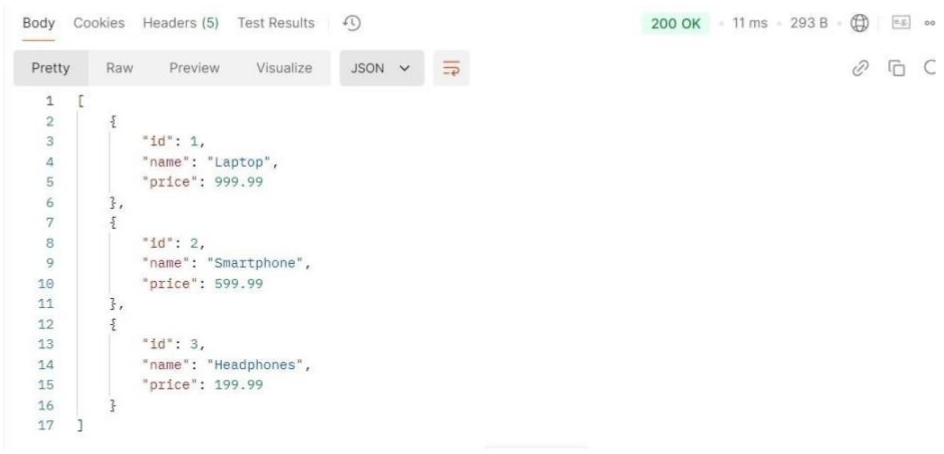
**3. Develop a Spring Boot application with a RESTful API that exposes an endpoint to retrieve a list of products.**

- **Utilize Spring MVC annotations like @RestController and @GetMapping.**
- **Implement a service layer to interact with a product repository (in-memory or database).**
- **Return the list of products in JSON format using @ResponseBody**

```
ProductController.java                                    package
com.example.productapi.controller;                         import
com.example.productapi.model.Product;                      import
com.example.productapi.service.ProductService;             import
org.springframework.web.bind.annotation.GetMapping;    import
org.springframework.web.bind.annotation.RestController;
import java.util.List; @RestController
public class ProductController { private final
   ProductService productService;

   public ProductController(ProductService productService) {
   this.productService = productService; }

   @GetMapping("/products")     public
   List<Product> getProducts() { return
   productService.getProducts(); }
}
```

```
Product.java                              package
com.example.productapi.model;

public class Product {
   private    Long    id;
   private String name;
   private double price;
   // Constructors
   public Product(Long id, String name, double price) {
      this.id      =      id;
      this.name = name;
      this.price = price;
   }
   // Getters and 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 double getPrice() {
      return price;
   }
   public void setPrice(double price) {
      this.price = price;
   }
}
ProductRepository.java                    package
com.example.productapi.repository;        import
com.example.productapi.model.Product;  import
org.springframework.stereotype.Repository;
import java.util.Arrays;
import java.util.List;
@Repository      public      class
ProductRepository {
   public List<Product> getAllProducts() {
        return  Arrays.asList(  new  Product(1L,
              "Laptop", 999.99),
              new Product(2L, "Smartphone", 599.99),
              new Product(3L, "Headphones", 199.99)
        );
     }
  }
  ProductService.java package
  com.example.productapi.service; import
  com.example.productapi.model.Product; import
  com.example.productapi.repository.ProductRepository;
  import org.springframework.stereotype.Service;
  import java.util.List;
  @Service
  public    class    ProductService    {    private    final
     ProductRepository productRepository;

     public ProductService(ProductRepository productRepository) {
     this.productRepository = productRepository; }

     public  List<Product>  getProducts()  {  return
     productRepository.getAllProducts(); }
  }
  application.properties spring.h2.
console.enabled=true
spring.h2.console.path=/h2-console
spring.datasource.url=jdbc:h2:mem:DEMO
spring.datasource.driverClassName=org.h2.Driv
er spring.datasource.username=root
spring.datasource.password=12345
```

**OUTPUT :**



```
[
    {
        "id": 1,
        "name": "Laptop",
        "price": 999.99
    },
    {
        "id": 2,
        "name": "Smartphone",
        "price": 599.99
    },
    {
        "id": 3,
        "name": "Headphones",
        "price": 199.99
    }
]
```

# Assignment 6: Hibernate Framework

**6.1 Write a Hibernate program to create the product table (product id,product name,product category,product price) and delete the specific product record.(using through the product id)**

**Product.java**

```
import javax.persistence.Entity; import

javax.persistence.Id;

@Entity

public class Product {

   @Id

   private  int  id;  private

   String    name;    private

   String category; private

   double price;

   // Default constructor (required by JPA) public

   Product() {

   }
   // Constructor with parameters

   public Product(int id, String name, String category, double price) {

      this.id = id;

      this.name = name; this.category

      = category;

      this.price = price;

   }
```

```
public int getId() { return
    id;
} public void setId(int
id) { this.id = id;
}
public String getName() { return
    name;
}
public void setName(String name) { this.name
    = name;
}
public String getCategory() { return
    category;
}
public void setCategory(String category) { this.category
    = category;
}
public double getPrice() { return
    price;
}
public void setPrice(double price) { this.price
    = price;
}
```

```
}
```

**ProductService.java**

```
import org.hibernate.Session;

import org.hibernate.SessionFactory; import

org.hibernate.Transaction;

public class ProductService {

   public void createProduct(Product product) {

      // Get session factory

      SessionFactory factory = HibernateUtil.getSessionFactory();

      // Get session from the factory

      Session session = factory.getCurrentSession();

      // Begin transaction

      Transaction transaction = session.beginTransaction();

      try {

         //   Save   the   product

         session.save(product)

         ;         //         Commit

         transaction

         transaction.commit();

      } catch (Exception e) {

         // Handle exception, roll back transaction

         if (transaction != null) {

            transaction.rollback();
         }
```

```
            e.printStackTrace();

        } finally {

            // Close the session (do not call closeSession here, just use session.close())
            session.close();

        }

    }

}
```

**<u>Main.java</u>**

```
public class Main {

    public static void main(String[] args) {

        try {

            // Create a new product

          Product newProduct = new Product(2, "Laptop", "Electronics", 1200.00);

            // Create ProductService instance

            ProductService productService = new ProductService();

            // Call method to create product productService.createProduct(newProduct);

        } finally {

            // Clean up resources by closing the SessionFactory

            HibernateUtil.closeSessionFactory();

        }

    }

}
```

**InsertProduct.java**

```
import org.hibernate.Session;

import org.hibernate.SessionFactory; import

org.hibernate.Transaction;     public     class

InsertProduct {

   public static void main(String[] args) {

       // Create a new Product object

          Product newProduct = new Product(2, "Laptop", "Electronics", 1200.00); // id
changed to 2

       // Get session factory

       SessionFactory factory = HibernateUtil.getSessionFactory();

       // Get session from factory

       Session session = factory.getCurrentSession();

       // Begin transaction

       Transaction transaction = session.beginTransaction();

       try {

          // Save the Product object session.save(newProduct);

          // Commit the transaction (this will persist the product in the database)

          transaction.commit();

       } catch (Exception e) {

          // Handle exception (in case of any errors, roll back the transaction)

          if (transaction != null) {

             transaction.rollback();
```

```
            }

            e.printStackTrace();

        } finally {

            // Close the session session.close();

        }

    }

}
```

**<u>HibernateUtil.java</u>**

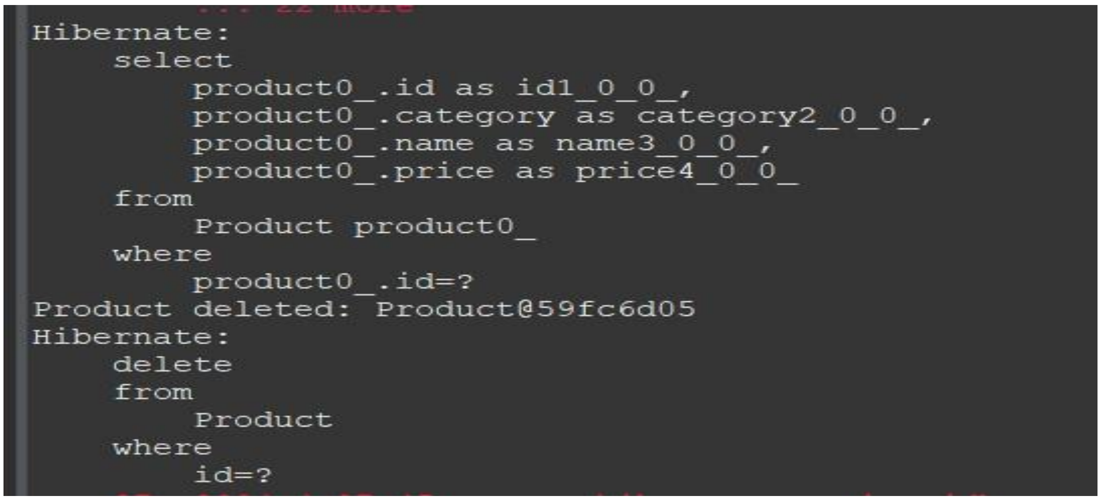
```
import org.hibernate.SessionFactory; import

org.hibernate.cfg.Configuration;

public   class   HibernateUtil   {   private   static

    SessionFactory sessionFactory;

    static {

        try {

            // Initialize SessionFactory from Hibernate configuration file

            sessionFactory = new
Configuration().configure("hibernate.cfg.xml").addAnnotatedClass(Product.class).b
u ildSessionFactory();

        } catch (Exception e) {

            e.printStackTrace();

            throw new ExceptionInInitializerError("SessionFactory initialization
failed.");

        }
    }

    // Method to get SessionFactory

    public static SessionFactory getSessionFactory() {

        return sessionFactory;

    }

    // Method to close the SessionFactory public

    static    void    closeSessionFactory()    {    if

    (sessionFactory != null) {

            sessionFactory.close();

        }

    }

}
```

**Hibernate.cfg.xml**

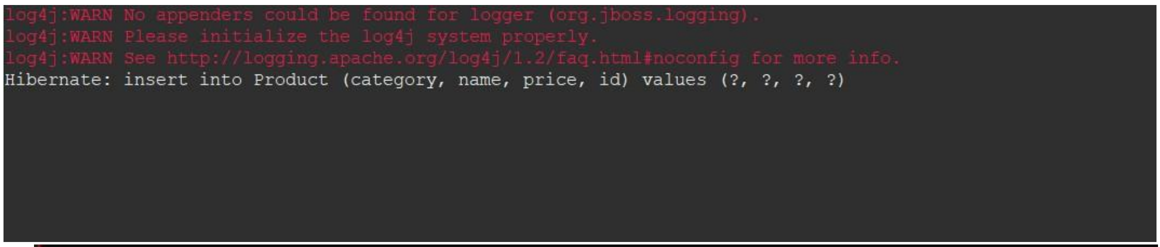
```
<!DOCTYPE hibernate-configuration PUBLIC "-//Hibernate/Hibernate
Configuration DTD 3.0//EN" "http://hibernate.sourceforge.net/hibernate-
configuration-3.0.dtd">

<hibernate-configuration> <session-factory>


        <!-- JDBC Database connection settings -->

        <property
name="hibernate.connection.driver_class">com.mysql.cj.jdbc.Driver</property>

        <property
name="hibernate.connection.url">jdbc:mysql://localhost:3306/products</property>
```

```
        <property name="hibernate.connection.username">root</property>

        <property name="hibernate.connection.password">1234567890</property>

        <!-- JDBC connection pool settings -->

        <property name="hibernate.c3p0.min_size">5</property>

        <property name="hibernate.c3p0.max_size">20</property>

        <!-- Specify dialect -->

        <property
name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>

        <!-- Enable Hibernate's automatic session context management -->

        <property name="hibernate.current_session_context_class">thread</property>
        <!-- Echo all executed queries -->

        <property name="hibernate.show_sql">true</property>

        <!-- Drop and re-create the database schema on startup -->

        <property name="hibernate.hbm2ddl.auto">update</property>

        <!-- Disable the second-level cache -->

        <property
name="hibernate.cache.provider_class">org.hibernate.cache.NoCacheProvider</pr
o perty>

        <!-- Drop and re-create the database schema on startup -->

        <property name="hibernate.hbm2ddl.auto">update</property>

    </session-factory>

</hibernate-configuration>
```

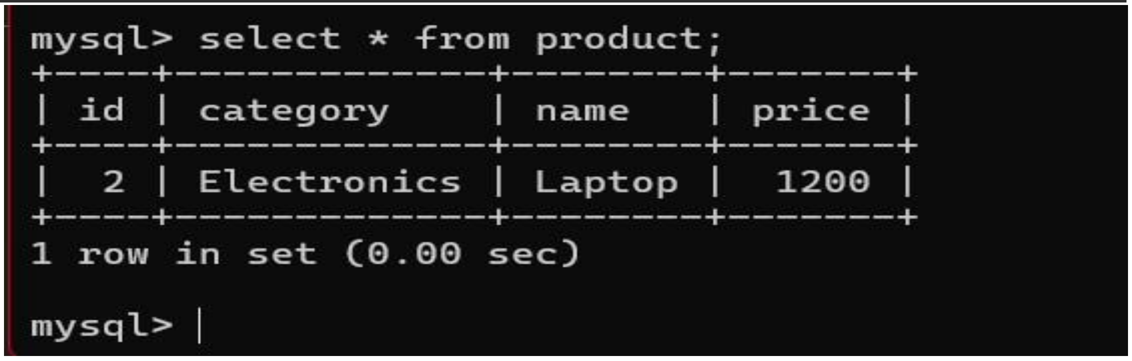
**OUTPUT**



```
    ... 22 more
Hibernate:
    select
        product0_.id as id1_0_0_,
        product0_.category as category2_0_0_,
        product0_.name as name3_0_0_,
        product0_.price as price4_0_0_
    from
        Product product0_
    where
        product0_.id=?
Product deleted: Product@59fc6d05
Hibernate:
    delete
    from
        Product
    where
        id=?
```



```
log4j:WARN No appenders could be found for logger (org.jboss.logging).
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for more info.
Hibernate: insert into Product (category, name, price, id) values (?, ?, ?, ?)
```



```
mysql> select * from product;
+----+-------------+--------+-------+
| id | category    | name   | price |
+----+-------------+--------+-------+
|  2 | Electronics | Laptop |  1200 |
+----+-------------+--------+-------+
1 row in set (0.00 sec)

mysql> |
```

**6.2 Write a Hibernate program to update the product price data from product table.(Using HQL)**

**Product.java**

```
import

javax.persistence.Entity;

import      javax.persistence.Id;

import javax.persistence.Table;
```

```
@Entity
@Table(name = "product") // This maps the entity to the "product" table
public class Product {
   @Id // Marks the "id" field as the primary key
   private  int  id;  private
   String   name;   private
   String category; private
   double price; // Default
   constructor         public
   Product() {}
   // Constructor with all fields
   public Product(int id, String name, String category, double price) {
       this.id = id;
       this.name = name;
       this.category = category; this.price
       = price;
   }

   // Getters and Setters public
   int getId() {
       return id;

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

```
    }

    public String getName() { return

        name;

    }

    public void setName(String name) { this.name

        = name;

    }

    public String getCategory() { return

        category;

    }

    public void setCategory(String category) { this.category

        = category;

    }
    public double getPrice() { return

        price;

    }
    public void setPrice(double price) {

        this.price = price;

    }

    @Override

    public String toString() {

        return "Product [id=" + id + ", name=" + name + ", category=" + category + ",
price=" + price + "]";

    }
```

```
}
```

**ProductService.java**

```
import org.hibernate.Session; import

org.hibernate.Transaction;

public class ProductService {

   public void updateProductPrice(int productId, double newPrice) {

       // Start session

       Session session = HibernateUtil.getSessionFactory().openSession();

       // Begin transaction

       Transaction transaction = null;

       try {

          transaction = session.beginTransaction();

          // HQL Query to update product price

          String hql = "UPDATE Product p SET p.price = :price WHERE p.id =
:productId";

          // Create query and set parameters

          int updatedEntities = session.createQuery(hql)
                                .setParameter("price", newPrice)
                                .setParameter("productId", productId)

                                .executeUpdate();

          // Commit the transaction

          transaction.commit();    //

          Output success message if

          (updatedEntities > 0) {
                System.out.println("Product price updated successfully!");

            } else {

                System.out.println("Product not found with id: " + productId);


            }

        } catch (Exception e) {
if (transaction != null) {
transaction.rollback(); // Rollback transaction on error


            }

            e.printStackTrace();

        } finally {
session.close(); // Close session


        }

    }

 }
```

**HibernateUtil.java**

```
 import   org.hibernate.SessionFactory;   import

 org.hibernate.cfg.Configuration;   public   class

 HibernateUtil  {  private  static  SessionFactory

 sessionFactory;

    // Static block to initialize sessionFactory

    static {

        try {

            // Build the session factory using the configuration
```

```
sessionFactory = new Configuration().configure("hibernate.cfg.xml")

                .addAnnotatedClass(Product.class) // Add the annotated entity class
 (Product)

                .buildSessionFactory();

        } catch (Exception e) {

            e.printStackTrace();

            throw new ExceptionInInitializerError(e);

        }

    }

    // Method to get the sessionFactory

    public static SessionFactory getSessionFactory() {

        return sessionFactory;

    }

    // Method to close the sessionFactory

    public static void closeSessionFactory() {

        if (sessionFactory != null) {
sessionFactory.close();

        }

    }

 }
```

**Main.java**

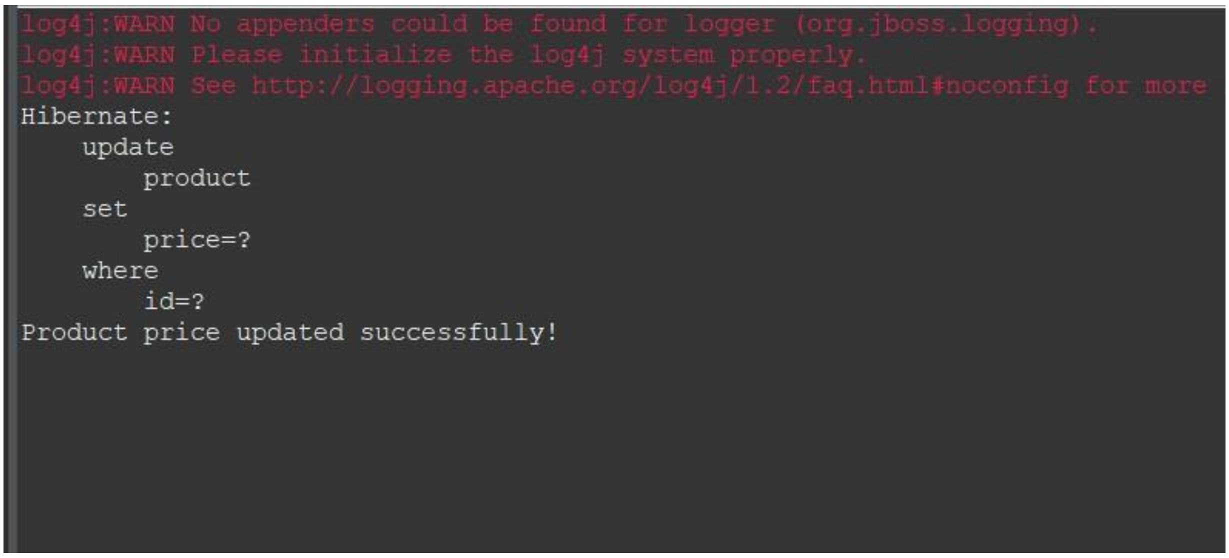
```
 public class Main {
    public static void main(String[] args) {

        ProductService productService = new ProductService();



        // Update product price where productId is 1 and new price is 899.99

        productService.updateProductPrice(1, 899.99);

    }

}
```

**Hibernate.cfg.xml**

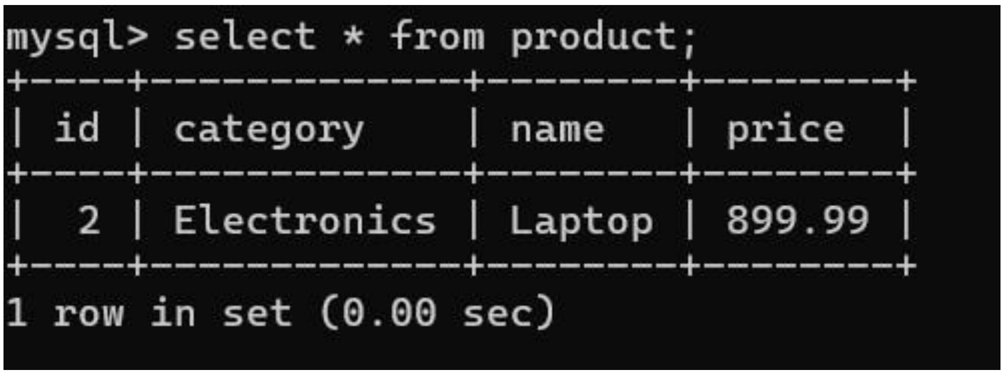
```
<!DOCTYPE hibernate-configuration PUBLIC "-//Hibernate/Hibernate
Configuration DTD 3.0//EN" "http://hibernate.sourceforge.net/hibernate-
configuration-3.0.dtd">

<hibernate-configuration>

    <!-- JDBC Database connection settings -->

    <session-factory>

        <!-- JDBC driver -->

        <property
name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>

        <property
name="hibernate.connection.driver_class">com.mysql.cj.jdbc.Driver</property>

        <property
name="hibernate.connection.url">jdbc:mysql://localhost:3306/products</property>

        <property name="hibernate.connection.username">root</property>

        <property name="hibernate.connection.password">1234567890</property>
        <!-- JDBC connection pool settings -->

        <property name="hibernate.c3p0.min_size">5</property>
        <property name="hibernate.c3p0.max_size">20</property>

        <property name="hibernate.c3p0.timeout">300</property>

       <property  name="hibernate.c3p0.max_statements">50</property>

        <!-- Specify the JDBC transaction handling -->

        <property
name="hibernate.transaction.factory_class">org.hibernate.transaction.JDBCTransa
ct ionFactory</property>

        <!-- Echo all executed SQL to stdout -->

        <property name="hibernate.show_sql">true</property>

        <!-- Drop and re-create the database schema on startup -->

        <property name="hibernate.hbm2ddl.auto">update</property>

        <!-- Enable Hibernate's automatic session context management -->

        <property name="hibernate.current_session_context_class">thread</property>

        <!-- Disable the second-level cache -->

        <property
name="hibernate.cache.provider_class">org.hibernate.cache.NoCacheProvider</pr
o perty>

        <!-- Echo all executed SQL to stdout -->

        <property name="hibernate.format_sql">true</property>

        <!-- Specify annotated class for the entity -->

        <mapping class="Product"/>

    </session-factory>
```

</hibernate-configuration>

**OUTPUT:**



```
log4j:WARN No appenders could be found for logger (org.jboss.logging).
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for more
Hibernate:
    update
        product
    set
        price=?
    where
        id=?
Product price updated successfully!
```



```
mysql> select * from product;
+----+-------------+--------+--------+
| id | category    | name   | price  |
+----+-------------+--------+--------+
|  2 | Electronics | Laptop | 899.99 |
+----+-------------+--------+--------+
1 row in set (0.00 sec)
```

**6.3 Write a Hibernate Program for product information and display the information by selecting the details from product database table**

**<u>Product.java</u>**

```
import
javax.persistence.Entity;
import      javax.persistence.Id;
import javax.persistence.Table;

@Entity
@Table(name = "product") // Map to the 'product' table in the database public
class Product {
```

```
@Id
private int id; private
String name; private
String category; private
double price;
// Constructor, Getters, and Setters public
Product() {}

public Product(int id, String name, String category, double price) {
   this.id = id; this.name = name; this.category = category;
   this.price = price;
}

public int getId() { return
   id;
}
public void setId(int id) { this.id
   = id;
}
public String getName() { return
   name;
}
public void setName(String name) { this.name
   = name;
}
public String getCategory() { return
   category;
}
public void setCategory(String category) { this.category
   = category;
}
public double getPrice() { return
   price;
}
public void setPrice(double price) { this.price
   = price;
}

@Override
public String toString() { return "Product [id=" + id + ", name=" + name + ",
   category=" + category + ", price=" + price + "]";
}
```

```
}
```

**ProductService.java**

```
import org.hibernate.Session; import
org.hibernate.Transaction;    import
java.util.List; // Add this import
statement        public        class
ProductService {
   public void displayProductInfo() {
      // Get the session from the session factory
      Session session = HibernateUtil.getSessionFactory().getCurrentSession();

      // Begin a transaction
      Transaction transaction = session.beginTransaction();

      try {
         // Retrieve product data using HQL (Hibernate Query Language)
         String hql = "FROM Product"; // Get all product records
         List<Product> products = session.createQuery(hql,
               Product.class).getResultList(); // List is now recognized

         // Display each product for
         (Product product : products) {
            System.out.println(product);
         }

         // Commit the transaction transaction.commit();
      } catch (Exception e) {
         e.printStackTrace(); if
         (transaction != null) {
         transaction.rollback();
         }
      } finally {
         HibernateUtil.closeSessionFactory(); }
   }
}
```

**Main.java**

```
public class Main {

   public static void main(String[] args) {
        // Create an instance of ProductService
        ProductService productService = new ProductService();

        // Display product information from the
     database productService.displayProductInfo(); }
  }
```

**HibernateUtil.java**

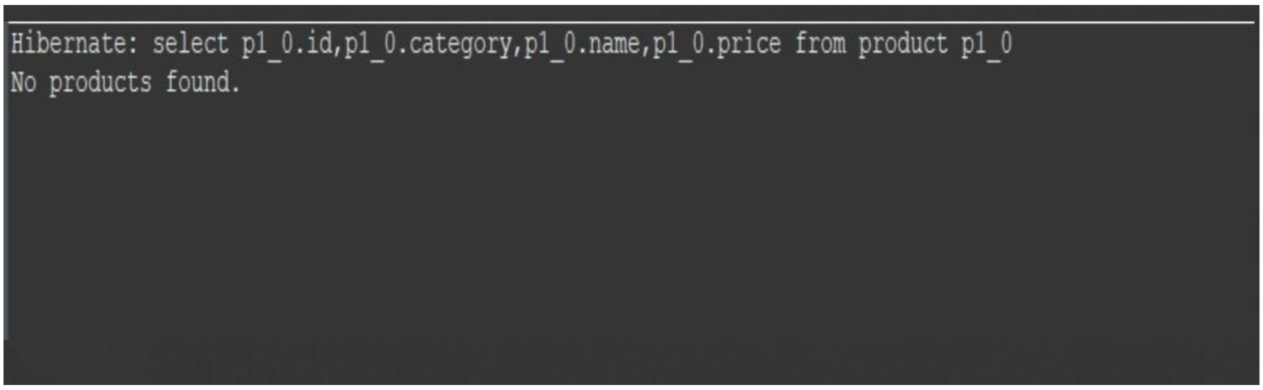
```
import org.hibernate.SessionFactory; import
org.hibernate.cfg.Configuration;

public   class   HibernateUtil   {   private   static

     SessionFactory sessionFactory;

     static        {        try        {        sessionFactory        =        new
        Configuration().configure("hibernate.cfg.xml")
                .addAnnotatedClass(Product.class) // Add Product class for mapping
                .buildSessionFactory();
        } catch (Exception e) {
           e.printStackTrace();
           throw new ExceptionInInitializerError(e); }
     }

     public static SessionFactory getSessionFactory() { return
        sessionFactory;
     }

     public static void closeSessionFactory() {
        if    (sessionFactory    !=    null)    {
        sessionFactory.close();
        }
     }
}
```

**Hibernate.cfg.xml**

```
<!DOCTYPE     hibernate-configuration     PUBLIC     "-//Hibernate/Hibernate
              Configuration DTD 3.0//EN"
              "http://hibernate.sourceforge.net/hibernate-configuration-3.0.dtd">
```

```
<hibernate-configuration> <session-factory>
    <!-- JDBC Database connection settings -->
    <property
    name="hibernate.connection.driver_class">org.h2.Driver</property>
    <property
        name="hibernate.connection.url">jdbc:h2:~/test;DB_CLOSE_ON_E
        XI T=FALSE</property>
    <property name="hibernate.connection.username">sa</property>
    <property name="hibernate.connection.password"></property>

    <!-- JDBC connection pool settings -->
    <property name="hibernate.c3p0.min_size">5</property>
    <property name="hibernate.c3p0.max_size">20</property>
    <property name="hibernate.c3p0.timeout">300</property>
    <property name="hibernate.c3p0.max_statements">50</property>
    <property name="hibernate.c3p0.idle_test_period">3000</property>

    <!-- Specify dialect -->
    <property
        name="hibernate.dialect">org.hibernate.dialect.H2Dialect</property>

    <!-- Echo all executed queries -->
    <property name="hibernate.show_sql">true</property>

    <!-- Drop and re-create the database schema on startup -->
   <property name="hibernate.hbm2ddl.auto">update</property>



    <!-- Enable Hibernate's automatic session context management -->
    <property name="hibernate.current_session_context_class">thread</property>

    <!-- Disable the second-level cache -->
    <property
        name="hibernate.cache.provider_class">org.hibernate.cache.NoCache
        P rovider</property>
  </session-factory>
</hibernate-configuration>
```

**Output:-**



```
Hibernate: select p1_0.id,p1_0.category,p1_0.name,p1_0.price from product p1_0
No products found.
```