Experiment 1

Student Name: Toshik Sharma **UID: 22BCS13034**
Branch: BE-CSE **Section/Group: KRG-3-B**
Semester:6th **Date of Performance: 16/1/25**
Subject Name: Project Based Learning in Java with Lab **Subject Code: 22CSH-359**

1. **Aim:** Given the following table containing information about employees of an organization, develop a small java application, which accepts employee id from the command prompt and displays the following details as output:
   Emp No Emp Name Department Designation and Salary
   You may assume that the array is initialized with the following details:

Emp No.	Emp Name	Join Date	Desig Code	Dept	Basic	HRA	IT
1001	Ashish	01/04/2009	e	R&D	20000	8000	3000
1002	Sushma	23/08/2012	c	PM	30000	12000	9000
1003	Rahul	12/11/2008	k	Acct	10000	8000	1000
1004	Chahat	29/01/2013	r	Front Desk	12000	6000	2000
1005	Ranjan	16/07/2005	m	Engg	50000	20000	20000
1006	Suman	1/1/2000	e	Manu factur ing	23000	9000	4400
1007	Tanmay	12/06/2006	c	PM	29000	12000	10000

   Salary is calculated as Basic+HRA+DA-IT. (DA details are given in the Designation table)

   Designation details :

Designation Code	Designation	DA
e	Engineer	20000
c	Consultant	32000
k	Clerk	12000
r	Receptionist	15000
m	Manager	40000

Use Switch-Case to print Designation in the output and to find the value of DA for a particular employee.

2. **Objective:**

i. Assuming that your class name is Project1, and you execute your code as java Project1 1003, it should display the following output :

Emp No. Emp Name Department Designation Salary
1003 Rahul Acct Clerk 29000

ii. java Project1 123

There is no employee with empid : 123

3. **Implementation/Code:**

```
package WorkSheets.Exp1_1;

import java.time.LocalDate;

public class Employee {
    int EmpNo;
    String EmpName;
    LocalDate DateJoining;
    char DesigCode;
    String Dept;
    int Basic;
    int HR;
```

```
    int IT;

    Employee(int EmpNo, String EmpName, LocalDate DateJoining, char
DesigCode, String Dept, int Basic, int HR, int IT){
        this.EmpNo = EmpNo;
        this.EmpName = EmpName;
        this.DateJoining = DateJoining;
        this.DesigCode = DesigCode;
        this.Dept = Dept;
        this.Basic = Basic;
        this.HR = HR;
        this.IT = IT;
    }
    int calculateSalary(int da){
        return Basic+HR+IT-da;
    }
}


package WorkSheets.Exp1_1;

import java.time.LocalDate;
import java.time.format.DateTimeFormatter;
import java.util.ArrayList;
import java.util.Scanner;

public class PrintResult {
    public static void main(String[] args) {
        ArrayList<Employee> employees = new ArrayList<>();
        employees.add(new Employee(1001,"Ashish",
LocalDate.of(2009,04,01),'e',"R&D",20000,8000,3000));
        employees.add(new Employee(1002,"Sushma",
LocalDate.of(2012,8,23),'c',"PM",30000,12000,9000));
        employees.add(new Employee(1003,"Rahul",
LocalDate.of(2008,11,12),'k',"Acct",10000,8000,1000));
        employees.add(new Employee(1004,"Chahat",
LocalDate.of(2013,01,29),'r',"Front Desk",12000,6000,2000));
        employees.add(new Employee(1005,"Ranjan",
LocalDate.of(2005,07,16),'m',"Engg",50000,20000,20000));
        employees.add(new Employee(1006,"Suman",
LocalDate.of(2000,01,01),'e',"Manufacturing",23000,9000,4400));
        employees.add(new Employee(1007,"Tanmay",
```

```
LocalDate.of(2006,06,12),'c',"PM",29000,12000,10000));

        Scanner sc = new Scanner(System.in);
        System.out.print("Enter Employee Id: ");
        int id = sc.nextInt();
        Employee e = null;
        for(Employee emp : employees){
            if(emp.EmpNo == id){
                e = emp;
                break;
            }
        }

        if(e!=null){
            int da = 0;
            String designationName = "";
            switch(e.DesigCode){
                case 'e':
                    da = 20000;
                    designationName = "Engineer";
                    break;
                case 'c':
                    da = 32000;
                    designationName = "Consultant";
                    break;
                case 'k':
                    da = 12000;
                    designationName = "Clerk";
                    break;
                case 'r':
                    da = 15000;
                    designationName = "Receptionist";
                    break;
                case 'm':
                    da = 40000;
                    designationName = "Manager";
                    break;
                default:
                    System.out.println("Invalid designation code!");
                    return;
            }
            int salary = e.calculateSalary(da);
```

```
            System.out.println("Emp No.       : " + e.EmpNo);
            System.out.println("Name          : " + e.EmpName);
            System.out.println("Department    : " + e.Dept);
            System.out.println("Designation   : " + designationName);
            System.out.println("Date of Joining: " +
e.DateJoining.format(DateTimeFormatter.ofPattern("dd-MM-yyyy"))); // Display
the date
            System.out.println("Salary        : " + salary);
        }else{
            System.out.println("Wrong Id! it is not in this table");
        }
        sc.close();
    }
}
```

4. Output:

```
Enter Employee Id: 1001
Emp No.        : 1001
Name           : Ashish
Department     : R&D
Designation    : Engineer
Date of Joining: 01-04-2009
Salary         : 11000
```

5. Learning Outcomes:

i. Understand how to map employee details (like designation codes to roles) using efficient logic and structures.
ii. Learn to identify and address input mismatches or invalid entries through proper validation and error messages.
iii. Gain skills in presenting data in a well-structured and readable format for better user understanding.

Experiment 2

Student Name:Toshik Sharma **UID: 22BCS13034**
Branch: BE-CSE **Section/Group: KRG-3B**
Semester:6th **Date of Performance: 16/01/25**
Subject Name: Project Based Learning in Java with Lab **Subject Code: 22CSH-359**

1. **Aim:** The aim of this project is to design and implement a simple inventory control system for a small video rental store. Define least two classes: a class Video to model a video and a class VideoStore to model the

   actual store.

   Assume that an object of class Video has the following attributes:

   1. A title;
   2. a flag to say whether it is checked out or not;
   3. An average user rating.

   Add instance variables for each of these attributes to the Video class.

   In addition, you will need to add methods corresponding to the following:

   1. being checked out;
   2. being returned; 3. receiving a rating.

   The VideoStore class will contain at least an instance variable that references an array of videos (say of length 10). The VideoStore will contain the following methods:

   1. addVideo(String): add a new video (by title) to the inventory;
   2. checkOut(String): check out a video (by title);
   3. returnVideo(String): return a video to the store;
   4. receiveRating(String, int) : take a user's rating for a video; and 5. listInventory(): list the whole inventory of videos in the store.

2. **Objective:** Create a VideoStoreLauncher class with a main() method which will test the functionality of your other two classes. It should allow the following.

   1. Add 3 videos: "The Matrix", "Godfather II", "Star Wars Episode IV: A New Hope".
   2. Give several ratings to each video.
   3. Rent each video out once and return it.

   List the inventory after "Godfather II" has been rented out.

3. Implementation/Code:

1. Video Class:-

```
 class Video
{ private String title; private
boolean checkedOut; private
double averageRating;
   private int ratingCount;

   public Video(String title)
{       this.title = title;
this.checkedOut = false;
this.averageRating = 0.0;
      this.ratingCount = 0;
   }

   public void checkOut()
{       if (!checkedOut)
{           checkedOut = true;
          System.out.println("Video \"" + title + "\" has been checked
out.");       } else {
          System.out.println("Video \"" + title + "\" is already checked out.");
      }
   }

   public void returnVideo()
{       if (checkedOut)
{           checkedOut = false;
```

```
            System.out.println("Video \"" + title + "\" has been
returned.");        } else {
            System.out.println("Video \"" + title + "\" was not checked out.");
        }
    }

    public void receiveRating(int rating)
{        if (rating < 1 || rating > 5) {
            System.out.println("Invalid rating. Please rate between 1 and 5.");
return;
        }
        averageRating = (averageRating * ratingCount + rating) /
(++ratingCount);
        System.out.println("Received rating of " + rating + " for video \"" + title +
"\".");
    }

    public String getTitle() {
        return title;
    }

    public boolean isCheckedOut() {
        return checkedOut;
    }

    public double getAverageRating() {
        return averageRating;
    }
}
```

2. VideoStore Class:-

```
class      VideoStore      {
private Video[] videos;
    private int count;

    public VideoStore(int capacity)
{                videos = new Video[capacity];
```

```
count = 0;
    }

    public void addVideo(String title)
{        if (count < videos.length) {
            videos[count++] = new Video(title);
System.out.println("Added video: " + title);
        } else {
            System.out.println("Inventory is full. Cannot add more videos.");
        }
    }

    public void checkOut(String title)
{        Video video = findVideo(title);
        if (video != null)
{            video.checkOut();
        } else {
            System.out.println("Video \"" + title + "\" not found.");
        }
    }

    public void returnVideo(String title)
{        Video video = findVideo(title);
        if (video != null)
{            video.returnVideo();
        } else {

            System.out.println("Video \"" + title + "\" not found.");
        }
    }

    public void receiveRating(String title, int rating) {
        Video video = findVideo(title);
if (video != null) {
            video.receiveRating(rating);
        } else {
            System.out.println("Video \"" + title + "\" not found.");
```

```
        }
    }

    public void listInventory()
{        System.out.println("\nInventory:");
for (int i = 0; i < count; i++) {
            Video video = videos[i];
            System.out.println("Title: " + video.getTitle() + ", Checked Out: " +
video.isCheckedOut() +
                    ", Average Rating: " + video.getAverageRating());
        }
    }

    private Video findVideo(String title)
{        for (int i = 0; i < count; i++) {
            if (videos[i].getTitle().equalsIgnoreCase(title))
{                return videos[i];
            }
}
        return null;
    }
}
```

3. **VideoStoreLauncher Class:-**

```
public  class  VideoStoreLauncher  {   public
static void main(String[] args) {    VideoStore
store = new VideoStore(10);

        store.addVideo("The Matrix");
store.addVideo("Godfather II");
        store.addVideo("Star Wars Episode IV: A New Hope");

        store.receiveRating("The Matrix", 5);
 store.receiveRating("Godfather II", 4);
        store.receiveRating("Star Wars Episode IV: A New Hope", 5);
```

```
        store.checkOut("Godfather II");
        store.returnVideo("Godfather II");
        store.listInventory();
    }
}
```

4. **Output:**

```
Added video: The Matrix
Added video: Godfather II
Added video: Star Wars Episode IV: A New Hope
Received rating of 5 for video "The Matrix".
Received rating of 4 for video "Godfather II".
Received rating of 5 for video "Star Wars Episode IV: A New Hope".
Video "Godfather II" has been checked out.
Video "Godfather II" has been returned.

Inventory:
Title: The Matrix, Checked Out: false, Average Rating: 5.0
Title: Godfather II, Checked Out: false, Average Rating: 4.0
Title: Star Wars Episode IV: A New Hope, Checked Out: false, Average Rating: 5.0


...Program finished with exit code 0
Press ENTER to exit console.
```

5. **Learning Outcomes:**
   1. Designed a functional system to manage video rentals, demonstrating the use of classes and objects in Java.
   2. Implemented methods for operations like adding videos, renting out, returning, and recording user ratings.
   3. Applied arrays to store and efficiently manage the video inventory within the store.
   4. Learned to integrate multiple classes and enable seamless interaction among them in a structured program.
   5. Strengthened understanding of object-oriented programming concepts like encapsulation and method abstraction.

Experiment -4

StudentName:Toshik Sharma **Branch: CSE**
UID:22BCS13034 **Section:KRG_IOT-3/B**
Semester: 6th **DOP:**
Subject: Java **Subject Code:22CSH-359**

Aim: Develop Java programs using core concepts such as data structures, collections, and multithreading to manage and manipulate data.

Objective: Write a Java program to implement an ArrayList that stores employee details (ID, Name, and Salary). Allow users to add, update, remove, and search employees.

Algorithm:

1.) Define Data Structure:
- Create an Employee class/structure with:
  - Integer id
  - String name
  - Double salary

2.) Initialize Data Storage:
- Create an empty list (e.g., ArrayList<Employee>) to hold employee objects.

3.) Main Loop:
- Repeat until the user chooses to exit:
  1) Display Menu Options:
     - "1. Add Employee"
     - "2. Update Employee"
     - "3. Remove Employee"
     - "4. Search Employee"
     - "5. Display All Employees"
     - "0. Exit"
  2) **Input Choice**:
- Read the user's menu option (e.g., as an integer).

4.) Process User Choice:
- **If** choice is **1 (Add Employee):**
1. Prompt the user to enter Employee ID.
2. Prompt the user to enter Employee Name.
3. Prompt the user to enter Employee Salary.
4. Create a new Employee object with the provided details.
5. Add the new employee to the list.
6. Display a success message.
- **If** choice is **2 (Update Employee):**
1. Prompt the user to enter the Employee ID to update.
2. Search for the employee in the list using the given ID.
3. If the employee exists:
   - Prompt the user to enter the new Name.

5.) End Program

Code:

```
import java.util.ArrayList;
import java.util.Scanner;
class Employee {
    private int id;
    private String name;
    private double salary;
    public Employee(int id, String name, double salary)
        { this.id = id;
        this.name = name;
        this.salary = salary;
    }
    public int getId() { return id; }
    public String getName() { return name; }
    public double getSalary() { return salary; }
    public void setName(String name) { this.name = name; }
    public void setSalary(double salary) { this.salary = salary; }
    @Override
    public String toString() {
        return "Employee ID: " + id + ", Name: " + name + ", Salary: " + salary;
    }
}
public class EmployeeManagement {
private static ArrayList<Employee> employees = new ArrayList<>(); private
static Scanner scanner = new Scanner(System.in);

    public static void main(String[] args)
        { int choice;
        do {
            System.out.println("\nEmployee Management System");
            System.out.println("1. Add Employee");
            System.out.println("2. Update Employee");
            System.out.println("3. Remove Employee");
            System.out.println("4. Search Employee");
            System.out.println("5. Display All Employees");
            System.out.println("0. Exit");
            System.out.print("Enter your choice: ");
            choice = scanner.nextInt();
            scanner.nextLine();
            switch(choice) {
                case 1: addEmployee(); break;
                case 2: updateEmployee(); break;
                case 3: removeEmployee(); break;
                case 4: searchEmployee(); break;
                case 5: displayEmployees(); break;
                case 0: System.out.println("Exiting..."); break;
                default: System.out.println("Invalid choice. Try again.");
            }
        } while(choice != 0);
    }
```

```
    private static void addEmployee()
        { System.out.print("Enter Employee ID: ");
        int id = scanner.nextInt();
        scanner.nextLine();
        System.out.print("Enter Employee Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter Employee Salary: ");
        double salary = scanner.nextDouble();
        scanner.nextLine();
        employees.add(new Employee(id, name, salary));
        System.out.println("Employee added successfully.");
    }
    private static void updateEmployee()
        { System.out.print("Enter Employee ID to update: ");
        int id = scanner.nextInt();
        scanner.nextLine();
        Employee emp = findEmployeeById(id);
        if(emp != null) {
            System.out.print("Enter new Name: ");
            String name = scanner.nextLine();
            System.out.print("Enter new Salary: ");
            double salary = scanner.nextDouble();
            scanner.nextLine();
            emp.setName(name);
            emp.setSalary(salary);
            System.out.println("Employee updated successfully.");
} else {
            System.out.println("Employee not found.");
        }
    }
    private static void removeEmployee()
        { System.out.print("Enter Employee ID to remove: ");
        int id = scanner.nextInt();
        scanner.nextLine();
        Employee emp = findEmployeeById(id);
        if(emp != null) {
            employees.remove(emp);
            System.out.println("Employee removed successfully.");
        } else {
            System.out.println("Employee not found.");
        }
    }
    private static void searchEmployee()
        { System.out.print("Enter Employee ID to search:
        "); int id = scanner.nextInt();
        scanner.nextLine();
        Employee emp = findEmployeeById(id);
        if(emp != null) {
            System.out.println("Employee found: " + emp);
        } else {
            System.out.println("Employee not found.");
        }
    }
```

```
    private static void displayEmployees()
        { if(employees.isEmpty()) {
            System.out.println("No employees to display.");
        } else {
            System.out.println("Employee List:");
            for(Employee emp : employees) {
                System.out.println(emp);
            }
        }
    }
    private static Employee findEmployeeById(int id)
        { for(Employee emp : employees) {
            if(emp.getId() == id)
                { return emp;
            }
        }
        return null;
    }
}
```

Learning Outcomes:

1. Demonstrate: Apply key concepts to real-world scenarios to showcase understanding.
2. Analyze: Critically evaluate information, identify patterns, and draw meaningful conclusions.
3. Communicate: Convey ideas and findings effectively through oral and written communication.
4. Collaborate: Contribute to group projects and exhibit strong teamwork capabilities in a collaborative environment.

Output:

```
Employee Management System
1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Display All Employees
0. Exit
Enter your choice: 5
Employee List:
Employee ID: 17209, Name: Vishwas, Salary: 1500000.0
Employee ID: 17134, Name: Rajat, Salary: 1150000.0
```

Experiment 5

Student Name: Toshik Sharma **UID:22BCS13034**
Branch: CSE **Semester: 6th**
Subject: PBLJ **Subject Code:22CSH-359**

Aim: Write a Java program to calculate the sum of a list of integers using autoboxing and unboxing. Include methods to parse strings into their respective wrapper classes (e.g., Integer.parseInt()).

Objective: Demonstrate **autoboxing** and **unboxing** in Java by converting string numbers into Integer objects, storing them in a list, and computing their sum.

Algorithm:

Step 1: Initialize the Program

1. Start the program.
2. Import ArrayList and List classes.
3. Define the AutoboxingExample class.

Step 2: Convert String Array to Integer List.

Step 3: Calculate the Sum of Integers

1. Define the method calculateSum(List<Integer> numbers).
2. Initialize a variable sum to 0.
3. Iterate through the list:
   - Extract each integer (**unboxing** happens here).
   - Add it to sum.
4. Return the total sum.

Step 4: Execute Main Function

Step 5: Terminate the Program

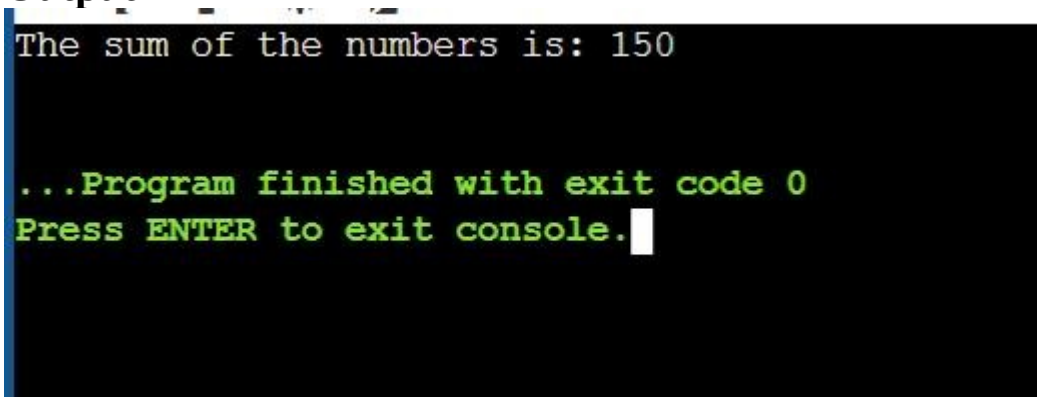
1. End the execution.

Code:

```
import java.util.ArrayList;
import java.util.List;

public class AutoboxingExample
   { public static void main(String[] args)
   {
      String[] numberStrings = {"10", "20", "30", "40", "50"};

      List<Integer> numbers = parseStringArrayToIntegers(numberStrings);

      int sum = calculateSum(numbers);

      System.out.println("The sum of the numbers is: " + sum);
   }
```

```
    public static List<Integer> parseStringArrayToIntegers(String[] strings)
        { List<Integer> integerList = new ArrayList<>();
        for (String str : strings)
            { integerList.add(Integer.parseInt(str));
        }
        return integerList;
    }

    public static int calculateSum(List<Integer> numbers)
        { int sum = 0;
        for (Integer num : numbers)
            { sum += num;
        }
        return sum;
    }
}
```

Output:



Learning Outcomes:

- Understand the concept of **autoboxing and unboxing** in Java and how primitive types are automatically converted to their wrapper classes and vice versa.
- Learn how to **convert string values into Integer objects** using Integer.parseInt() and store them in a list.
- Gain experience in **working with ArrayLists** to store and manipulate a collection of numbers dynamically.
- Develop proficiency in **iterating through collections** and performing arithmetic operations like summation.

Experiment 5.2

1. **Aim:** Create a Java program to serialize and deserialize a Student object.
The program should:
- Serialize a Student object (containing id, name, and GPA) and save it to a file.
- Deserialize the object from the file and display the student details.
- Handle FileNotFoundException, IOException, and ClassNotFoundException using exception handling.

2. **Objective:** The objective is to serialize and deserialize a Student object, store and retrieve its id, name, and GPA from a file, and handle exceptions like FileNotFoundException, IOException, and ClassNotFoundException.

3. Algorithm:

Step 1: Initialize the Program
Step 2: Define the Serialization Method
1. Create serializeStudent(Student student).
2. Use a try-with-resources block to create an ObjectOutputStream:
   - Open a FileOutputStream to write to student.ser.
   - Write the Student object to the file using writeObject().
3. Handle exceptions:
   - FileNotFoundException → Print error message.
   - IOException → Print error message.
4. Print a success message if serialization is successful.

Step 3: Define the Deserialization Method
1. Create deserializeStudent().
2. Use a try-with-resources block to create an ObjectInputStream:
   - Open a FileInputStream to read student.ser.
   - Read the Student object using readObject().

Step 4: Execute Main Function
1. Define main(String[] args).
2. Create a Student object with sample data.
3. Call serializeStudent() to save the object.
4. Call deserializeStudent() to read and display the object.

Step 5: Terminate the Program
1. End execution.

4 - Implementation Code:

```
import java.io.*;

class Student implements Serializable {
    private static final long serialVersionUID = 1L;
    private int id;
    private String name;
    private double gpa;

    public Student(int id, String name, double gpa)
        { this.id = id;
        this.name = name;
        this.gpa = gpa;
    }
```

```
    @Override
    public String toString() {
        return "Student{id=" + id + ", name='" + name + "', gpa=" + gpa + "}";
    }
}
public class StudentSerialization {
    private static final String FILE_NAME = "student.ser";

    public static void main(String[] args) {
        Student student = new Student(1, "Anwar", 7.8);
        serializeStudent(student);
        deserializeStudent();
    }
    public static void serializeStudent(Student student) {
        try (ObjectOutputStream oos = new ObjectOutputStream(new
FileOutputStream(FILE_NAME))) {
            oos.writeObject(student);
            System.out.println("Student object serialized successfully.");
        } catch (FileNotFoundException e)
            { System.err.println("File not found: " + e.getMessage());
        } catch (IOException e) {
            System.err.println("IOException occurred: " + e.getMessage());
        }
    }
    public static void deserializeStudent() {
        try (ObjectInputStream ois = new ObjectInputStream(new FileInputStream(FILE_NAME)))
{
            Student student = (Student) ois.readObject();
            System.out.println("Deserialized Student: " + student);
        } catch (FileNotFoundException e)
            { System.err.println("File not found: " + e.getMessage());
        } catch (IOException e) {
            System.err.println("IOException occurred: " + e.getMessage());
        } catch (ClassNotFoundException e) {
System.err.println("Class not found: " + e.getMessage());
        }
    }
}
```

4. Output

```
Student object serialized successfully.
Deserialized Student: Student{id=1, name='Anwar', gpa=7.8}


...Program finished with exit code 0
Press ENTER to exit console.
```

5. Learning Outcomes:

- Understand object serialization and deserialization in Java.
- Learn how to use ObjectOutputStream and ObjectInputStream for file operations.

Experiment-3

Student Name: Toshik Sharma UID:22BCS13034
Branch: BE-CSE Section/Group: KRG_3/B
Semester: 6th Date of Performance: 28.1.25
Subject Name: Project Based Learning in Java Subject Code: 22CSH-359

1.Aim :Create an application to calculate interest for FDs, RDs based on certain conditions using inheritence

2.Objective: To design and implement a Java program that calculates interest for various account types (FD, RD, SB) using object-oriented principles, focusing on abstraction, method overriding, and dynamic input validation.

3.Implementation/Code:

```
abstract class
Account { double
interestRate; double
amount;
abstract double calculateInterest();
}
class FDAccount extends Account
{ int noOfDays;
int ageOfACHolder;

FDAccount(double amount, int noOfDays, int ageOfACHolder) {
this.amount = amount;
this.noOfDays = noOfDays;
 this.ageOfACHolder = ageOfACHolder;
}
@Override
double calculateInterest() {
if (amount < 10000000) { // Less than 1 crore
if (noOfDays >= 7 && noOfDays <= 14) interestRate = ageOfACHolder >= 60 ? 5.0 : 4.5;
else if (noOfDays >= 15 && noOfDays <= 29) interestRate = ageOfACHolder >= 60 ? 5.25:
4.75; else if (noOfDays >= 30 && noOfDays <= 45) interestRate = ageOfACHolder >= 60 ?
6.0 : 5.5; else if (noOfDays >= 45 && noOfDays <= 60) interestRate = ageOfACHolder >= 60
? 7.5 :7.0; else if (noOfDays >= 61 && noOfDays <= 184) interestRate = ageOfACHolder >=
60 ? 8.0: 7.5; else if (noOfDays >= 185 && noOfDays <= 365) interestRate = ageOfACHolder
>= 60 ?8.5 : 8.0;
} else { // Greater than or equal to 1 crore
if (noOfDays >= 7 && noOfDays <= 14) interestRate = 6.5;
else if (noOfDays >= 15 && noOfDays <= 29) interestRate =
 6.75; else if (noOfDays >= 30 && noOfDays <= 45) interestRate
 = 6.75;
```

```
else if (noOfDays >= 45 && noOfDays <= 60) interestRate = 8.0;
else if (noOfDays >= 61 && noOfDays <= 184) interestRate = 8.5;
else if (noOfDays >= 185 && noOfDays <= 365) interestRate = 10.0;
}
return amount * interestRate / 100;
}
}
class RDAccount extends Account {
 int noOfMonths;
double monthlyAmount;
 int ageOfACHolder;

RDAccount(double monthlyAmount, int noOfMonths, int ageOfACHolder) {
 this.monthlyAmount = monthlyAmount;
this.noOfMonths = noOfMonths;
this.ageOfACHolder = ageOfACHolder;
}
@Override
double calculateInterest() {
if (noOfMonths == 6) interestRate = ageOfACHolder >= 60 ? 8.0 : 7.5;
else if (noOfMonths == 9) interestRate = ageOfACHolder >= 60 ? 8.25 : 7.75;
else if (noOfMonths == 12) interestRate = ageOfACHolder >= 60 ? 8.5 : 8.0;
else if (noOfMonths == 15) interestRate = ageOfACHolder >= 60 ? 8.75 : 8.25;
else if (noOfMonths == 18) interestRate = ageOfACHolder >= 60 ? 9.0 : 8.5;
else if (noOfMonths == 21) interestRate = ageOfACHolder >= 60 ? 9.25 : 8.75;
return monthlyAmount * noOfMonths * interestRate / 100;
}
}
class SBAccount extends Account {
String accountType;
SBAccount(double amount, String accountType) {
 this.amount = amount;
 this.accountType = accountType;
}
@Override
double calculateInterest() {
interestRate = accountType.equalsIgnoreCase("NRI") ? 6.0 : 4.0;
return amount * interestRate / 100;
}
```

4.Output:

```
Select the option:
1. Interest Calculator  SB
2. Interest Calculator  FD
3. Interest Calculator  RD
4. Exit
1
Enter the Average amount in your account:
50000
Enter account type (Normal/NRI):
normal
Interest gained: Rs. 2000.0
Select the option:
1. Interest Calculator  SB
2. Interest Calculator  FD
3. Interest Calculator  RD
4. Exit
```

5. Learning outcomes:

1. Understand the concept of abstract classes and method overriding in Java.
2. Learn to implement real-world scenarios using object-oriented principles.
3. Develop skills to validate user input for different account types.
4. Gain knowledge of calculating interest dynamically based on conditions.
5. Enhance problem-solving abilities by applying conditional logic effectively.

Experiment 6

Student Name: Toshik Sharma **UID:22bcs13034**
Branch: CSE **Section/Group:KRG_3B**
Semester: 6 **Date of Performance:25-03-25**
Subject Name: Java with Lab **Subject Code: 22CSH-359**

1. **Aim:** Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

2. **Objective:**

   • Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

   • Implement easy, medium, and hard-level tasks involving sorting employees, filtering and sorting students, and processing products using streams.

3. **Implementation/Code:**

a.
```
import java.util.*;
class Employee {
   String name;
   int age;
   double salary;
   Employee(String name, int age, double salary) {
      this.name = name;
      this.age = age;
      this.salary = salary;
   }
   @Override
   public String toString() {
      return name + " - Age: " + age + ", Salary: " + salary;
   }
}
public class EmployeeSort {
   public static void main(String[] args) {
      List<Employee> employees = Arrays.asList(
         new Employee("Ayush", 20, 90000),
         new Employee("Vinay", 22, 100000),
```

```
            new Employee("Prakul", 23, 70000)
        );
        employees.sort(Comparator.comparing(emp -> emp.name));
        System.out.println("Sorted by Name: " + employees);
        employees.sort(Comparator.comparingInt(emp -> emp.age));
        System.out.println("Sorted by Age: " + employees);
        employees.sort(Comparator.comparingDouble(emp -> emp.salary));
        System.out.println("Sorted by Salary: " + employees);
    }
}
```

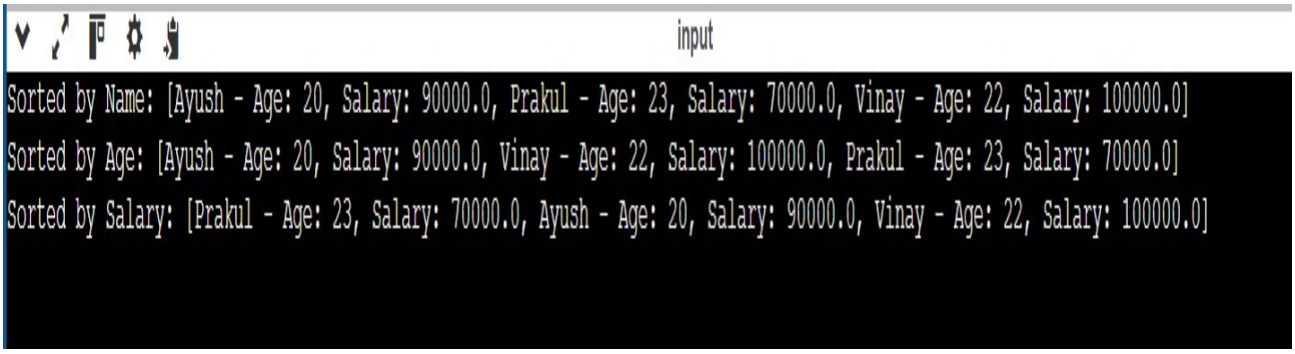
b.
```
import java.util.*;
import java.util.stream.Collectors;
class Student {
    private String name;
    private double marks;
    public Student(String name, double marks) {
        this.name = name;
        this.marks = marks;
    }
    public String getName() {
        return name;
    }
    public double getMarks() {
        return marks;
    }
}
public class StudentFilter {
    public static void main(String[] args) {
        List<Student> students = List.of(
            new Student("Ayush", 85),
            new Student("Rajeev", 70),
            new Student("Vinay", 90),
            new Student("David", 60),
            new Student("Prakul", 80)
        );
```

```
        List<String> topStudents = students.stream()
            .filter(s -> s.getMarks() > 75)
            .sorted(Comparator.comparingDouble(Student::getMarks).reversed())
            .map(Student::getName)
            .collect(Collectors.toList());
        System.out.println("Top Students: " + topStudents);
    }
}
```

c.
```
import java.util.*;
import java.util.stream.Collectors;
class Product {
    String name;
    String category;
    double price;
    public Product(String name, String category, double price) {
        this.name = name;
        this.category = category;
        this.price = price;
    }
    @Override
    public String toString() {
        return name + " ($" + price + ")";
    }
}
public class ProductProcessor {
    public static void main(String[] args) {
        List<Product> products = Arrays.asList(
            new Product("Laptop", "Electronics", 1200),
            new Product("Phone", "Electronics", 800),
            new Product("TV", "Electronics", 1500),
            new Product("Shirt", "Clothing", 50),
            new Product("Jeans", "Clothing", 70),
            new Product("Blender", "Appliances", 200),
            new Product("Toaster", "Appliances", 100)
        );
```

```
        Map<String, List<Product>> productsByCategory = products.stream()
            .collect(Collectors.groupingBy(p -> p.category));
        System.out.println("Products grouped by category:");
        productsByCategory.forEach((category, productList) ->
            System.out.println(category + ": " + productList));
        Map<String, Optional<Product>> mostExpensiveByCategory = products.stream()
            .collect(Collectors.groupingBy(
                p -> p.category,
                Collectors.maxBy(Comparator.comparingDouble(p -> p.price))
            ));
        System.out.println("\nMost expensive product in each category:");
        mostExpensiveByCategory.forEach((category, product) ->
            System.out.println(category + ": " + product.orElse(null)));
        double averagePrice = products.stream()
            .mapToDouble(p -> p.price)
            .average()
            .orElse(0);
        System.out.println("\nAverage price of all products: $" + averagePrice);
    }
}
```

4. Output:



```
Top Students: [Vinay, Ayush, Prakul]
```

```
Products grouped by category:
Appliances: [Blender (200.0), Toaster (100.0)]
Clothing: [Shirt (50.0), Jeans (70.0)]
Electronics: [Laptop (1200.0), Phone (800.0), TV (1500.0)]

Most expensive product in each category:
Appliances: Blender (200.0)
Clothing: Jeans (70.0)
Electronics: TV (1500.0)

Average price of all products: $560.0
```

5. Learning Outcome:

- Understand and implement **lambda expressions** for sorting objects in a list based on different attributes.
- Utilize **Java Streams API** to perform operations like **filtering, sorting, and mapping** efficiently on large datasets.
- Learn **Comparator and method references** to simplify object comparisons for sorting.
- Apply **grouping and aggregation functions** using Collectors.groupingBy() and Collectors.maxBy() for processing categorized data.
- Gain hands-on experience in computing **statistical values** like the **average** from a dataset using mapToDouble() and average().
- Improve **code efficiency and readability** by using **functional programming** techniques in Java.

Experiment -7

Student Name: Toshik Sharma **UID:22BCS13034**
Branch: BE-CSE **Section/Group: KRG_3B**
Semester: 6 **Date of Performance:02/04/2025**
Subject : Project Based Learning in Java with Lab **Subject Code: 22CSH-359**

7.1.1.Aim: Create a Java program to connect to a MySQL database and fetch data from a single table. The program should: Use DriverManager and Connection objects. Retrieve and display all records from a table named Employee with columns EmpID, Name, and Salary..

7.1.2 Objective: To develop a Java program that connects to a MySQL database, retrieves data from the Employee table, and displays all records, demonstrating basic JDBC connectivity and data retrieval operations.

7.1.3 Code:

```
import java.sql.*;

public class FetchEmployeeData {
   public static void main(String[] args) {
      String url =  "jdbc:mysql://localhost:3306/testdb";
      String user = "root";
      String password = "password";

      String query = "SELECT EmpID, Name, Salary FROM Employee";

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

         // Establish connection
         Connection con = DriverManager.getConnection(url, user, password);
         System.out.println("Connected to the database!");

         // Create statement and execute query
         Statement stmt = con.createStatement();
         ResultSet rs = stmt.executeQuery(query);

         // Display results
         System.out.println("\nEmployee Records:");
```

```
            System.out.println("-------------------------");
            System.out.printf("%-10s %-20s %-10s%n", "EmpID", "Name", "Salary");
            System.out.println("-------------------------");

            while (rs.next()) {
                int empID = rs.getInt("EmpID");
                String name = rs.getString("Name");
                double salary = rs.getDouble("Salary");

                System.out.printf("%-10d %-20s %-10.2f%n", empID, name, salary);
            }

            // Close resources
            rs.close();
            stmt.close();
            con.close();
            System.out.println("\nConnection closed.");

        } catch (ClassNotFoundException e) {
            System.out.println("MySQL Driver not found: " + e.getMessage());
        } catch (SQLException e) {
            System.out.println("SQL Error: " + e.getMessage());
        }
    }
}
```

7.1.4 Output:

```
(base) PS C:\Users\virat\OneDrive\Desktop\java exp7> java -cp ".;lib/mysql-connector-j-9.2.0.jar" FetchEmployeeD
ata
>>
Connected to the database!

Employee Records:
-------------------------------------
EmpID      Name                 Salary
-------------------------------------
1          Alice                50000.00
2          Bob                  60000.00
3          Charlie              55000.00

Connection closed.
(base) PS C:\Users\virat\OneDrive\Desktop\java exp7>
```

7.2.1 Aim: Build a program to perform CRUD operations (Create, Read, Update, Delete) on a database table Product with columns: ProductID, ProductName, Price, and Quantity. The program should include: Menu-driven options for each operation. Transaction handling to ensure data integrity.

7.2.2 Objective: To develop a Java program that connects to a MySQL database and performs CRUD operations (Create, Read, Update, Delete) on the Product table. The program ensures data integrity by using transaction handling and provides a menu-driven interface for user-friendly interaction.

7.2.3 Code:

```
import java.sql.*;
import java.util.Scanner;

public class ProductCRUD {

    private static final String URL = "jdbc:mysql://localhost:3306/ProductDB";
    private static final String USER = "root";
    private static final String PASSWORD = "password";

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD)) {
            Class.forName("com.mysql.cj.jdbc.Driver");
            System.out.println("Connected to the database!");

            boolean exit = false;

            while (!exit) {
                System.out.println("\n=== Product CRUD Operations ===");
                System.out.println("1. Create Product");
                System.out.println("2. Read Products");
                System.out.println("3. Update Product");
                System.out.println("4. Delete Product");
                System.out.println("5. Exit");
                System.out.print("Choose an option: ");

                int choice = scanner.nextInt();
```

```
                scanner.nextLine();
                switch (choice) {
                    case 1 -> createProduct(conn, scanner);
                    case 2 -> readProducts(conn);
                    case 3 -> updateProduct(conn, scanner);
                    case 4 -> deleteProduct(conn, scanner);
                    case 5 -> exit = true;
                    default -> System.out.println("Invalid option. Try again.");
                }
            }

        } catch (ClassNotFoundException e) {
            System.out.println("MySQL Driver not found: " + e.getMessage());
        } catch (SQLException e) {
            System.out.println("SQL Error: " + e.getMessage());
        }

        scanner.close();
    }

    private static void createProduct(Connection conn, Scanner scanner) throws SQLException {
        System.out.print("Enter product name: ");
        String name = scanner.nextLine();
        System.out.print("Enter price: ");
        double price = scanner.nextDouble();
        System.out.print("Enter quantity: ");
        int quantity = scanner.nextInt();

        String query = "INSERT INTO Product (ProductName, Price, Quantity) VALUES (?, ?,
?)";

        try (PreparedStatement pstmt = conn.prepareStatement(query)) {
            conn.setAutoCommit(false);

            pstmt.setString(1, name);
            pstmt.setDouble(2, price);
            pstmt.setInt(3, quantity);

            int rows = pstmt.executeUpdate();
            conn.commit();

            System.out.println(rows + " product(s) inserted successfully!");
```

```
        } catch (SQLException e) {
            conn.rollback();
            System.out.println("Transaction rolled back due to error: " + e.getMessage());
        } finally {
            conn.setAutoCommit(true);
        }
    }

    private static void readProducts(Connection conn) throws SQLException {
        String query = "SELECT * FROM Product";

        try (Statement stmt = conn.createStatement();
             ResultSet rs = stmt.executeQuery(query)) {

            System.out.println("\nProduct Records:");
            System.out.println(" ---------------------------------------------- ");
            System.out.printf("%-10s %-20s %-10s %-10s%n", "ProductID", "ProductName",
"Price", "Quantity");
            System.out.println("-----------------------------------");

            while (rs.next()) {
                int id = rs.getInt("ProductID");
                String name = rs.getString("ProductName");
                double price = rs.getDouble("Price");
                int quantity = rs.getInt("Quantity");

                System.out.printf("%-10d %-20s %-10.2f %-10d%n", id, name, price, quantity);
            }
        }
    }


    private static void updateProduct(Connection conn, Scanner scanner) throws SQLException
{
        System.out.print("Enter product ID to update: ");
        int id = scanner.nextInt();
        scanner.nextLine();

        System.out.print("Enter new name: ");
        String name = scanner.nextLine();
        System.out.print("Enter new price: ");
```

```
        double price = scanner.nextDouble();
        System.out.print("Enter new quantity: ");
        int quantity = scanner.nextInt();

        String query = "UPDATE Product SET ProductName = ?, Price = ?, Quantity = ? WHERE
ProductID = ?";

        try (PreparedStatement pstmt = conn.prepareStatement(query)) {
            conn.setAutoCommit(false);

            pstmt.setString(1, name);
            pstmt.setDouble(2, price);
            pstmt.setInt(3, quantity);
            pstmt.setInt(4, id);

            int rows = pstmt.executeUpdate();
            conn.commit();

            System.out.println(rows + " product(s) updated successfully!");

        } catch (SQLException e) {
            conn.rollback();
            System.out.println("Transaction rolled back due to error: " + e.getMessage());
        } finally {
            conn.setAutoCommit(true);
        }
    }

    private static void deleteProduct(Connection conn, Scanner scanner) throws SQLException {
        System.out.print("Enter product ID to delete: ");
        int id = scanner.nextInt();

        String query = "DELETE FROM Product WHERE ProductID = ?";

        try (PreparedStatement pstmt = conn.prepareStatement(query)) {
            conn.setAutoCommit(false);

            pstmt.setInt(1, id);
            int rows = pstmt.executeUpdate();
            conn.commit();

            System.out.println(rows + " product(s) deleted successfully!");
```

```
        } catch (SQLException e) {
            conn.rollback();
            System.out.println("Transaction rolled back due to error: " + e.getMessage());
        } finally {
            conn.setAutoCommit(true);
        }
    }
}
```

7.2.4 Output:

```
(base) PS C:\Users\virat\OneDrive\Desktop\java exp7> java -cp ".;lib/mysql-connector-j-9.2.0.jar
" ProductCRUD
>>
Connected to the database!

=== Product CRUD Operations ===
1. Create Product
2. Read Products
3. Update Product
4. Delete Product
5. Exit
Choose an option: 2

Product Records:
-------------------------------------------------
ProductID  ProductName          Price      Quantity
-------------------------------------------------
1          Laptop              75000.00   10
2          Mobile Phone        30000.00   25
3          Tablet              20000.00   15
4          Headphones          5000.00    50
5          Smartwatch          12000.00   30
6          Camera              45000.00   12
```

7.3.1 Aim: Develop a Java application using JDBC and MVC architecture to manage student data. The application should: Use a Student class as the model with fields like StudentID, Name, Department, and Marks. Include a database table to store student data. Allow the user to perform CRUD operations through a simple menu-driven view. Implement database operations in a separate controller class.

7.3.2 Objective: The objective of this program is to develop a menu-driven Java application that allows users to add employee details, display all stored employees, and exit the program. Employee details, including ID, name, designation, and salary, are stored persistently in a file using serialization.

7.3.3 Code:

StudentController.java

```
package controller;

import model.Student;
import java.sql.*;
import java.util.ArrayList;
import java.util.List;

public class StudentController {

    private static final String URL = "jdbc:mysql://localhost:3306/StudentDB";
    private static final String USER = "root";
    private static final String PASSWORD = "rishuraman1@V";

    // Method to create a new student
    public void createStudent(Student student) throws SQLException {
        String query = "INSERT INTO Student (Name, Department, Marks) VALUES (?, ?, ?)";

        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
             PreparedStatement pstmt = conn.prepareStatement(query)) {

            pstmt.setString(1, student.getName());
            pstmt.setString(2, student.getDepartment());
            pstmt.setDouble(3, student.getMarks());

            pstmt.executeUpdate();
            System.out.println("Student added successfully!");
        }
    }

    // Method to retrieve all students
```

```
    public List<Student> getAllStudents() throws SQLException {
        List<Student> students = new ArrayList<>();
        String query = "SELECT * FROM Student";

        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
             Statement stmt = conn.createStatement();
             ResultSet rs = stmt.executeQuery(query)) {

            while (rs.next()) {
                students.add(new Student(
                        rs.getInt("StudentID"),
                        rs.getString("Name"),
                        rs.getString("Department"),
                        rs.getDouble("Marks")
                ));
            }
        }
        return students;
    }

    // Method to update student data
    public void updateStudent(Student student) throws SQLException {
        String query = "UPDATE Student SET Name = ?, Department = ?, Marks = ? WHERE
StudentID = ?";

        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
             PreparedStatement pstmt = conn.prepareStatement(query)) {

            pstmt.setString(1, student.getName());
            pstmt.setString(2, student.getDepartment());
            pstmt.setDouble(3, student.getMarks());
            pstmt.setInt(4, student.getStudentID());

            int rows = pstmt.executeUpdate();
            if (rows > 0) {
                System.out.println("Student updated successfully!");
            } else {
                System.out.println("Student not found.");
            }
        }
    }
```

```
    // Method to delete a student
    public void deleteStudent(int studentID) throws SQLException {
        String query = "DELETE FROM Student WHERE StudentID = ?";

        try (Connection conn = DriverManager.getConnection(URL, USER, PASSWORD);
             PreparedStatement pstmt = conn.prepareStatement(query)) {

            pstmt.setInt(1, studentID);
            int rows = pstmt.executeUpdate();
            if (rows > 0) {
                System.out.println("Student deleted successfully!");
            } else {
                System.out.println("Student not found.");
            }
        }
    }
}
```

Student.java

```
package model;

public class Student {
    private int studentID;
    private String name;
    private String department;
    private double marks;

    public Student(int studentID, String name, String department, double marks) {
        this.studentID = studentID;
        this.name = name;
        this.department = department;
        this.marks = marks;
    }

    // Getters and Setters
    public int getStudentID() {
        return studentID;
    }

    public void setStudentID(int studentID) {
        this.studentID = studentID;
```

```
    }

    public String getName() {
        return name;
    }

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

    public String getDepartment() {
        return department;
    }

    public void setDepartment(String department) {
        this.department = department;
    }

    public double getMarks() {
        return marks;
    }

    public void setMarks(double marks) {
        this.marks = marks;
    }

    @Override
    public String toString() {
        return String.format("ID: %d, Name: %s, Dept: %s, Marks: %.2f",
                studentID, name, department, marks);
    }
}
```

StudentView.java

```
package view;

import controller.StudentController;
import model.Student;

import java.util.List;
```

```
import java.util.Scanner;

public class StudentView {

    private static final Scanner scanner = new Scanner(System.in);
    private static final StudentController controller = new StudentController();

    public void displayMenu() {
        boolean exit = false;

        while (!exit) {
            System.out.println("\n=== Student Management System ===");
            System.out.println("1. Add Student");
            System.out.println("2. View All Students");
            System.out.println("3. Update Student");
            System.out.println("4. Delete Student");
            System.out.println("5. Exit");
            System.out.print("Choose an option: ");

            int choice = scanner.nextInt();
            scanner.nextLine();  // Consume newline

            try {
                switch (choice) {
                    case 1 -> addStudent();
                    case 2 -> viewStudents();
                    case 3 -> updateStudent();
                    case 4 -> deleteStudent();
                    case 5 -> exit = true;
                    default -> System.out.println("Invalid option. Try again.");
                }
            } catch (Exception e) {
                System.out.println("Error: " + e.getMessage());
            }
        }
        scanner.close();
    }
    private void addStudent() throws Exception {
        System.out.print("Enter name: ");
        String name = scanner.nextLine();
        System.out.print("Enter department: ");
        String department = scanner.nextLine();
```

```
        System.out.print("Enter marks: ");
        double marks = scanner.nextDouble();

        Student student = new Student(0, name, department, marks);
        controller.createStudent(student);
    }
    private void viewStudents() throws Exception {
        List<Student> students = controller.getAllStudents();
        System.out.println("\nStudents List:");
        for (Student student : students) {
            System.out.println(student);
        }
    }
    private void updateStudent() throws Exception {
        System.out.print("Enter student ID to update: ");
        int id = scanner.nextInt();
        scanner.nextLine();

        System.out.print("Enter new name: ");
        String name = scanner.nextLine();
        System.out.print("Enter new department: ");
        String department = scanner.nextLine();
        System.out.print("Enter new marks: ");
        double marks = scanner.nextDouble();

        Student student = new Student(id, name, department, marks);
        controller.updateStudent(student);
    }

    private void deleteStudent() throws Exception {
        System.out.print("Enter student ID to delete: ");
        int id = scanner.nextInt();
        controller.deleteStudent(id);
    }
}
```

MainApp.java

```
import view.StudentView;

public class MainApp {
    public static void main(String[] args) {
        StudentView view = new StudentView();
        view.displayMenu();}}
```

7.3.4 Output:

```
Student added successfully!

=== Student Management System ===
1. Add Student
2. View All Students
3. Update Student
4. Delete Student
5. Exit
Choose an option: 2

Students List:
ID: 1, Name: Alice, Dept: Computer Science, Marks: 85.50
ID: 2, Name: Bob, Dept: Electronics, Marks: 78.00
ID: 3, Name: Charlie, Dept: Mechanical, Marks: 92.30
ID: 4, Name: Virat, Dept: CSE, Marks: 70.00
```

Learning Outcomes:

1. Understanding JDBC Integration**:**Gained practical experience in integrating JDBC with a Java application for database connectivity.
2. MVC Architecture Implementation**:**Learned how to implement the Model-View-Controller (MVC) architecture in Java for better code organization and separation of concerns.
3. Database CRUD Operations:Acquired the ability to perform CRUD operations (Create, Read, Update, Delete) using SQL queries in Java applications.
4. Transaction Handling**:**Understood the importance of transaction handling for maintaining data integrity during database operations.

Experiment-8

Student Name: Toshik Sharma UID: 22BCS13034
Branch: BE-CSE Section/Group: Krg_3B
Semester: 6TH Date of Performance:03/04/25
Subject Name: Project Based Learning in Java Subject Code: 22CSH-359

1. Aim:
a. Write a servlet to accept user credentials through an HTML form and display a personalized welcome message if the login is successful.
b. Create a servlet integrated with JDBC to display a list of employees from a database. Include a search form to fetch employee details by ID.
c. Develop a JSP-based student portal. Include a form for entering attendance details ar save them to the database using a servlet.

2. Objective: The objective is to develop web applications using Servlets and JSP for user input handling, database integration.

3. Implementation/Code:
a) EASY LEVEL
HTML code:

```
<!DOCTYPE html>
<html>
<head>
   <title>Login Page</title>
</head>
<body>
   <h2>Login</h2>
   <form action="LoginServlet" method="post">
      <label>Username:</label>
      <input type="text" name="username" required><br><br>

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

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

Java code:

```
import java.io.IOException;
import java.io.PrintWriter;
import javax.servlet.ServletException;
import javax.servlet.annotation.WebServlet;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

@WebServlet("/LoginServlet")
public class LoginServlet extends HttpServlet {
    protected void doPost(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();

        // Retrieve username and password
        String username = request.getParameter("username");
        String password = request.getParameter("password");

        // Hardcoded credentials for validation (Replace with DB authentication)
        if ("admin".equals(username) && "password123".equals(password)) {
            out.println("<h2>Welcome, " + username + "!</h2>");
        } else {
            out.println("<h2>Invalid Username or Password</h2>");
        }
        out.close();
    }
}
```

```
Username: admin
Password: password123
```

```
Welcome, admin!
```

(a)

b) MEDIUM LEVEL
Sql code:

```
CREATE DATABASE CompanyDB;
USE CompanyDB;

CREATE TABLE employees (
    id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(100) NOT NULL,
    position VARCHAR(100),
    salary DECIMAL(10,2)
);

INSERT INTO employees (name, position, salary) VALUES
('Alice Johnson', 'Software Engineer', 75000.00),
('Bob Smith', 'Manager', 90000.00),
('Charlie Brown', 'Analyst', 65000.00);
```

Java code:

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

@WebServlet("/EmployeeServlet")
public class EmployeeServlet extends HttpServlet {
    private static final String JDBC_URL =
        "jdbc:mysql://localhost:3306/CompanyDB";
    private static final String JDBC_USER = "root"; // Change as per your MySQL
        setup
    private static final String JDBC_PASS = "password"; // Change accordingly

    protected void doGet(HttpServletRequest request, HttpServletResponse response)
        throws ServletException, IOException {
```

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

try {
    Class.forName("com.mysql.cj.jdbc.Driver");
    Connection conn = DriverManager.getConnection(JDBC_URL,
JDBC_USER, JDBC_PASS);

    String searchId = request.getParameter("id");
    String query = "SELECT * FROM employees";

    if (searchId != null && !searchId.isEmpty()) {
        query += " WHERE id = ?";
    }

    PreparedStatement stmt = conn.prepareStatement(query);

    if (searchId != null && !searchId.isEmpty()) {
        stmt.setInt(1, Integer.parseInt(searchId));
    }

    ResultSet rs = stmt.executeQuery();

    out.println("<html><head><title>Employee List</title></head><body>");
    out.println("<h2>Employee Details</h2>");
    out.println("<form action='EmployeeServlet' method='GET'>");
    out.println("Search by ID: <input type='text' name='id'/> <input type='submit'
value='Search'/>");
    out.println("</form><br>");

    out.println("<table
border='1'><tr><th>ID</th><th>Name</th><th>Position</th><th>Salary</th>
</tr>");

    boolean found = false;
    while (rs.next()) {
        found = true;
        out.println("<tr><td>" + rs.getInt("id") + "</td>");
        out.println("<td>" + rs.getString("name") + "</td>");
        out.println("<td>" + rs.getString("position") + "</td>");
```

```
            out.println("<td>" + rs.getDouble("salary") + "</td></tr>");
        }

        if (!found) {
            out.println("<tr><td colspan='4'>No Employee Found</td></tr>");
        }

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

        rs.close();
        stmt.close();
        conn.close();
    } catch (Exception e) {
        out.println("<h3>Error: " + e.getMessage() + "</h3>");
    }
  }
}
```

XML code:

```
<web-app>
  <servlet>
    <servlet-name>EmployeeServlet</servlet-name>
    <servlet-class>EmployeeServlet</servlet-class>
  </servlet>
  <servlet-mapping>
    <servlet-name>EmployeeServlet</servlet-name>
    <url-pattern>/EmployeeServlet</url-pattern>
  </servlet-mapping>
</web-app>
```

Employees List

ID	Name	Position	Salary
1	Alice Johnson	Software Engineer	78000.00
2	Bob Smith	Senior Manager	95000.00
3	Charlie Brown	Data Analyst	68000.00
4	David Wilson	HR Specialist	62000.00

ID 2 searching

ID	Name	Position	Salary
3	Charlie Brown	Lead Analyst	88000.00

(b)

c) HARD LEVEL
Sql code:

```
CREATE DATABASE StudentDB;
USE StudentDB;

CREATE TABLE student_attendance (
    id INT PRIMARY KEY AUTO_INCREMENT,
    student_name VARCHAR(100) NOT NULL,
    roll_number VARCHAR(20) UNIQUE NOT NULL,
    attendance_status ENUM('Present', 'Absent') NOT NULL,
    date DATE NOT NULL
);
```

Java code:

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

@WebServlet("/AttendanceServlet")
public class AttendanceServlet extends HttpServlet {
    private static final String JDBC_URL = "jdbc:mysql://localhost:3306/StudentDB";
    private static final String JDBC_USER = "root"; // Change as per your MySQL
        setup
    private static final String JDBC_PASS = "password"; // Change accordingly
```

```
protected void doPost(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
    response.setContentType("text/html");
    PrintWriter out = response.getWriter();

    String name = request.getParameter("studentName");
    String rollNumber = request.getParameter("rollNumber");
    String status = request.getParameter("attendanceStatus");
    String date = request.getParameter("date");

    try {
        Class.forName("com.mysql.cj.jdbc.Driver");
        Connection conn = DriverManager.getConnection(JDBC_URL,
    JDBC_USER, JDBC_PASS);

        String query = "INSERT INTO student_attendance (student_name,
    roll_number, attendance_status, date) VALUES (?, ?, ?, ?)";
        PreparedStatement stmt = conn.prepareStatement(query);
        stmt.setString(1, name);
        stmt.setString(2, rollNumber);
        stmt.setString(3, status);
        stmt.setString(4, date);

        int rows = stmt.executeUpdate();
        if (rows > 0) {
            out.println("<h3>Attendance recorded successfully!</h3>");
        }

        stmt.close();
        conn.close();
    } catch (Exception e) {
        out.println("<h3>Error: " + e.getMessage() + "</h3>");
    }

    out.println("<br><a href='attendance.jsp'>Back to Attendance Form</a>");
}

protected void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
    response.setContentType("text/html");
```

```
        PrintWriter out = response.getWriter();

        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            Connection conn = DriverManager.getConnection(JDBC_URL,
        JDBC_USER, JDBC_PASS);

            String query = "SELECT * FROM student_attendance";
            PreparedStatement stmt = conn.prepareStatement(query);
            ResultSet rs = stmt.executeQuery();

            out.println("<h2>Student Attendance Records</h2>");
            out.println("<table border='1'><tr><th>ID</th><th>Name</th><th>Roll
         Number</th><th>Status</th><th>Date</th></tr>");

            while (rs.next()) {
                out.println("<tr><td>" + rs.getInt("id") + "</td>");
                out.println("<td>" + rs.getString("student_name") + "</td>");
                out.println("<td>" + rs.getString("roll_number") + "</td>");
                out.println("<td>" + rs.getString("attendance_status") + "</td>");
                out.println("<td>" + rs.getString("date") + "</td></tr>");
            }

            out.println("</table>");
            out.println("<br><a href='attendance.jsp'>Back to Attendance Form</a>");

            rs.close();
            stmt.close();
            conn.close();
        } catch (Exception e) {
            out.println("<h3>Error: " + e.getMessage() + "</h3>");
        }
    }
}
```

XML code:

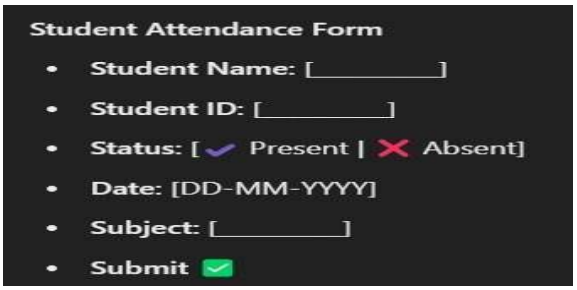
```
<web-app>
    <servlet>
        <servlet-name>AttendanceServlet</servlet-name>
        <servlet-class>AttendanceServlet</servlet-class>
```

```
    </servlet>
    <servlet-mapping>
        <servlet-name>AttendanceServlet</servlet-name>
        <url-pattern>/AttendanceServlet</url-pattern>
    </servlet-mapping>
</web-app>
```

JSP code:

```
<%@ page language="java" contentType="text/html; charset=UTF-8"
        pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
<head>
    <title>Student Attendance Portal</title>
</head>
<body>
    <h2>Enter Attendance Details</h2>
    <form action="AttendanceServlet" method="post">
        Name: <input type="text" name="studentName" required /><br><br>
        Roll Number: <input type="text" name="rollNumber" required /><br><br>
        Attendance:
        <select name="attendanceStatus">
            <option value="Present">Present</option>
            <option value="Absent">Absent</option>
        </select><br><br>
        Date: <input type="date" name="date" required /><br><br>
        <input type="submit" value="Submit Attendance">
    </form>

    <h3><a href="AttendanceServlet">View Attendance Records</a></h3>
</body>
</html>
```

Attendance form



Viewing Attendance

ID	Name	Roll Number	Status	Date
1	Charlie	103	Present	2024-03-20
2	Daisy	104	Absent	2024-03-20

(c)

4. Learning Outcome:
   - Servlet and JDBC Integration: Understanding how to connect a Java Servlet to a MySQL database.
   - Handling HTTP Requests: Learning how to process GET and POST requests to retrieve and display data.
   - Database Query Execution: Writing SQL queries in Java to fetch records dynamically.
   - Form Handling & User Input: Implementing a search feature to filter employee records.
   - Deploying on Tomcat: Deploying a Java web application using Apache Tomcat.
   - Error Handling in JDBC: Managing SQL exceptions and debugging database connectivity issues.

Experiment-9

Student Name: Toshik Sharma UID: 22BCS13034
Branch: BE-CSE Section/Group: Krg_3B
Semester: 6TH Date of Performance:09/04/25
Subject Name: Project Based Learning in Java Subject Code: 22CSH-359

9.1.1 Aim: To demonstrate dependency injection using Spring Framework with Java-based configuration.

9.1.2 Objective:

Define Course and Student classes.
Use Configuration and Bean annotations to inject dependencies.
Load Spring context and print student details.

9.1.3 Code:

```
// Course.java
public class Course {
    private String courseName; private
    String duration;

    public Course(String courseName, String duration) { this.courseName =
        courseName;
        this.duration = duration;
    }

    public String getCourseName() { return courseName; } public
    String getDuration() { return duration; }

    @Override
    public String toString() {
        return "Course: " + courseName + ", Duration: " + duration;
    }
}

// Student.java
public class Student { private
    String name; private Course
    course;
```

```
    public Student(String name, Course course) {
        this.name = name;
        this.course = course;
    }

    public void showDetails() { System.out.println("Student: " +
        name); System.out.println(course);
    }
}// AppConfig.java
import org.springframework.context.annotation.*;

@Configuration
public class AppConfig { @Bean
    public Course course() {
        return new Course("Java", "3 months");
    }

    @Bean
    public Student student() {
        return new Student("Aman", course());
    }
}// MainApp.java
import org.springframework.context.ApplicationContext;
import org.springframework.context.annotation.AnnotationConfigApplicationContext;

public class MainApp {
    public static void main(String[] args) { ApplicationContext
        context = new
AnnotationConfigApplicationContext(AppConfig.class); Student
        student = context.getBean(Student.class);
        student.showDetails();
    }
}
```

Output:

```
Student: Aman
Course: Java, Duration: 3 months
```

9.2.1 Aim: To perform CRUD operations on a Student entity using Hibernate ORM with MySQL.

Objective: Define Course and Student classes.

Use Configuration and Bean annotations to inject dependencies. Load Spring context and print student details.

9.2.2 Code:

```
<hibernate-configuration>
    <session-factory>
        <property name="hibernate.connection.driver_class">com.mysql.cj.jdbc.Driver</prop
        <property name="hibernate.connection.url">jdbc:mysql://localhost:3306/testdb</pro
        <property name="hibernate.connection.username">root</property>
        <property name="hibernate.connection.password">password</property>
        <property name="hibernate.dialect">org.hibernate.dialect.MySQL8Dialect</property
        <property name="hibernate.hbm2ddl.auto">update</property>
        <mapping class="Student"/>
    </session-factory>
</hibernate-configuration> import

javax.persistence.*;

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

    public Student() {}
    public Student(String name, int age) { this.name =
        name;
        this.age = age;
    }
    // Getters, setters, toString
}
import org.hibernate.SessionFactory; import
org.hibernate.cfg.Configuration;

public class HibernateUtil {
    private static final SessionFactory sessionFactory;

    static {
```

```
        sessionFactory = new Configuration().configure().buildSessionFactory();
    }

    public static SessionFactory getSessionFactory() { return
        sessionFactory;
    }
}

import org.hibernate.*; public

class MainCRUD {
    public static void main(String[] args) {
        Session session = HibernateUtil.getSessionFactory().openSession();

        // Create
        Transaction tx = session.beginTransaction();
        Student s1 = new Student("Aman", 22);
        session.save(s1);
        tx.commit();

        // Read
        Student student = session.get(Student.class, 1);
        System.out.println(student);

        // Update
        tx = session.beginTransaction();
        student.setAge(23);
        session.update(student); tx.commit();

        // Delete
        tx = session.beginTransaction(); session.delete(student);
```

```
        tx.commit();

        session.close();
    }
}
```

9.2.3Output:

```
Student{id=1, name='Sallu', age=22}
Updated age to 23
Deleted student with id 1
```

9.3.1 Aim: To implement a banking system using Spring and Hibernate that ensures transaction c
during fund transfers.

Objective:

Integrate Spring + Hibernate.
Handle transactions atomically (rollback on failure). Demonstrate
success and failure cases.

Code:

```
import javax.persistence.*;

Entity
public class Account { @Id
    private int accountId; private
    String holderName; private double
    balance;

    // Constructors, getters, setters
}

import javax.persistence.*; import
java.util.Date;

@Entity
public class BankTransaction { @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY) private int
    txnId;
    private int fromAcc; private
    int toAcc; private double
    amount;
    private Date txnDate = new Date();

    // Constructors, getters, setters
}
import org.hibernate.*;
import org.springframework.transaction.annotation.Transactional;

public class BankService {
    private SessionFactory sessionFactory;
```

```
    public BankService(SessionFactory sessionFactory) { this.sessionFactory
        = sessionFactory;
    }

    @Transactional
    public void transferMoney(int fromId, int toId, double amount) { Session session =
        sessionFactory.getCurrentSession();

        Account from = session.get(Account.class, fromId); Account to =
        session.get(Account.class, toId);

        if (from.getBalance() < amount) {
            throw new RuntimeException("Insufficient Balance");
        }

        from.setBalance(from.getBalance() - amount);
        to.setBalance(to.getBalance() + amount);

        session.update(from);
        session.update(to);

        BankTransaction txn = new BankTransaction(fromId, toId, amount); session.save(txn);
    }
}
@Configuration
@EnableTransactionManagement public
class AppConfig {
    @Bean
    public DataSource dataSource() {
        DriverManagerDataSource ds = new DriverManagerDataSource();
        ds.setDriverClassName("com.mysql.cj.jdbc.Driver");
        ds.setUrl("jdbc:mysql://localhost:3306/testdb"); ds.setUsername("root");
        ds.setPassword("password");
        return ds;
    }

    @Bean
    public LocalSessionFactoryBean sessionFactory() { LocalSessionFactoryBean lsf = new
        LocalSessionFactoryBean(); lsf.setDataSource(dataSource());
        lsf.setPackagesToScan("your.package");
```

```
        Properties props = new Properties();
        props.put("hibernate.dialect", "org.hibernate.dialect.MySQL8Dialect");
        props.put("hibernate.hbm2ddl.auto", "update"); lsf.setHibernateProperties(props);
        return lsf;
    }

    @Bean
    public HibernateTransactionManager transactionManager(SessionFactory sf) { return new
        HibernateTransactionManager(sf);
    }

    @Bean
    public BankService bankService(SessionFactory sf) { return new
        BankService(sf);
    }
}

public class MainApp {
    public static void main(String[] args) {
        AnnotationConfigApplicationContext ctx = new
AnnotationConfigApplicationContext(AppConfig.class);
        BankService service = ctx.getBean(BankService.class);

        try {
            service.transferMoney(101, 102, 500);
            System.out.println("Transaction Successful!");
        } catch (Exception e) {
            System.out.println("Transaction Failed: " + e.getMessage());
        }
        ctx.close();
    }
}
```

OUTPUT

```
Transaction Successful!
OR
Transaction Failed: Insufficient Balance
```

Learning Outcomes

- Demonstrated Dependency Injection using Spring with Java-based configuration via @Bean and @Configuration.
- Performed CRUD operations on Student entity using Hibernate ORM with MySQL database.
- Integrated Spring + Hibernate for seamless object-relational mapping and dependency management.
- Implemented transaction management using @Transactional to ensure atomicity in fund transfers.
- Handled transaction failures and rollbacks (e.g., insufficient balance) to maintain data consistency.