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COMPUTER SCIENCE & ENGINEERING
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Experiment 6

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Subject Name: PBL Java

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),
```



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```
        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)
        );
    }
}
```



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```
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()
```



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```
.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]
```



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```
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.