Experiment 7

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1. Aim:

To design and implement Java programs using JDBC connectivity**,** CRUD operations, and MVC architecture for database interaction and management.
• To apply JDBC concepts**,** transaction handling**,** and MVC design pattern for real-world data management applications.

Part A – Easy Level:
• To create a Java program that connects to a MySQL database and retrieves all records from the Employee table.
• To demonstrate database connectivity using DriverManager and Connection objects.

Part B – Medium Level:
• To develop a Java program that performs CRUD operations on a Product table using JDBC.
• To implement transaction handling for ensuring data consistency during database operations.

Part C – Hard Level:
• To build a Java application using MVC architecture for managing student data through JDBC.
• To separate Model, View, and Controller functionalities and perform CRUD operations efficiently.

2. Objective:

- ✓ To understand and implement **JDBC connectivity** for accessing relational databases.

- ✓ To perform Create, Read, Update, and Delete (CRUD) operations using JDBC.
- ✓ To apply transaction management for maintaining database integrity.
- ✓ To design applications using the MVC architecture for modular and maintainable code.
- ✓ To handle SQL exceptions and manage JDBC resources effectively..

3. JAVA script and output:

EASY-LEVEL PROBLEM

```
package exp.pkg6;


import java.sql.*;


public class Exp6 {
    public static void main(String[] args) {
        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            Connection con = DriverManager.getConnection("jdbc:mysql://localhost:3306/college",
"root", "password");
            Statement stmt = con.createStatement();
            ResultSet rs = stmt.executeQuery("SELECT * FROM Employee");
            while (rs.next()) {
                System.out.println("EmpID: " + rs.getInt(1) + ", Name: " + rs.getString(2) + ", Salary:
" + rs.getDouble(3));
            }
            con.close();
        } catch (Exception e) {
            System.out.println(e);
```

```
        }
    }
}
```

SAMPLE OUTPUT:

EmpID: 101, Name: Akshara, Salary: 50000
EmpID: 102, Name: Ishika, Salary: 60000

MEDIUM LEVEL PROBLEM:

```
package exp.pkg6;

import java.sql.*;
import java.util.*;

public class Exp6 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            Connection con = DriverManager.getConnection("jdbc:mysql://localhost:3306/college",
"root", "password");
            while (true) {
                System.out.println("Menu:\n1. Add Product\n2. View All Products\n3. Update
Product\n4. Delete Product\n5. Exit");
                System.out.print("Enter your choice: ");
                int choice = sc.nextInt();
                sc.nextLine();
                if (choice == 1) {
                    System.out.print("Enter ProductID: ");
                    int id = sc.nextInt();
                    sc.nextLine();
                    System.out.print("Enter Product Name: ");
```

```
                String name = sc.nextLine();
                System.out.print("Enter Price: ");
                double price = sc.nextDouble();
                System.out.print("Enter Quantity: ");
                int qty = sc.nextInt();
                PreparedStatement ps = con.prepareStatement("INSERT INTO Product VALUES
(?, ?, ?, ?)");
                ps.setInt(1, id);
                ps.setString(2, name);
                ps.setDouble(3, price);
                ps.setInt(4, qty);
                ps.executeUpdate();
                System.out.println("Product added successfully!");
            } else if (choice == 2) {
                Statement stmt = con.createStatement();
                ResultSet rs = stmt.executeQuery("SELECT * FROM Product");
                while (rs.next()) {
                    System.out.println("ID: " + rs.getInt(1) + ", Name: " + rs.getString(2) + ", Price: "
+ rs.getDouble(3) + ", Quantity: " + rs.getInt(4));
                }
            } else if (choice == 3) {
                System.out.print("Enter ProductID to update: ");
                int id = sc.nextInt();
                System.out.print("Enter new Price: ");
                double price = sc.nextDouble();
                PreparedStatement ps = con.prepareStatement("UPDATE Product SET Price=?
WHERE ProductID=?");
                ps.setDouble(1, price);
                ps.setInt(2, id);
                ps.executeUpdate();
                System.out.println("Product updated successfully!");
            } else if (choice == 4) {
                System.out.print("Enter ProductID to delete: ");
                int id = sc.nextInt();
                PreparedStatement ps = con.prepareStatement("DELETE FROM Product WHERE
ProductID=?");
                ps.setInt(1, id);
                ps.executeUpdate();
                System.out.println("Product deleted successfully!");
            } else if (choice == 5) {
```

```
                System.out.println("Exiting...");
                break;
            } else {
                System.out.println("Invalid choice!");
            }
        }
        con.close();
    } catch (Exception e) {
        System.out.println(e);
    }
  }
}
```

SAMPLE OUTPUT:

```
Menu:
1. Add Product
2. View All Products
3. Update Product
4. Delete Product
5. Exit
Enter your choice: 1
Product added successfully!
```

HARD LEVEL PROBLEM

```
package exp.pkg6;

import java.sql.*;
import java.util.*;

class Student {
    int id;
    String name;
    String dept;
```

```
    double marks;

    Student(int id, String name, String dept, double marks) {
        this.id = id;
        this.name = name;
        this.dept = dept;
        this.marks = marks;
    }
}

class StudentController {
    Connection con;

    StudentController() throws Exception {
        Class.forName("com.mysql.cj.jdbc.Driver");
        con = DriverManager.getConnection("jdbc:mysql://localhost:3306/college", "root",
"password");
    }

    void addStudent(Student s) throws Exception {
        PreparedStatement ps = con.prepareStatement("INSERT INTO Student VALUES (?, ?, ?,
?)");
        ps.setInt(1, s.id);
        ps.setString(2, s.name);
        ps.setString(3, s.dept);
        ps.setDouble(4, s.marks);
        ps.executeUpdate();
```

```
    }

    void viewAll() throws Exception {
        Statement stmt = con.createStatement();
        ResultSet rs = stmt.executeQuery("SELECT * FROM Student");
        while (rs.next()) {
            System.out.println("StudentID: " + rs.getInt(1) + ", Name: " + rs.getString(2) + ",
Department: " + rs.getString(3) + ", Marks: " + rs.getDouble(4));
        }
    }

    void updateStudent(int id, double marks) throws Exception {
        PreparedStatement ps = con.prepareStatement("UPDATE Student SET Marks=? WHERE
StudentID=?");
        ps.setDouble(1, marks);
        ps.setInt(2, id);
        ps.executeUpdate();
    }

    void deleteStudent(int id) throws Exception {
        PreparedStatement ps = con.prepareStatement("DELETE FROM Student WHERE
StudentID=?");
        ps.setInt(1, id);
        ps.executeUpdate();
    }
}
```

```
public class Exp6 {
    public static void main(String[] args) {
        try {
            StudentController sc = new StudentController();
            Scanner in = new Scanner(System.in);
            while (true) {
                System.out.println("--- Student Management System ---");
                System.out.println("1. Add Student\n2. View All Students\n3. Update Student\n4.
Delete Student\n5. Exit");
                System.out.print("Enter your choice: ");
                int ch = in.nextInt();
                if (ch == 1) {
                    System.out.print("Enter ID: ");
                    int id = in.nextInt();
                    in.nextLine();
                    System.out.print("Enter Name: ");
                    String name = in.nextLine();
                    System.out.print("Enter Department: ");
                    String dept = in.nextLine();
                    System.out.print("Enter Marks: ");
                    double marks = in.nextDouble();
                    sc.addStudent(new Student(id, name, dept, marks));
                    System.out.println("Student added successfully!");
                } else if (ch == 2) {
                    sc.viewAll();
                } else if (ch == 3) {
                    System.out.print("Enter ID to update: ");
```

```
                int id = in.nextInt();
                System.out.print("Enter new Marks: ");
                double marks = in.nextDouble();
                sc.updateStudent(id, marks);
                System.out.println("Student updated successfully!");
            } else if (ch == 4) {
                System.out.print("Enter ID to delete: ");
                int id = in.nextInt();
                sc.deleteStudent(id);
                System.out.println("Student deleted successfully!");
            } else if (ch == 5) {
                System.out.println("Exiting...");
                break;
            } else {
                System.out.println("Invalid choice!");
            }
        }
    } catch (Exception e) {
        System.out.println(e);
    }
  }
}
```

SAMPLE OUTPUT:

--- Student Management System ---

1. Add Student

2. View All Students

3. Update Student

4. Delete Student

5. Exit

Enter your choice: 2

StudentID: 1001, Name: Akshara, Department: CSE, Marks: 98