Experiment 6

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Semester: 6th **Date of Performance:28/02/2025**
Subject: Project Based Learning in Java **Subject Code: 22CSH-359**

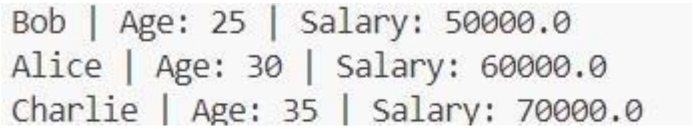
1. **Aim:** Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

2. **Objective 1: Easy Level**
   Write a program to sort a list of Employee objects (name, age, salary) using lambda expressions.

3. **Code/Implementation:**

```
import java.util.*;

class Employee
{     String name;
int age;     double
salary;
     public 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
Experiment6A {
    public static void main(String[] args) {
        List<Employee> employees = new
 ArrayList<>(Arrays.asList(             new Employee("Alice", 30,
 60000),              new Employee("Bob", 25, 50000),
 new Employee("Charlie", 35, 70000)
        ));

        // Sorting by salary using Lambda         employees.sort((e1,
 e2) -> Double.compare(e1.salary, e2.salary));         // Display sorted
 employees
        employees.forEach(System.out::println);
    } }
```

Output:



```
Bob | Age: 25 | Salary: 50000.0
Alice | Age: 30 | Salary: 60000.0
Charlie | Age: 35 | Salary: 70000.0
```

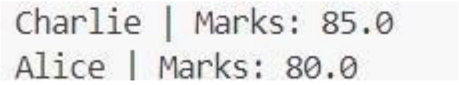
4. Objective 2: Medium Level

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

5. Code/Implementation:

```
import java.util.*; import
java.util.stream.*;

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

    @Override
    public String toString() {
        return name + " | Marks: " + marks;
    }
}
public class Experiment6B {
    public static void main(String[] args)
 {      List<Student> students =
 Arrays.asList(              new
 Student("Alice", 80),            new
 Student("Bob", 70),            new
 Student("Charlie", 85),            new
 Student("David", 60)
        );

        // Filter students scoring above 75%, sort by marks, and
 display names          students.stream()
            .filter(s -> s.marks > 75)
            .sorted((s1, s2) -> Double.compare(s2.marks, s1.marks)) //
 Descending order
            .forEach(System.out::println);
    }
}
```

Output:



```
Charlie | Marks: 85.0
Alice | Marks: 80.0
```

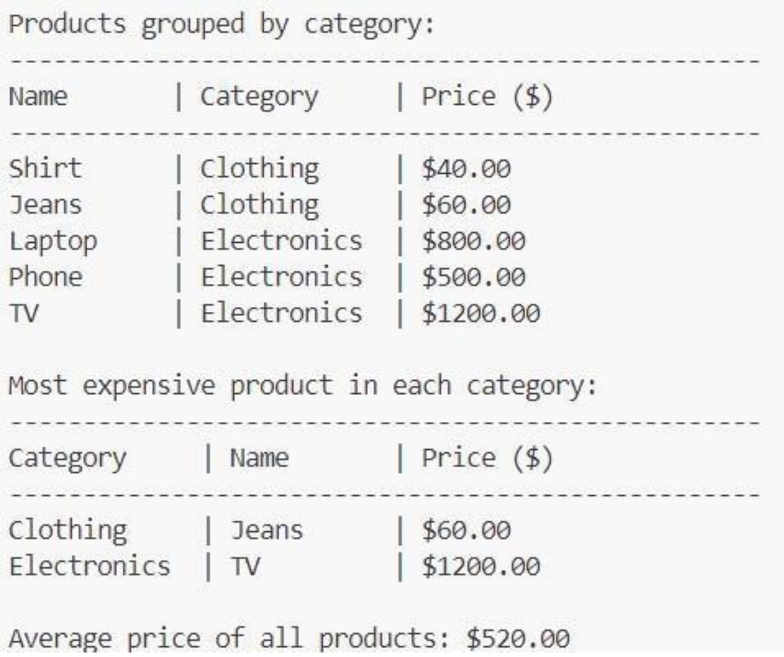
6. Objective 3 : Hard Level

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.

7. Code/Implementation:

```
import java.util.*; import
java.util.stream.Collectors;

class Product {
    String name, 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
 String.format("%-10s | %-12s | $%-8.2f", name, category, price);
    }
 }  public class
 Experiment6C { public
 static void main(String[]
 args)
 {          List<Product>
 products =
 Arrays.asList(
 new Product("Laptop",
 "Electronics", 800),
 new Product("Phone",
 "Electronics", 500),
 new Product("Shirt",
 "Clothing", 40),
 new Product("Jeans",
 "Clothing", 60),
new Product("TV",
"Electronics", 1200)
        );

        // Grouping products by category
        Map<String, List<Product>> groupedByCategory = products.stream()
            .collect(Collectors.groupingBy(p -> p.category));
        // Finding the most expensive product in each category
        Map<String, Product> mostExpensiveByCategory = products.stream()
            .collect(Collectors.groupingBy(
      p -> p.category,
                Collectors.collectingAndThen(
                    Collectors.maxBy(Comparator.comparingDouble(p ->
p.price)),
                    Optional::get
                )
            ));

        // Calculating the average price of all products
double avgPrice = products.stream()
            .mapToDouble(p -> p.price)
            .average()
            .orElse(0);

        // Display results with symmetric formatting
        System.out.println("\nProducts grouped by category:");
        System.out.println("-------------------------------------------------
---");
        System.out.printf("%-10s | %-12s | %-10s\n", "Name", "Category",
"Price ($)");
        System.out.println("-------------------------------------------------
---");
        groupedByCategory.forEach((category, productList) ->
{             productList.forEach(System.out::println);
        });

        System.out.println("\nMost expensive product in each category:");
        System.out.println("-------------------------------------------------
--");
        System.out.printf("%-12s | %-10s | %-10s\n", "Category", "Name",
"Price ($)");     System.out.println("--------------------------------------
----------
---");
        mostExpensiveByCategory.forEach((category, product) ->
{             System.out.printf("%-12s | %-10s | $%-8.2f\n", category,
product.name, product.price);
        });
        System.out.println("\nAverage price of all products: $" +
String.format("%.2f", avgPrice));
    } }
```

Output:



```
Products grouped by category:
-------------------------------------------------
Name          | Category      | Price ($)
-------------------------------------------------
Shirt         | Clothing      | $40.00
Jeans         | Clothing      | $60.00
Laptop        | Electronics   | $800.00
Phone         | Electronics   | $500.00
TV            | Electronics   | $1200.00

Most expensive product in each category:
-------------------------------------------------
Category      | Name          | Price ($)
-------------------------------------------------
Clothing      | Jeans         | $60.00
Electronics   | TV            | $1200.00

Average price of all products: $520.00
```

8. Learning Outcomes:

- Understand and apply lambda expressions for sorting and filtering data efficiently.
- Utilize Java Streams to process and manipulate large datasets with ease.
- Implement grouping, aggregation, and transformation operations on collections.
- Analyze and extract meaningful insights using functional programming in Java.