Experiment-06

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Subject : 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);
    }
}
```

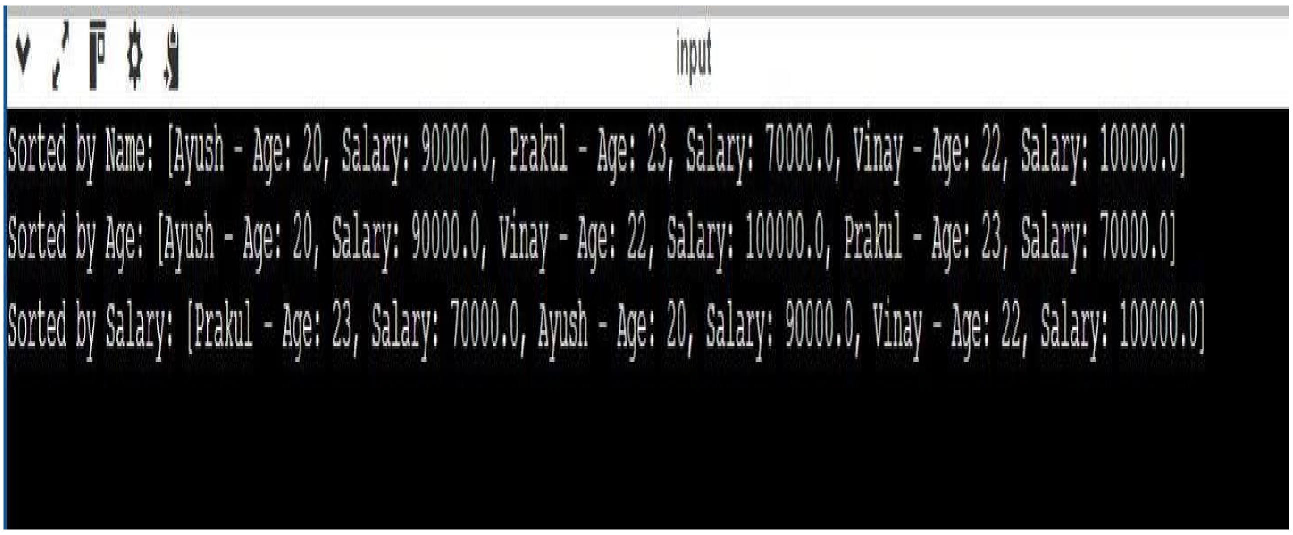
b. import java.util.*;

```
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)
```

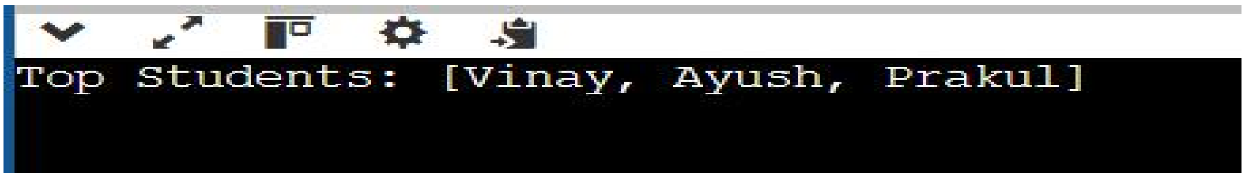
```
        List<String> topStudents = students.stream()
            .filter(s -> s.getMarks() > 75)
            .sorted(Comparator.comparingDouble(Student::getMarks).reversed())
            .map(Student::getName)
            .collect(Collectors.toList());
        System.out.println("Top Students: "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

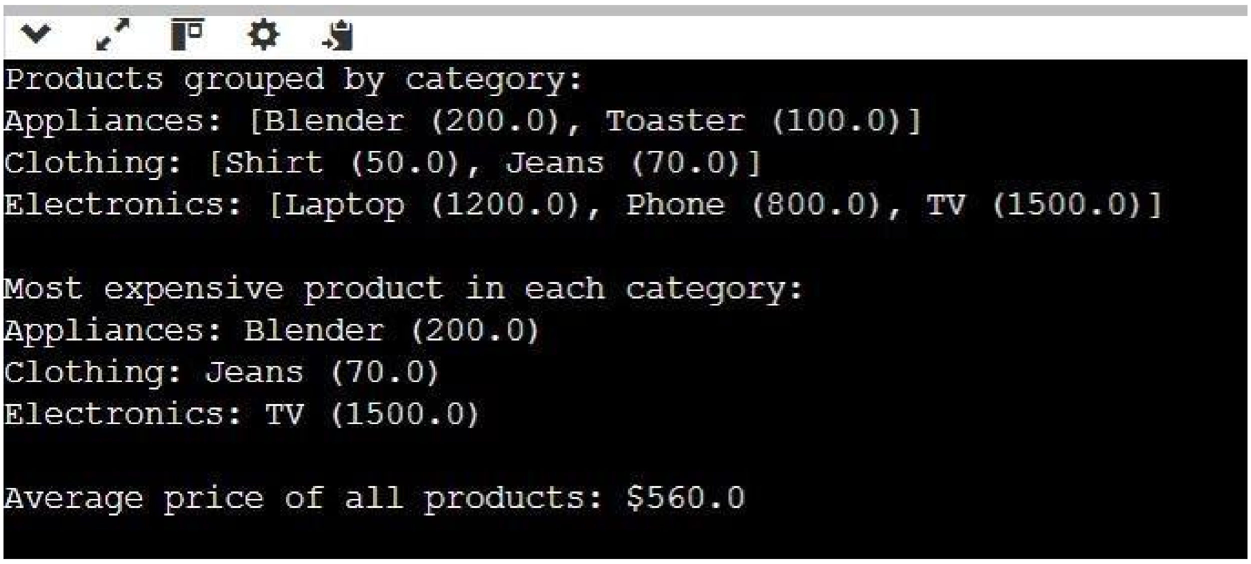
4. Output:



```
Sorted by Name: [Ayush - Age: 20, Salary: 90000.0, Prakul - Age: 23, Salary: 70000.0, Vinay - Age: 22, Salary: 100000.0]
Sorted by Age: [Ayush - Age: 20, Salary: 90000.0, Vinay - Age: 22, Salary: 100000.0, Prakul - Age: 23, Salary: 70000.0]
Sorted by Salary: [Prakul - Age: 23, Salary: 70000.0, Ayush - Age: 20, Salary: 90000.0, Vinay - Age: 22, Salary: 100000.0]
```



```
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.