**Exercise 1: Implementing the Singleton Pattern**

CODE:

import java.util.\*;

public class ECommerceSearch {

static class Product {

int productId;

String productName;

String category;

public Product(int productId, String productName, String category) {

this.productId = productId;

this.productName = productName;

this.category = category;

}

@Override

public String toString() {

return "ProductID: " + productId + ", Name: " + productName + ", Category: " + category;

}

}

public static Product linearSearch(List<Product> products, String name) {

for (Product p : products) {

if (p.productName.equalsIgnoreCase(name)) {

return p;

}

}

return null;

}

public static Product binarySearch(List<Product> products, String name) {

List<Product> sortedList = new ArrayList<>(products);

sortedList.sort(Comparator.*comparing*(p -> p.productName.toLowerCase()));

int left = 0, right = sortedList.size() - 1;

while (left <= right) {

int mid = left + (right - left) / 2;

int cmp = sortedList.get(mid).productName.compareToIgnoreCase(name);

if (cmp == 0) return sortedList.get(mid);

else if (cmp < 0) left = mid + 1;

else right = mid - 1;

}

return null;

}

public static void displayProducts(List<Product> products) {

if (products.isEmpty()) {

System.*out*.println("No products added yet.");

return;

}

for (Product p : products) {

System.*out*.println(p);

}

}

public static void main(String[] args) {

Scanner scanner = new Scanner(System.*in*);

List<Product> products = new ArrayList<>();

System.*out*.print("Enter number of products to add: ");

int n = Integer.*parseInt*(scanner.nextLine());

for (int i = 0; i < n; i++) {

System.*out*.println("Enter details for product " + (i + 1));

System.*out*.print("Product ID: ");

int id = Integer.*parseInt*(scanner.nextLine());

System.*out*.print("Product Name: ");

String name = scanner.nextLine();

System.*out*.print("Category: ");

String category = scanner.nextLine();

products.add(new Product(id, name, category));

}

int choice;

do {

System.*out*.println("\n=== E-Commerce Search Menu ===");

System.*out*.println("1. Linear Search by Product Name");

System.*out*.println("2. Binary Search by Product Name");

System.*out*.println("3. Display All Products");

System.*out*.println("4. Exit");

System.*out*.print("Enter your choice: ");

choice = Integer.*parseInt*(scanner.nextLine());

switch (choice) {

case 1:

System.*out*.print("Enter product name to search (Linear): ");

String lname = scanner.nextLine();

Product lresult = *linearSearch*(products, lname);

if (lresult != null) System.*out*.println("Found: " + lresult);

else System.*out*.println("Product not found.");

break;

case 2:

System.*out*.print("Enter product name to search (Binary): ");

String bname = scanner.nextLine();

Product bresult = *binarySearch*(products, bname);

if (bresult != null) System.*out*.println("Found: " + bresult);

else System.*out*.println("Product not found.");

break;

case 3:

*displayProducts*(products);

break;

case 4:

System.*out*.println("Exiting program...");

break;

default:

System.*out*.println("Invalid choice. Try again.");

}

} while (choice != 4);

scanner.close();

}

}

OUTPUT:







