Experiment 6

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Semester: 6	**Date of Performance:**
Subject Name: PBLJ	**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.

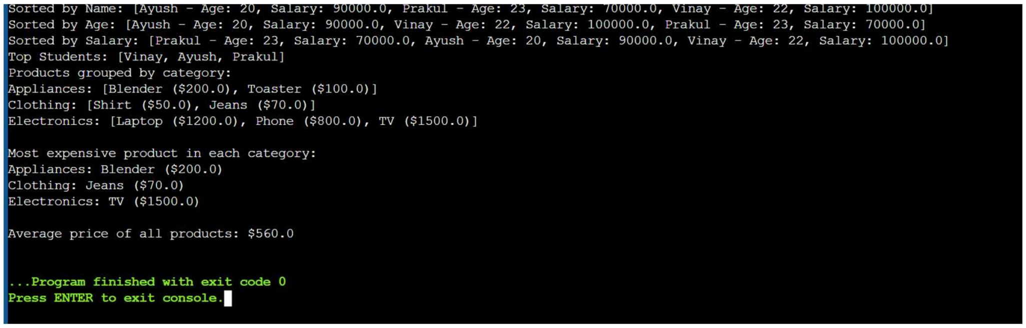
- Implement easy, medium, and hard-level tasks involving sorting employees, filtering and sorting students, and processing products using streams.

3. Implementation/Code:

```
import java.util.*;

import java.util.stream.*;

import java.util.stream.Collectors;


class Employee {

   String name;

   int age;

   double salary;


   Employee(String name, int age, double salary) {

      this.name = name;

      this.age = age;

      this.salary = salary;

   }
```

```
    public String toString() {
        return name + " - Age: " + age + ", Salary: " + salary;
    }
}

class Student {
    private String name;
    private double marks;

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

    public String getName() {
        return name;
    }

    public double getMarks() {
        return marks;
    }
}

class Product {
    String name;
    String category;
    double price;

    Product(String name, String category, double price) {
        this.name = name;

        this.category = category;

        this.price = price;

    }


    public String toString() {

        return name + " ($" + price + ")";

    }

}


public class LambdaStreamCombined {

    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);


        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);


        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:



```
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


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

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.