**DOCUMENTATION OF INVENTORY MANAGEMENT SYSTEM**

**Overview:**

This inventory management system allows you to manage products in a small retail store, handle stock levels, and process sales.

**Classes and Methods:**

**Classes:**

**1. Product:** Represents a product with attributes such as ID, name, description, price, and quantity. Allows updating of product information.

**2. Inventory:** Represents a collection of products. Provides methods to add, remove, and update products, manage stock levels, process sales, and generate reports.

**Product Class:**

**Attributes:**

- product\_id (int): Unique identifier for the product.

- name (str): Name of the product.

- description (str): Description of the product.

- price (float): Price of the product.

- quantity (int): Current stock quantity of the product.

**Methods:**

\_\_init\_\_(self, product\_id, name, description, price, quantity): Initializes a product with ID, name, description, price, and quantity.

update\_info(self, name=None, description=None, price=None): Updates the product's name, description, or price.

**Inventory Class:**

**Methods:**

init(self): Initializes a new Inventory instance with an empty dictionary of products.

**Attributes:**

add\_product(self, product): Adds a new product to the inventory.

remove\_product(self, product\_id): Removes a product from the inventory by its ID.

update\_stock(self, product\_id, quantity): Increases or decreases the stock quantity of a product.

process\_sale(self, product\_id, quantity): Processes a sale by reducing the stock and returns the total cost.

generate\_report(self): Generates a report of all products.

generate\_low\_stock\_report(self, threshold=5): Generates a report of products with stock below the threshold.

**Usage:**

Initialize products and inventory.

Add products to the inventory using add\_product.

Manage stock using update\_stock.

Process sales using process\_sale.

Generate reports using generate\_report and generate\_low\_stock\_report.

**Error Handling:**

Raises ValueError if attempting to add a product that already exists.

Raises KeyError if attempting to access a product that does not exist.

Raises ValueError if attempting to set a negative stock level or process a sale with insufficient stock.

**Test Cases:**

The if \_\_name\_\_ == "\_\_main\_\_": block provides example usage and demonstrates the functionality with the following operations:

Adding products.

Generating a full inventory report.

Updating stock levels.

Processing a sale.

Generating a low stock report.

Handling errors for insufficient stock and non-existent products.

Removing a product and generating an updated report.