Experiment-2.3

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Subject Name: PBLJ-Lab **Subject Code:** 22CSH-359

1. Aim:

Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

a.) Write a program to sort a list of Employee objects (name, age, salary) using lambda expressions.

b.) Create a program to use lambda expressions and stream operations to filter students scoring above 75%, sort them by marks, and display their names.

c.) Write a Java program to process a large dataset of products using streams. Perform operations such as grouping products by category, finding the most expensive product in each category, and calculating the average price of all products.

2. Objective:

a.) Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

b.) 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("Prakul", 22, 100000),
new Employee("Vinay", 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("Sneha", 85),
new Student("Palak ", 70),
new Student("Rubal", 90),
new Student("Rubal", 60),
new Student("Deep", 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);
}
}
```

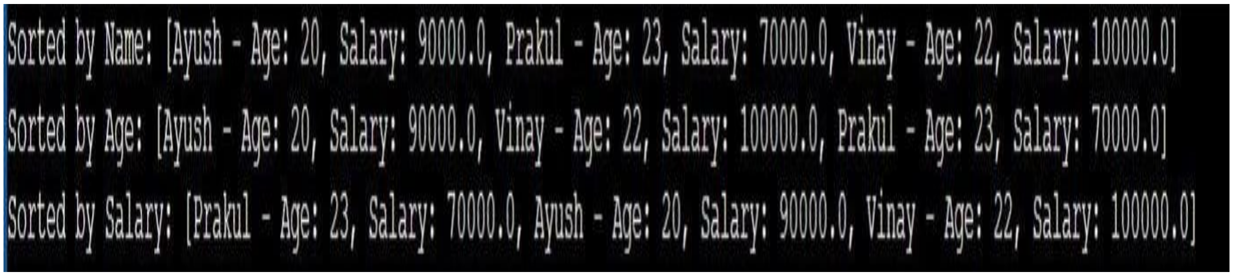
b)

```
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);
  }
  }
```

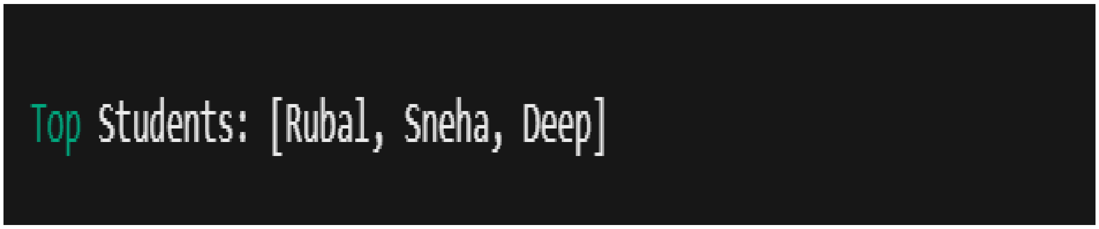
4. Output:

a.)



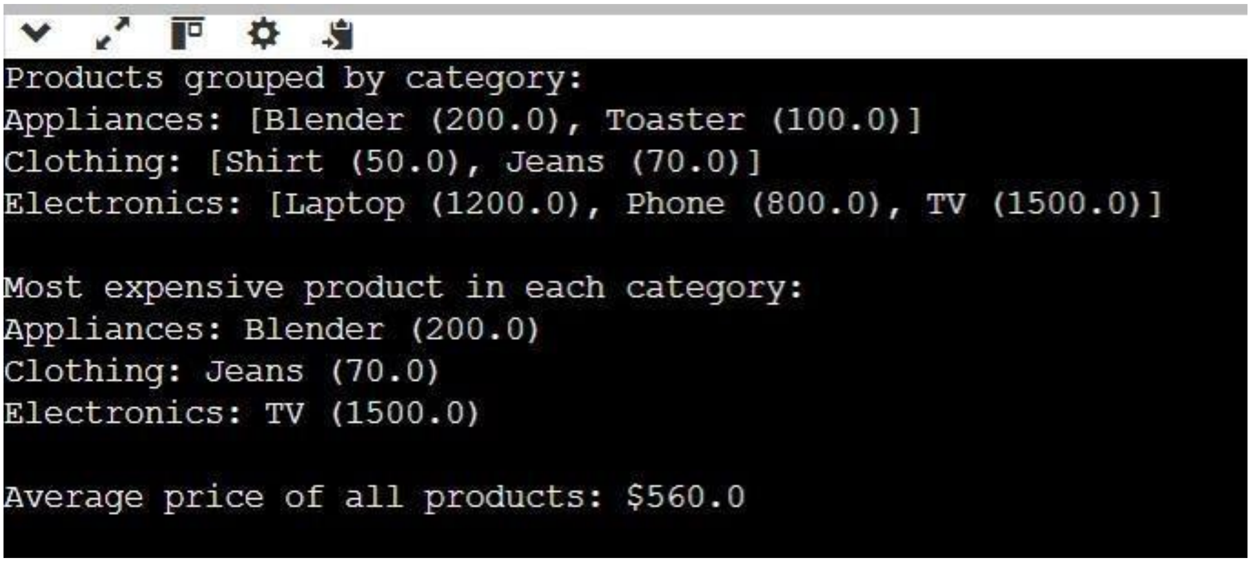
```
Sorted by Name: [Ayush - Age: 20, Salary: 90000.0, Prakul - Age: 23, Salary: 70000.0, Vinay - Age: 22, Salary: 100000.0]
Sorted by Age: [Ayush - Age: 20, Salary: 90000.0, Vinay - Age: 22, Salary: 100000.0, Prakul - Age: 23, Salary: 70000.0]
Sorted by Salary: [Prakul - Age: 23, Salary: 70000.0, Ayush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

b.)



```
Top Students: [Rubal, Sneha, Deep]
```

c.)



```
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.