CHRIST (Deemed to be University)
Department of Computer Science
Master of Artificial Intelligence and Machine Learning

Course: MAI271 – JAVA Programming
Exercise No: LAB Exercise – 6
Date: 5 – 01 – 2024
Duration: 2 Hrs

Question 1 (4 Marks)

You are provided with an integer array `coins[]` of size N, representing different denominations of currency, and an integer `sum`. The task is to find the number of ways you can make the given sum by using different combinations from the coins[] array. Assume that you have an infinite supply of each type of coin, and you can use any coin as many times as needed.Incorporate multithreading concepts to optimize the computation of different combinations. Design a concurrent solution that utilizes multiple threads to explore and calculate the various combinations efficiently.

Example 1:
Input:
N = 3, sum = 4
coins = {1, 2, 3}
Output: 4
Explanation: Four possible ways are: {1, 1, 1, 1}, {1, 1, 2}, {2, 2}, {1, 3}.

Example 2:
Input:
N = 4, Sum = 10
coins = {2, 5, 3, 6}
Output: 5
Explanation: Five possible ways are: {2, 2, 2, 2, 2}, {2, 2, 3, 3}, {2, 2, 6}, {2, 3, 5}, and {5, 5}.

Question 2 (6 Marks)

You are tasked with enhancing the backend of an online shopping platform's order fulfillment system. The system now needs to handle additional functionalities to provide a seamless and efficient experience for both customers and administrators.

1. **Enhanced Order Fulfillment System:**

   Implement the `**EnhancedOrderFulfillmentSystem**` class with the following methods:

- placeOrder(Order order): This method should be used to submit an order for processing.
- startProcessing(): This method should start the processing of submitted orders using worker threads.
- waitForCompletion(): This method should wait until all orders are processed.

Additionally, implement the following functionalities:

- Inventory Management:
- updateInventory(Order order): This method should update the system's inventory based on the items in the order.
- checkInventoryAvailability(Item item): This method should check if there is sufficient stock of an item in the inventory.

- Order Tracking:
- trackOrderStatus(int orderId): This method should provide real-time tracking information for a given order.

- Exception Handling:
- Implement custom exception handling to handle various scenarios, such as insufficient inventory, order cancellation, or any other exceptional cases that may arise during order processing.

Ensure that the system efficiently manages inventory updates, tracks order status, and handles exceptions gracefully.

General Instruction:

1. Ensure that your code includes relevant comments to enhance readability and understanding. Subsequently, upload your code to GitHub for version control and collaborative access.
2. Include descriptive comments within the code, explaining its functionality and logic.
3. In the Google Classroom submission, include the GitHub URL where your code is hosted.
4. Attach a PDF document named "your_register_number_exercise_No.pdf" to the submission.The PDF document should include screenshots of the code and the output screen.
5. Upload the answer document&GitHub URL in Google Classroom on or before the deadline mentioned.Evaluation will not be considered for late submission