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;
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 {
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 \rightarrow 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
                return name + " ($"
toString() {
+ 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);
}
```

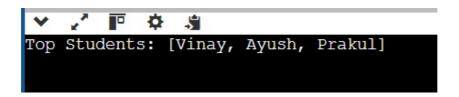
4. Output:

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]





```
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.