Experiment 5

Student Name: Anurag Singh **UID: 22BET10338**
Branch: IT **Section/Group: 22BET_701_A**
Semester: 6 **Date of Performance: 18-2-2025**
Subject Name: Java Lab **Subject Code: 22ITH-352**

1. **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()).

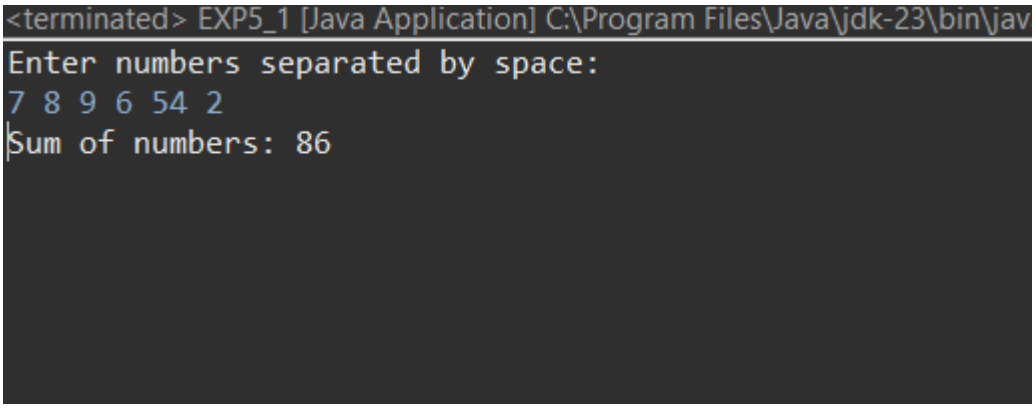
2. **Objective:**
   - To Demonstrate Autoboxing and Unboxing
   - To calculate sum of integers.

3. **Implementation/Code:**

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

public class SumUsingAutoboxing
  { public static void main(String[] args)
  {
    String[] numbers = {"10", "20", "30", "40", "50"};
    List<Integer> integerList = new ArrayList<>();
    for (String num : numbers) {
      integerList.add(Integer.parseInt(num)); // Autoboxing
    }

    int sum = calculateSum(integerList);
    System.out.println("Sum of numbers: " + sum);
  }
  public static int calculateSum(List<Integer> list)
    { int sum = 0;
    for (Integer num : list)
```

```
            { sum += num;
            }
            return sum;
        }
    }
```

5. **Output:**



6. **Learning Outcome:**

- Learn how Java automatically converts between primitive types and their wrapper classes when adding/removing elements from collections
- Gain experience in reading user input, splitting strings, and converting them into numerical values using Integer.parseInt().
- Learn how to store user-provided integers in an ArrayList<Integer>, iterate through the list, and perform calculations using loops

Problem 2

4. **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.

5. **Objective:**
   - To Convert a Student object into a binary format and store it in a file
   - To Retrieve the object from the file and reconstruct it using deserialization
   - To implement the Serializable interface to allow objects to be written to and read from a file

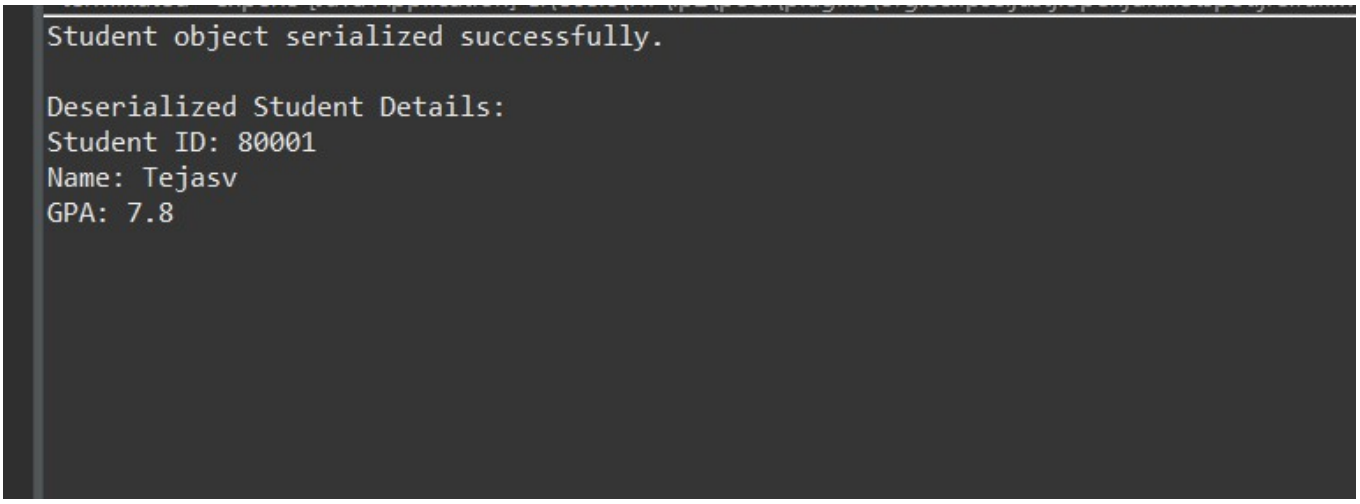
6. **Implementation/Code:**

```
import java.io.*;


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


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


 // Display Student details
 public void display() {
    System.out.println("Student ID: " + id);
```

```
    System.out.println("Name: " + name);
    System.out.println("GPA: " + gpa);
 }
}

public class StudentSerialization
 { public static void main(String[] args)
 {
    Student student = new Student(101, "Shuvam", 7.8);
    String filename = "student.ser"; // File to store serialized object
    serializeStudent(student, filename);
    Student deserializedStudent = deserializeStudent(filename);
    if (deserializedStudent != null) {
       System.out.println("\nDeserialized Student Details:");
       deserializedStudent.display();
    }
 }

 public static void serializeStudent(Student student, String filename)
    { try (ObjectOutputStream oos = new ObjectOutputStream(new
FileOutputStream(filename)))
       { oos.writeObject(student); // Serialize
       object
       System.out.println("Student object serialized successfully.");
    } catch (IOException e) {
       System.out.println("Error during serialization: " + e.getMessage());
    }
 }

 public static Student deserializeStudent(String filename) {
    try (ObjectInputStream ois = new ObjectInputStream(new FileInputStream(filename)))
```

```
            { return (Student) ois.readObject();
        } catch (FileNotFoundException e)
            { System.out.println("File not found: " + filename);
        } catch (IOException e) {
            System.out.println("Error during deserialization: " + e.getMessage());
        } catch (ClassNotFoundException e) {
            System.out.println("Class not found error: " + e.getMessage());
        }
        return null;
    }
}
```

7. Output:



8. Learning Outcome:

- Learn how to convert Java objects into a binary format for storage and retrieve them later while maintaining their state
- Gain hands-on experience in handling exceptions like FileNotFoundException, IOException, and ClassNotFoundException to ensure error-free file operations
- Learn how to implement the Serializable interface and use ObjectOutputStream and ObjectInputStream for efficient object persistence

Problem 3

7. **Aim:**
   - Create a menu-based Java application with the following options. 1.Add an Employee 2. Display All 3. Exit If option 1 is selected, the application should gather details of the employee like employee name, employee id, designation and salary and store it in a file. If option 2 is selected, the application should display all the employee details. If option 3 is selected the application should exit

8. **Objective:**
   - to read from and write to a file using FileWriter, BufferedWriter, and PrintWriter for storing and retrieving employee data.
   - designing user-friendly menu-based applications using loops and switch cases for handling user choices.
   - to take structured user input (such as integers, strings, and doubles) and process it correctly to avoid common input-related errors.

9. **Implementation/Code:**

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

public class EmployeeManagement {
   private static final String FILE_NAME = "employees.txt"; // File to store employee data

   public static void main(String[] args)
      { Scanner scanner = new
      Scanner(System.in); while (true) {
         // Display menu
         System.out.println("\nMenu:");
         System.out.println("1. Add an Employee");
         System.out.println("2. Display All Employees");
         System.out.println("3. Exit");
         System.out.print("Enter your choice: ");

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

         switch (choice)
```

```
            { case 1:
                addEmployee(scanner);
                break;
            case 2:
                displayEmployees();
                break;
            case 3:
                System.out.println("Exiting program...");
                scanner.close();
                System.exit(0);
            default:
                System.out.println("Invalid choice! Please enter 1, 2, or 3.");
        }
    }
}

// Method to add an employee and store details in a file
public static void addEmployee(Scanner scanner) {
    try (FileWriter fw = new FileWriter(FILE_NAME, true);
         BufferedWriter bw = new BufferedWriter(fw);
         PrintWriter out = new PrintWriter(bw)) {

        System.out.print("Enter Employee ID: ");
        int id = scanner.nextInt();
        scanner.nextLine(); // Consume newline

        System.out.print("Enter Employee Name: ");
        String name = scanner.nextLine();

        System.out.print("Enter Designation: ");
        String designation = scanner.nextLine();

        System.out.print("Enter Salary: ");
        double salary = scanner.nextDouble();

        // Store details in file
        out.println(id + "," + name + "," + designation + "," + salary);
        System.out.println("Employee added successfully!");

    } catch (IOException e) {
        System.out.println("Error writing to file: " + e.getMessage());
    }
```

```
    }

    // Method to display all employees by reading the file
    public static void displayEmployees() {
        try (BufferedReader br = new BufferedReader(new FileReader(FILE_NAME))) {
            String line;
            System.out.println("\nEmployee Details:");
            while ((line = br.readLine()) != null) {
                String[] data = line.split(",");
                System.out.println("ID: " + data[0] + ", Name: " + data[1] +
                                   ", Designation: " + data[2] + ", Salary: " + data[3]);
            }
        } catch (FileNotFoundException e)
            { System.out.println("No employee records found.");
        } catch (IOException e) {
            System.out.println("Error reading file: " + e.getMessage());
        }
    }
}
```

9. Output:

```
Menu:
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 2

Employee Details:
ID: 80001, Name: tejasv, Designation: mohali, Salary: 100.0
ID: 10320, Name: Arun, Designation: UI, Salary: 823784.0
ID: 48937, Name: Visu, Designation: Data, Salary: 871234.0

Menu:
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice:
```

10. Learning Outcome:

- Successfully read and write employee data to a file using FileWriter, BufferedReader, and PrintWriter.
- Learn to handle file-related exceptions such as IOException and FileNotFoundException, ensuring program stability
- Gain experience in storing structured employee data in a text file and retrieving it using string manipulation techniques like split()