Experiment 5

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Semester: 6th
DOP:24/02/25
Subject: PBLJ
Subject Code: 22CSH-359

Aim:
Develop Java programs using autoboxing, serialization, file handling, and efficient data processing and management.

Problem Statement :

1) 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) 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.

3) 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.

Algorithm:

1. Sum of a List of Integers Using Autoboxing & Unboxing:

- Initialize an empty list to store integers.
- Prompt the user to enter integers.
- Read input as a string, and if it's a valid number, parse it using Integer.parseInt().
  - Autoboxing occurs when adding int values to the List<Integer>.
- Repeat until the user enters "stop".
- Call a method calculateSum():

 Iterate through the list and perform unboxing (Integer → int) while calculating the sum.

2. Student Serialization & Deserialization:

 Create a Student class with fields (id, name, GPA) and implement Serializable.
 In the main method:
  - Prompt the user to enter student details.
  - Create a Student object with user input.
 Serialize (Save) the Student object:
  - Open a file using FileOutputStream.
  - Write the Student object using ObjectOutputStream.
  - Handle IOException.
 Deserialize (Load) the Student object:
  - Open the same file using FileInputStream.
  - Read the object using ObjectInputStream.
  - Cast it back to a Student object.
  - Handle FileNotFoundException, IOException, and ClassNotFoundException.
 Print the student details after deserialization.
 End program.

3. Employee Management System (Menu-Based) :

 Create Employee class (fields: id, name, designation, salary), implement Serializable.
 Load employees from file (if available).
 Menu:
  - Add Employee → Get details, create object, append to list, serialize & save.
  - Display All Employees → Deserialize & print details.
  - Exit → Terminate.
 Handle exceptions (FileNotFoundException, IOException, ClassNotFoundException).

Program :

1. Sum of a List of Integers Using Autoboxing & Unboxing:

```
import java.util.*;
public class AutoboxingUnboxingExample {     public
static int calculateSum(List<Integer> numbers) {         int
sum = 0;         for (Integer num : numbers) {              sum
+= num;
        }
return sum;
    }
    public static void main(String[] args) {
List<Integer> numbers = new ArrayList<>();
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter integers (type 'stop' to finish):");
while (scanner.hasNext()) {             String input =
scanner.next();            if (input.equalsIgnoreCase("stop"))
break;            int value = Integer.parseInt(input);
numbers.add(value);
        }
        System.out.println("Sum: " + calculateSum(numbers));
scanner.close();
    } }
```

2. Student Serialization & Deserialization:

```
 import java.io.*; import
 java.util.ArrayList; import
 java.util.List; import java.util.Scanner;
 class Student implements Serializable {
     private static final long serialVersionUID = 1L;
 int id;
     String name;     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 StudentManagement {     private static final String
FILE_NAME = "students.ser";     private static final Scanner
scanner = new Scanner(System.in);     private static
List<Student> students = new ArrayList<>();
   public static void serializeStudents() {
      try (ObjectOutputStream oos = new ObjectOutputStream(new
   FileOutputStream(FILE_NAME))) {
         oos.writeObject(students);
         System.out.println("All students serialized successfully!");
      } catch (IOException e) {
         System.out.println("Error during serialization: " + e.getMessage());
      }  }
   public static void deserializeStudents() {         try
(ObjectInputStream ois = new ObjectInputStream(new
FileInputStream(FILE_NAME))) {
         students = (List<Student>) ois.readObject();
System.out.println("\nDeserialized Student List:");             for
(Student student : students) {
            System.out.println(student);
         }
      } catch (FileNotFoundException e) {
         System.out.println("File not found! Please add students first.");
      } catch (IOException | ClassNotFoundException e) {
         System.out.println("Error during deserialization: " + e.getMessage());
      }  }
   public static void main(String[] args) {
      while (true) {
         System.out.println("\n1. Add Student\n2. Display Students\n3. Exit");
         System.out.print("Choose an option: ");
int choice = scanner.nextInt();             switch
(choice) {                case 1 -> {
               System.out.print("Enter Student ID: ");
               int id = scanner.nextInt();
scanner.nextLine();
```

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


                    System.out.print("Enter Student GPA: ");
  double gpa = scanner.nextDouble();
  students.add(new Student(id, name, gpa));
                    serializeStudents();
                }
                case 2 -> deserializeStudents();
  case 3 -> {
                    System.out.println("Exiting...");
                    scanner.close();
                    System.exit(0);
                }
                default -> System.out.println("Invalid choice! Try again.");
  } } }  }
```

3. Employee Management System (Menu-Based) :

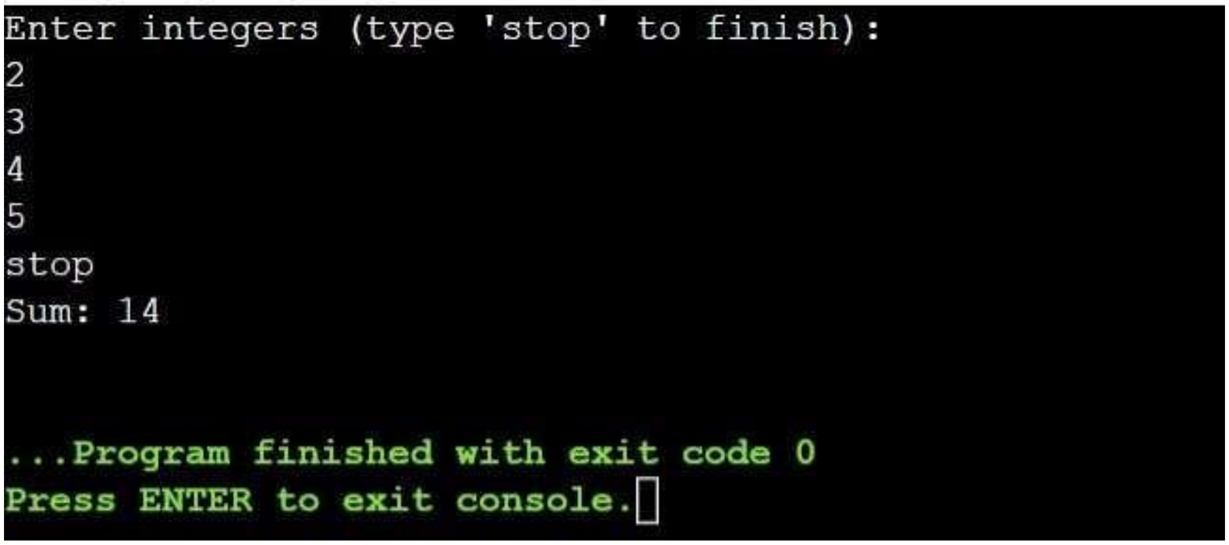
```
import java.io.*;
import java.util.*; class
Employee {
   String empId, name, designation;
   double salary;       public Employee(String empId, String name, String designation,
double salary) {              this.empId = empId; this.name = name; this.designation =
designation; this.salary = salary;
   }
   @Override
   public String toString() {
      return empId + ", " + name + ", " + designation + ", " + salary;
   }  }
public class EmployeeManagementApp {
   private static final String FILE_NAME = "employees.txt";
   public static void main(String[] args) {
Scanner scanner = new Scanner(System.in);
while (true) {
         System.out.println("\n1. Add Employee  2. Display All  3. Exit");
         System.out.print("Choice: ");          switch (scanner.nextInt()) {
case 1: addEmployee(scanner); break;              case 2: displayEmployees();
break;                case 3: System.out.println("Goodbye!"); scanner.close();
System.exit(0);                default: System.out.println("Invalid choice!");



        } }  }
   private static void addEmployee(Scanner scanner) {        try (PrintWriter out =
new PrintWriter(new FileWriter(FILE_NAME, true))) {            scanner.nextLine();
            System.out.print("ID: "); String empId = scanner.nextLine();
            System.out.print("Name: "); String name = scanner.nextLine();
            System.out.print("Designation: "); String designation = scanner.nextLine();
System.out.print("Salary: "); double salary = scanner.nextDouble();
out.println(new Employee(empId, name, designation, salary));
            System.out.println("Employee added!");
        }
           catch (IOException e) { System.out.println("Error saving employee.");
       }  }
   private static void displayEmployees() {
       try (BufferedReader br = new BufferedReader(new FileReader(FILE_NAME))) {
System.out.println("\nEmployees:"); br.lines().forEach(System.out::println);
        }
            catch (IOException e) { System.out.println("No employees found.");
     }  } }
```

OUTPUT :

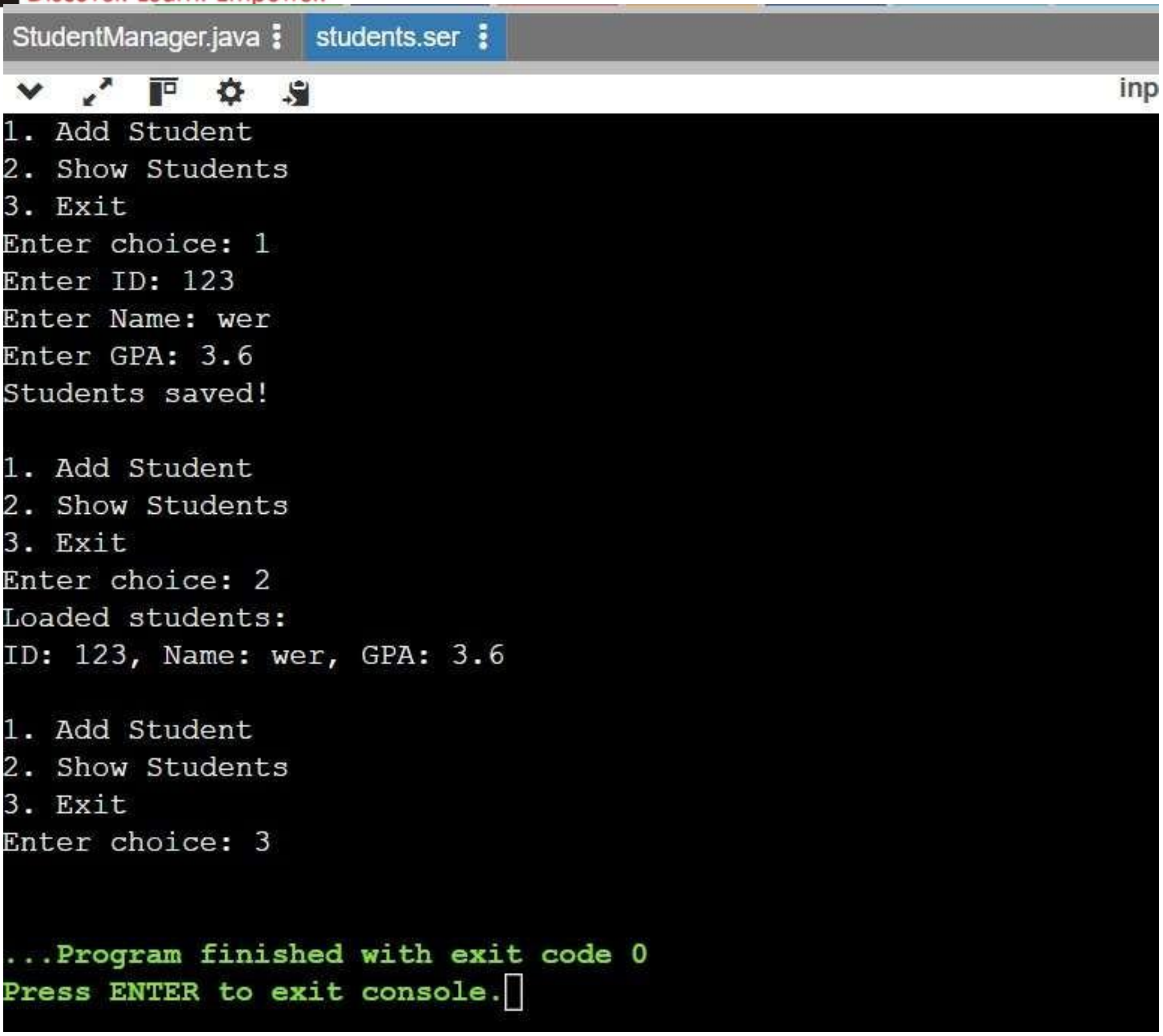
1. Sum of a List of Integers Using Autoboxing & Unboxing:



```
Enter integers (type 'stop' to finish):
2
3
4
5
stop
Sum: 14


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

2. Student Serialization & Deserialization:



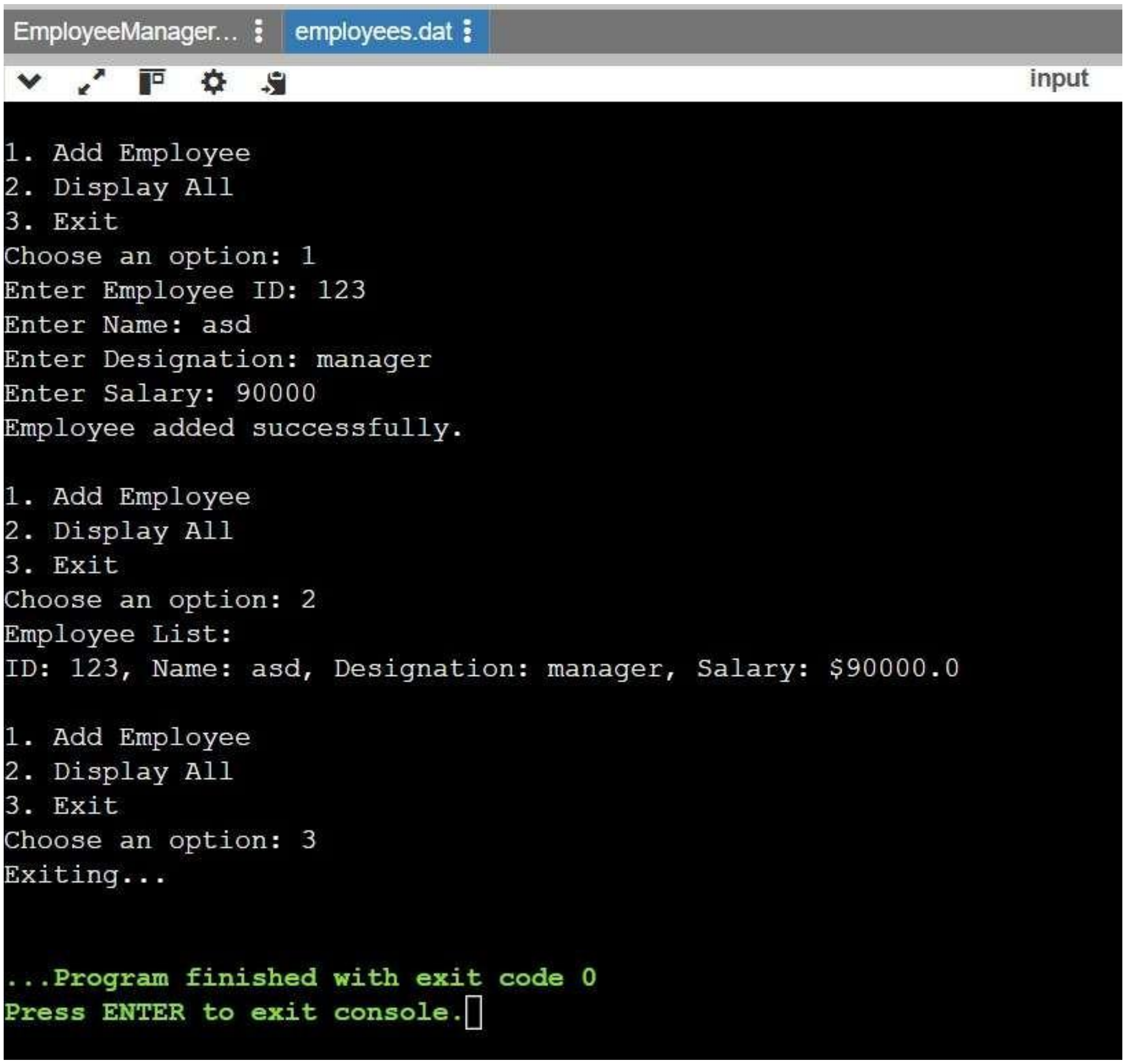
```
1. Add Student
2. Show Students
3. Exit
Enter choice: 1
Enter ID: 123
Enter Name: wer
Enter GPA: 3.6
Students saved!

1. Add Student
2. Show Students
3. Exit
Enter choice: 2
Loaded students:
ID: 123, Name: wer, GPA: 3.6

1. Add Student
2. Show Students
3. Exit
Enter choice: 3


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

3. Employee Management System (Menu-Based) :



```
1. Add Employee
2. Display All
3. Exit
Choose an option: 1
Enter Employee ID: 123
Enter Name: asd
Enter Designation: manager
Enter Salary: 90000
Employee added successfully.

1. Add Employee
2. Display All
3. Exit
Choose an option: 2
Employee List:
ID: 123, Name: asd, Designation: manager, Salary: $90000.0

1. Add Employee
2. Display All
3. Exit
Choose an option: 3
Exiting...


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

Learning Outcomes:

- Implement object-oriented programming with classes, encapsulation, and serialization.
- Utilize core Java concepts like loops, conditionals, autoboxing, and unboxing.
- Apply file handling with serialization, deserialization, and exception management.