Inventory Management System Functionality Implementation

Project Overview:

You are tasked with developing an inventory management system for a small retail store. The store specializes in selling various products, including electronics, clothing, and household items. The system will help the store efficiently manage its inventory, track product details, handle customer purchases, and provide basic reporting capabilities.

Objective:

To implement various functionalities of an Inventory Management System using appropriate data structures for efficient storage, retrieval, and manipulation of data.

Tasks:

1. **Add Product Functionality**:

   Data Structure Used: Dictionary

   Description: Implement the functionality to add a product to the inventory. Each product is represented as an object of the Product class with attributes such as product ID, name, price, and quantity. Maintain a list to preserve the order of products, and use a dictionary to map product IDs to their respective objects for fast access.

2. **Remove Product Functionality**:

   Data Structure Used: List, Dictionary

   Description: Develop the functionality to remove a product from the inventory. Ensure efficient removal by deleting the product from both the list of products and the product dictionary, eliminating any references to the removed product.

3. **Update Product Quantity Functionality**:

   Data Structure Used: Dictionary

   Description: Implement the functionality to update the quantity of a product in the inventory. Utilize the product dictionary to access the product object by its ID, and update its quantity attribute with the new quantity provided by the user.

4. **Add to Cart Functionality:**

   Data Structure Used: Linked List

   Description: Create the functionality to add a product to the shopping cart. Utilize a linked list where each node represents a product added to the cart, allowing for efficient insertion and traversal of items.

5. **Remove from Cart Functionality**:

   Data Structure Used: Linked List, Stack

Description: Develop the functionality to remove a product from the shopping cart. Delete the product from the linked list representing the cart and push the removed product onto a stack to enable undo functionality.

6. **Undo Remove from Cart Functionality:**

   Data Structure Used: Stack

   Description: Implement the undo functionality for removing a product from the cart. Utilize a stack to store removed products, and create a function to pop the last removed product from the stack and add it back to the shopping cart, effectively undoing the last removal operation.

7. **Display Inventory Functionality**:

   Data Structure Used: List

   Description: Develop the functionality to display the inventory to the user. Traverse the list of products in the inventory and display each product's details, including ID, name, price, and quantity.

8. **Display Cart Functionality**:

   Data Structure Used: Linked List

   Description: Create the functionality to display the shopping cart to the user. Traverse the linked list representing the shopping cart and display each product's details.

Instructions:

- Implement each functionality separately in a modular manner.
- Utilize appropriate data structures as specified for each functionality.
- Test each functionality thoroughly to ensure correctness and efficiency.
- Document your code comprehensively, including function descriptions, parameter details, and any assumptions made.
- Ensure that your implementation adheres to best practices of coding standards and efficiency.

Submission Guidelines:

- Submit the source code files containing the implementation of each functionality.
- Include a brief report documenting the functionalities implemented, data structures used, and any challenges faced during the implementation process.
- Submit your assignment by each submission deadline.

Note:

This assignment aims to provide practical experience in implementing key functionalities of an Inventory Management System. Pay close attention to the data structures chosen for each functionality to ensure efficiency and effectiveness in managing inventory and shopping cart operations. Complete the tasks diligently, providing a user-friendly menu for ease of interaction. Seek clarification from the instructor if needed.

Good luck!