Experiment 6

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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)
```

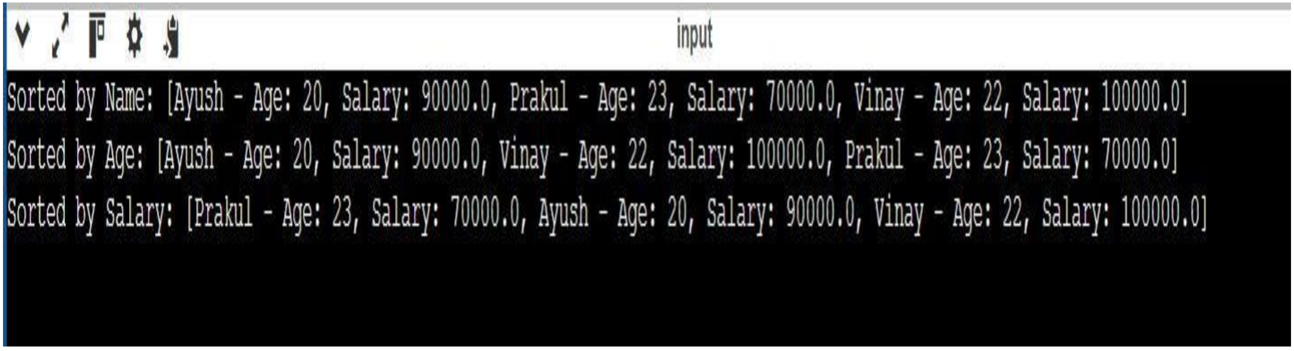
```
        );
        employees.sort(Comparator.comparing(emp -> emp.name));
    System.out.println("Sorted by Name: " + employees);
    employees.sort(Comparator.comparingInt(emp -> emp.age));
    System.out.println("Sorted by Age: " + employees);
    employees.sort(Comparator.comparingDouble(emp -> 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); }
}
```

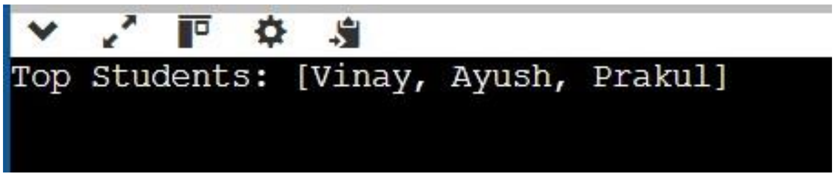
```
c.    import    java.util.*;    import
java.util.stream.Collectors;
class Product {
    String      name;
    String category;
    double price;
    public Product(String name, String category, double price) {
        this.name      =      name;
        this.category              =
        category;   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);
    }
}
```

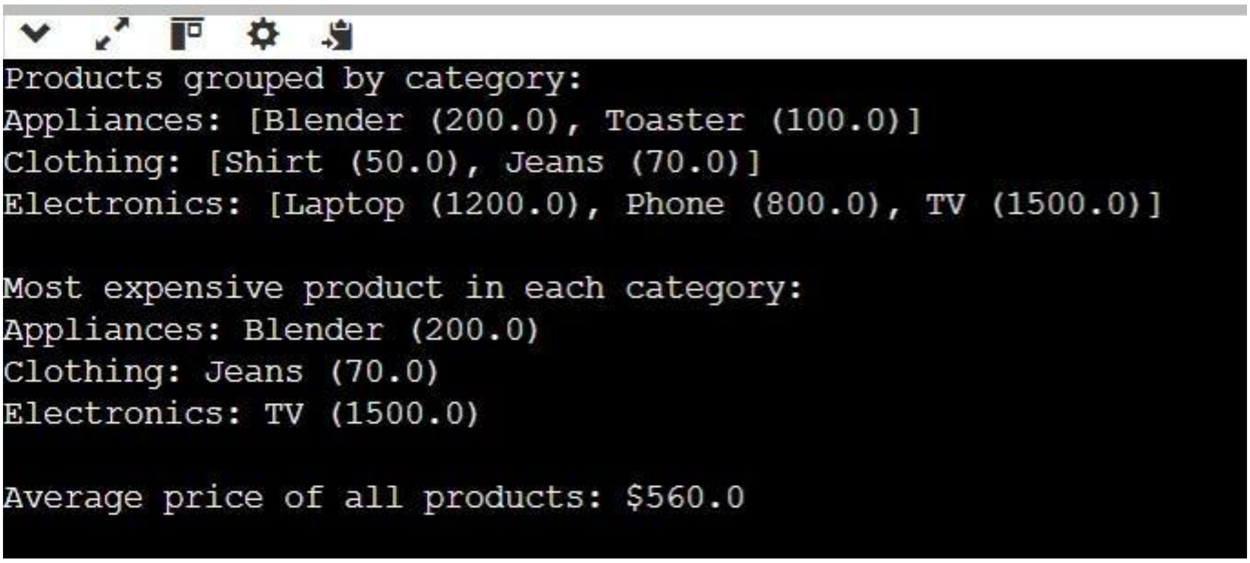
4. Output:



```
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.