E-Commerce System for Electrical Devices

Course Name: Software Engineering

Instructor: Eman Mahmoud

Team Members

1. Menna Haitham
2. Malak Ahmed
3. Nesma Hesham
4. Youssef Emad

Faculty : Computers and Artificial Intelligence

Date : 18-12-2025

1. Introduction

1.1 Purpose

The purpose of this document is to describe the functional and non-functional requirements for the **E-Commerce System for Electrical Devices**. This system is designed to provide a specialized online shopping platform for electrical and electronic products, enabling users to browse, compare, purchase, and manage products efficiently. This document serves as a guide for developers, testers, and stakeholders throughout the project lifecycle.

1.2 Scope

The system will support the following main functionalities:

- User registration, authentication, and profile management.
- Browsing and searching for electrical devices by category.
- Shopping cart management and order placement.
- Payment processing (Visa/Cash on Delivery).
- Seller product management (add, update, delete).
- Admin management of users, products, orders, and reports.
- Order tracking and review system.

1.3 Organization

This document is organized as follows:

- Section 1: Introduction
- Section 2: Overall Description
- Section 3: Specific Requirements (Functional & Non-Functional)
- Section 4: Detailed Use Case Scenarios

---

2. Overall Description

2.1 Product Perspective

The system is a standalone web-based e-commerce platform built using modern software engineering practices. It interacts with a relational database for data persistence and supports three main user roles: Customer, Seller, and Administrator.

2.2 Product Functions

- **User Authentication**: Register, login, logout, password reset.
- **Product Browsing**: View products by category, search, filter.
- **Shopping Cart**: Add, remove, update items, calculate total.
- **Order Processing**: Place order, choose payment method, confirm payment.
- **Order Tracking**: View order status (Pending, Paid, Shipped, Delivered).
- **Product Management (Seller)**: Add, edit, delete products, update stock.
- **Admin Management**: Manage users, sellers, products, orders, and view reports.
- **Review System**: Customers can write and read reviews.

2.3 User Characteristics

- **Customers**: Basic computer skills, able to browse, search, and purchase products.
- **Sellers**: Familiar with inventory management, able to add and update products.
- **Administrators**: Technical knowledge, able to manage users, products, and system settings.

2.4 Constraints

- The system must be responsive and compatible with modern web browsers.
- Payment gateway integration is limited to Visa and Cash on Delivery initially.
- The system must support Arabic and English interfaces.
- Must comply with basic e-commerce security standards (e.g., HTTPS, encrypted passwords).

2.5 Assumptions

- Users have reliable internet access.
- Sellers and administrators are trained to use the system.
- Product inventory is managed manually by sellers (no automated supplier integration).

System Development Life Cycle (SDLC)

The E-Commerce System for Electrical Devices was developed following the **Waterfall Model** of the Software Development Life Cycle, which is suitable for well-defined academic projects with clear requirements.

1. **Requirements Gathering and Analysis**
    - Collected functional and non-functional requirements.
    - Defined actors (Customer, Seller, Admin) and core features.
    - Documented project objectives and scope.
2. **System Design**
    - Created UML diagrams: Use Case, State, Activity, Sequence, and Class Diagrams.
    - Designed database schema based on Class Diagram.
    - Planned user interfaces and role-based access.
3. **Implementation**
    - Developed the system using web technologies (frontend: HTML/CSS/JavaScript; backend likely PHP or similar; database: MySQL).
    - Implemented authentication, product management, cart, order processing, and admin tools.
    - Built responsive and intuitive GUI screens.
4. **Testing**
    - Conducted unit testing for individual components (e.g., login, add product).
    - Integration testing for workflows (e.g., checkout process).
    - Performed user acceptance testing during live demo.
5. **Deployment & Demonstration**
    - Deployed the working prototype.
    - Conducted a full live demo on December 18, 2025, showcasing registration, browsing, purchasing, seller actions, and admin management.
6. **Documentation & Delivery**
    - Prepared comprehensive project report with diagrams, descriptions, screenshots, and code (if required).
    - Submitted final documentation and system.

3 Requirements

Functional Requirements

- **FR1:** The system shall allow users to register by providing personal details (name, email, password, address).
- **FR2:** The system shall authenticate users via login with email and password, assigning roles (Customer, Seller, Admin).
- **FR3:** Customers shall browse products by categories, search by keywords, and view detailed information (name, description, price, images).
- **FR4:** Customers shall add products to a shopping cart, update quantities, remove items, and view cart totals.
- **FR5:** Customers shall place orders from the cart, select payment methods (e.g., Visa, Cash), and receive order confirmations.
- **FR6:** Customers shall track order status and write reviews for purchased products.
- **FR7:** Sellers shall add new products with details (name, description, price, quantity, category, images).
- **FR8:** Sellers shall update or delete existing products and manage stock levels.
- **FR9:** Sellers shall view customer orders related to their products.
- **FR10:** Admins shall manage users (approve sellers, edit profiles, delete accounts).
- **FR11:** Admins shall manage products, categories, and orders across the system.
- **FR12:** Admins shall generate and view reports on sales, inventory, and user activity.
- **FR13:** The system shall handle order states: pending, paid, shipped, delivered, with transitions based on actions.

Non-Functional Requirements

- **NFR1 (Performance):** The system shall respond to user actions (e.g., page loads, searches) within 2 seconds under normal load.
- **NFR2 (Usability):** The interface shall be intuitive, with clear navigation and mobile responsiveness for screens above 320px width.
- **NFR3 (Security):** User data shall be stored securely with hashed passwords; access controls shall prevent unauthorized actions based on roles.
- **NFR4 (Reliability):** The system shall handle up to 100 concurrent users without crashes; data integrity shall be maintained during transactions.
- **NFR5 (Maintainability):** Code shall be modular, with clear documentation for future updates.
- **NFR6 (Scalability):** The database schema shall support expansion to additional product categories without major redesign.
- **NFR7 (Availability):** The system shall be available 99% of the time, assuming hosting on a reliable server.

Use Case Scenarios (UML)

Here is a refined and condensed version with **only 7 key use case scenarios** that comprehensively cover the main functionalities of the entire E-Commerce System for Electrical Devices. These scenarios align with your project's objectives, UML diagrams (especially the Use Case Diagram), and the roles: **Customer**, **Seller**, and **Admin**.

1. Use Case: Register / Sign Up

Actors: Customer, Seller **Type:** Primary and Essential **Description:** Allows a new user to create an account by providing personal details (name, email, password, address). Seller registrations may require admin approval. **Includes:** Validate Data **Extends:** None **Pre-conditions:** User is not registered. **Post-conditions:** Account created; confirmation sent; Sellers set to pending status. **Basic Flow:**

1. User navigates to registration page.
2. User enters details and selects role.
3. System validates and creates account. **Exceptions:** Duplicate email or invalid data → error message.

2. Use Case: Login

Actors: Customer, Seller, Admin **Type:** Primary and Essential **Description:** Allows a registered user to access the system by entering email and password, granting role-based access. **Includes:** Validate Data **Extends:** None **Pre-conditions:** User has a registered account. **Post-conditions:** User is authenticated and redirected to appropriate dashboard. **Basic Flow:**

1. User enters email and password.
2. System validates credentials.
3. System logs user in based on role. **Exceptions:** Invalid credentials → error and retry prompt.

3. Use Case: Browse and Search Products

Actors: Customer (Guest or Logged-in) **Type:** Primary and Essential **Description:** Allows users to browse products by category, search by keywords, filter, and view detailed product information (name, description, price, images, reviews). **Includes:** None **Extends:** None **Pre-conditions:** System has products available. **Post-conditions:** User views desired products. **Basic Flow:**

1. User accesses product listing page.
2. User browses categories or searches keywords.
3. System displays matching products with details. **Exceptions:** No results → display "No products found".

4. Use Case: Manage Shopping Cart and Place Order

Actors: Customer **Type:** Primary and Essential **Description:** Allows a logged-in customer to add products to the cart, update quantities, remove items, proceed to checkout, and place an order with payment (Visa or Cash on Delivery). **Includes:** Make Payment **Extends:** None **Pre-conditions:** Customer is logged in; cart has items. **Post-conditions:** Order is created; stock updated; confirmation sent. **Basic Flow:**

1. Customer adds products to cart.
2. Customer reviews and modifies cart.
3. Customer proceeds to checkout and selects payment.
4. System processes payment and confirms order. **Exceptions:** Insufficient stock → notify user.

5. Use Case: Track Order

Actors: Customer **Type:** Primary **Description:** Allows a customer to view the status of their orders (pending, paid, shipped, delivered). **Includes:** None **Extends:** None **Pre-conditions:** Customer is logged in and has placed orders. **Post-conditions:** Current order status displayed. **Basic Flow:**

1. Customer navigates to order history.
2. System lists orders with statuses.
3. Customer selects an order to view details.

6. Use Case: Add and Manage Products

Actors: Seller, Admin **Type:** Primary and Essential **Description:** Allows sellers to add new products (name, description, price, quantity, category, images) and update/delete their products. Admins can manage all products. **Includes:** None **Extends:** Update Stock **Pre-conditions:** User (Seller/Admin) is logged in. **Post-conditions:** Product catalog updated; changes reflected immediately. **Basic Flow:**

1. Seller/Admin navigates to product management.
2. User adds or edits product details.
3. System saves changes and updates inventory. **Exceptions:** Invalid data → prompt correction.

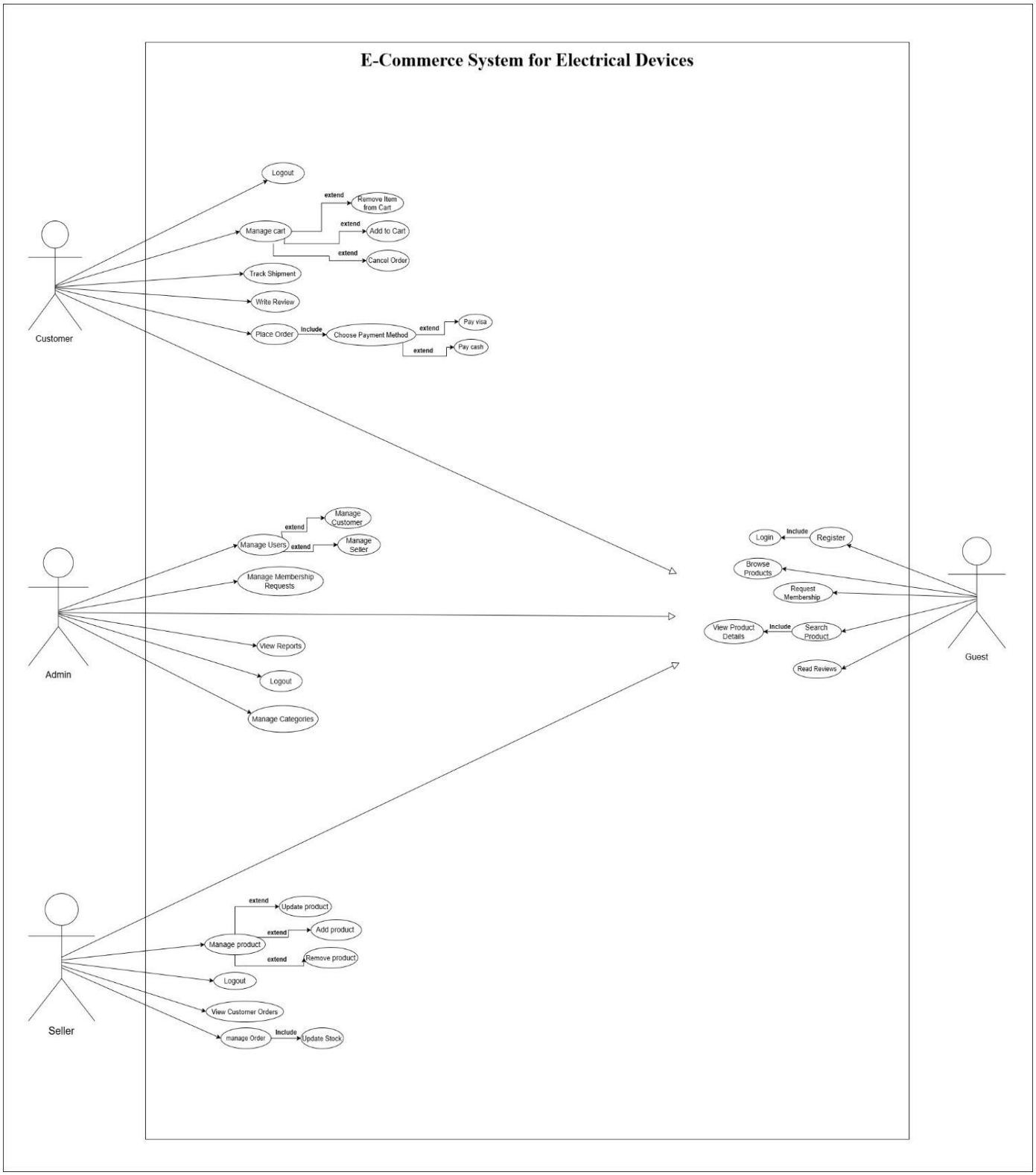
7. Use Case: Administer System (Manage Users and Orders)

Actors: Admin **Type:** Primary and Essential **Description:** Allows the admin to manage users (approve sellers, edit/delete accounts), view and manage all orders, and oversee the entire system. **Includes:** None **Extends:** None **Pre-conditions:** Admin is logged in. **Post-conditions:** System data and users updated securely. **Basic Flow:**

1. Admin accesses admin panel.
2. Admin views pending seller requests or orders.
3. Admin approves users or updates order statuses.
4. System applies changes.

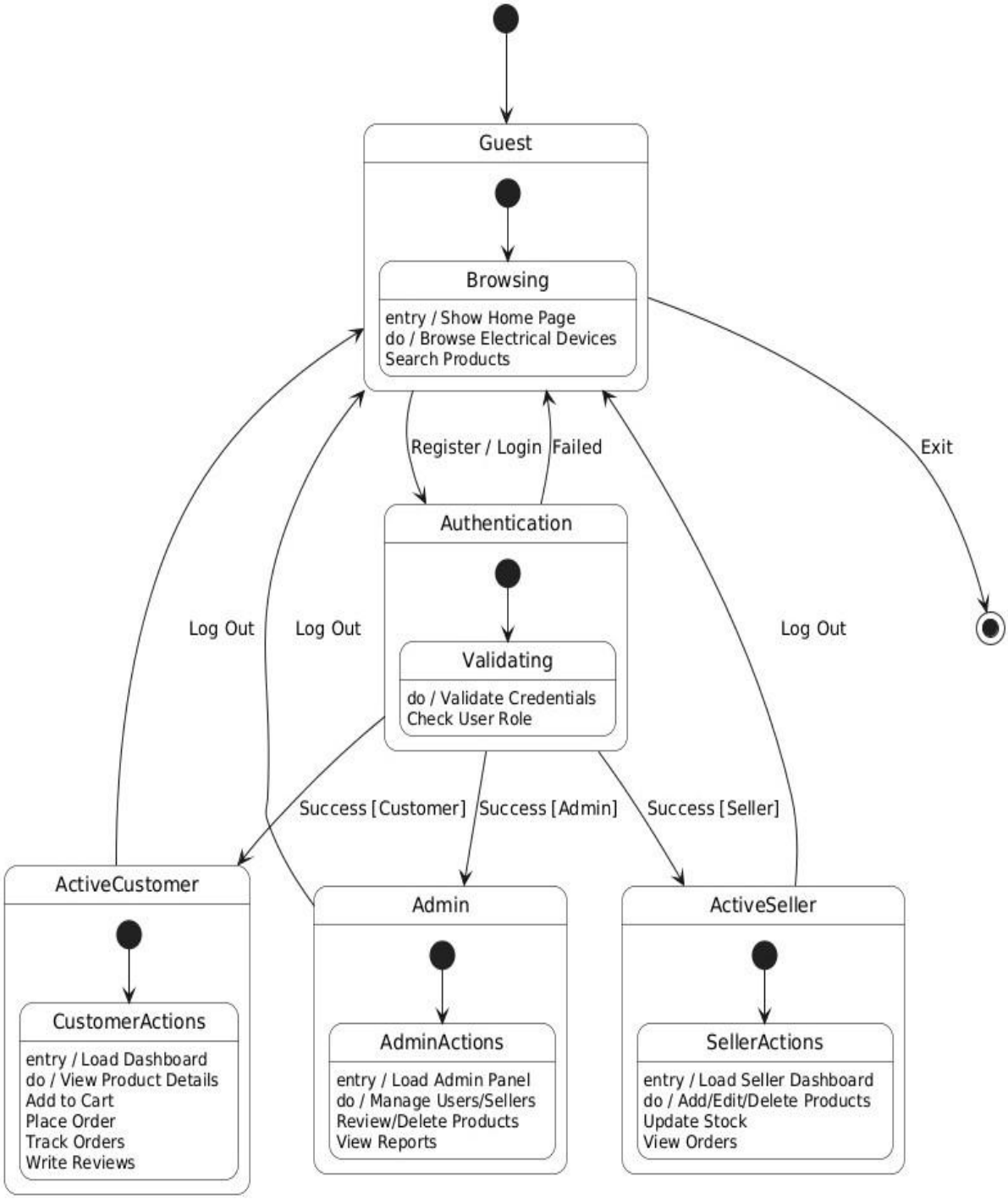
1- Use Case Diagram

This use case diagram illustrates the interaction between the system actors (Customer and Admin) and the main functionalities of the E-Commerce System, such as browsing products, placing orders, and manage products



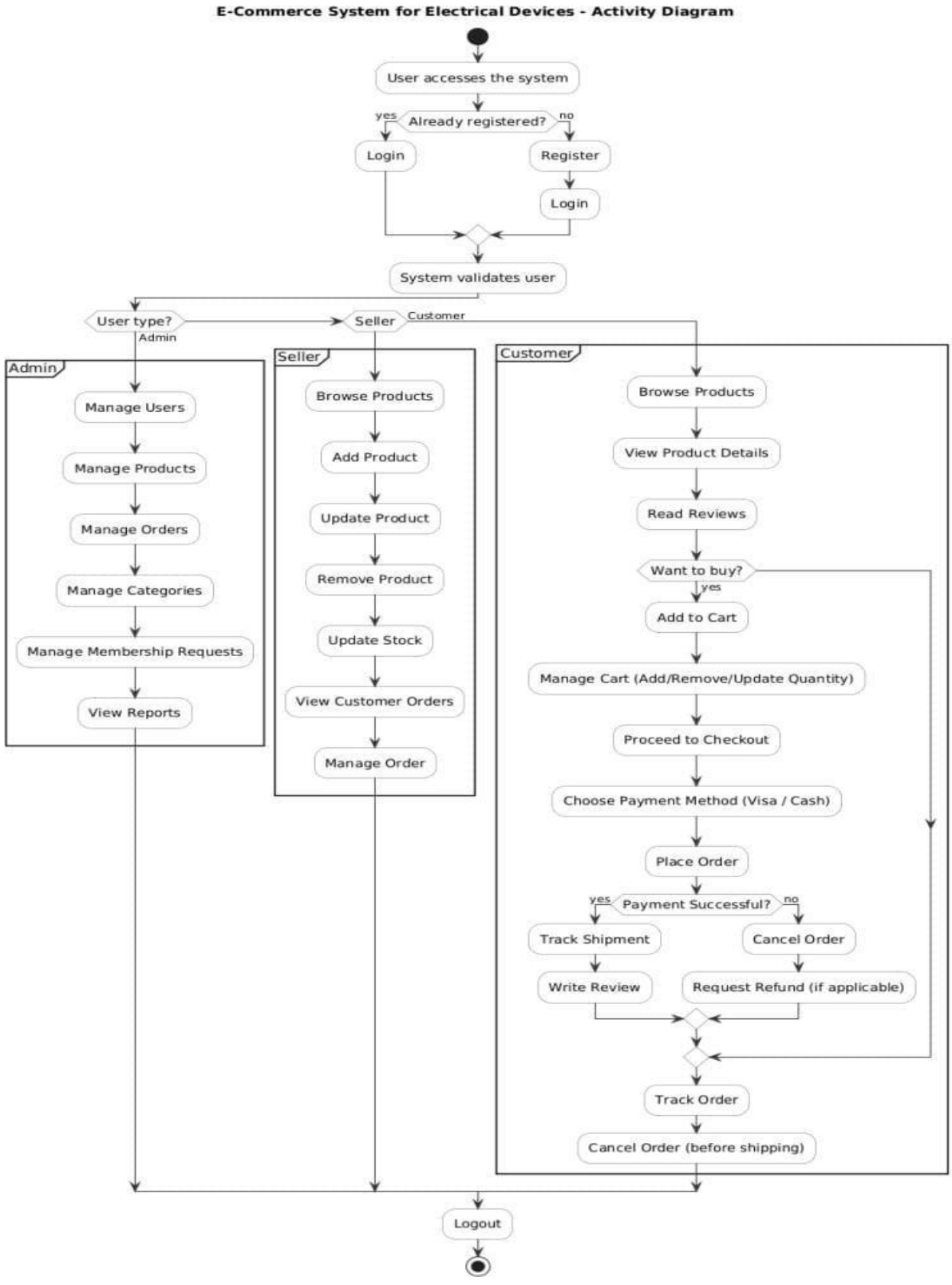
2- State Diagram

This state diagram represents the different states of an order in the E-Commerce System, starting from order creation until order completion. It shows how the order transitions between states such as pending, paid, shipped, and delivered



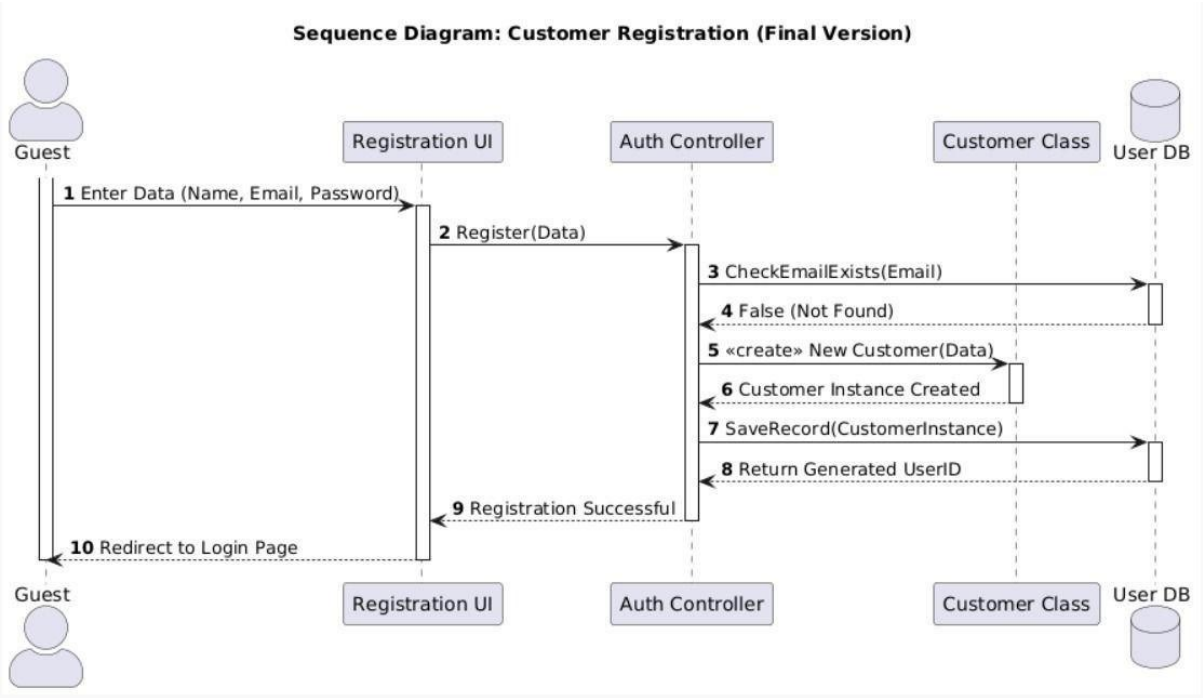
3- Activity Diagram

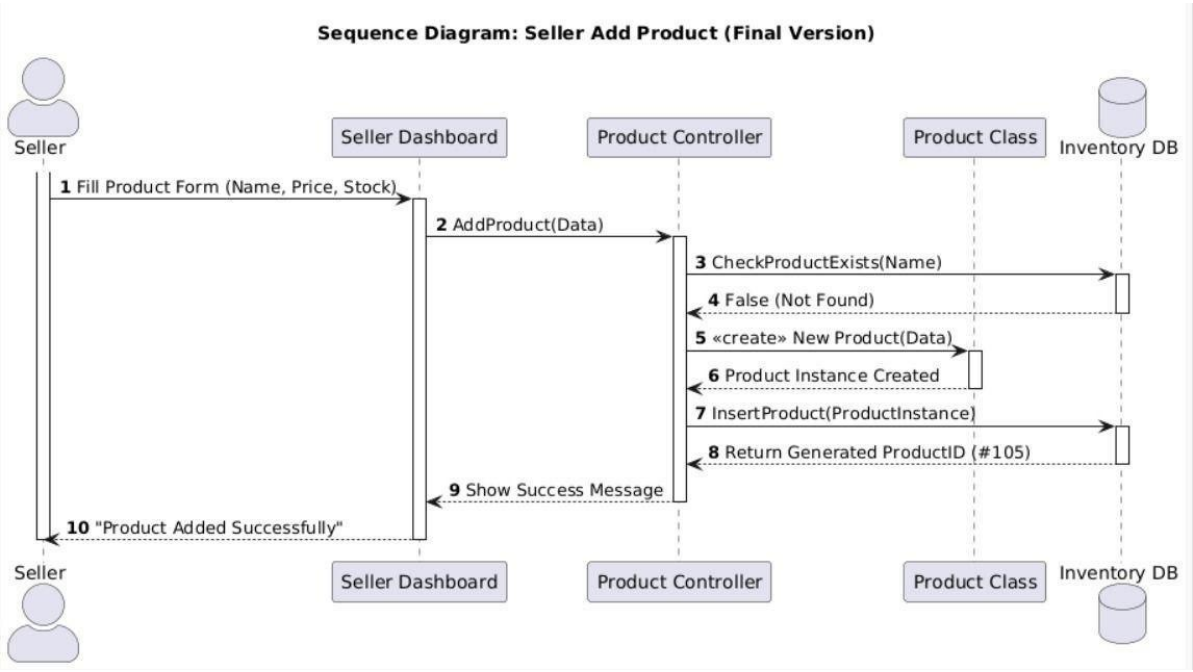
This activity diagram illustrates the workflow of the E-Commerce System, starting from user login and product selection to checkout and payment. It shows the sequence of activities performed by the user and the system.

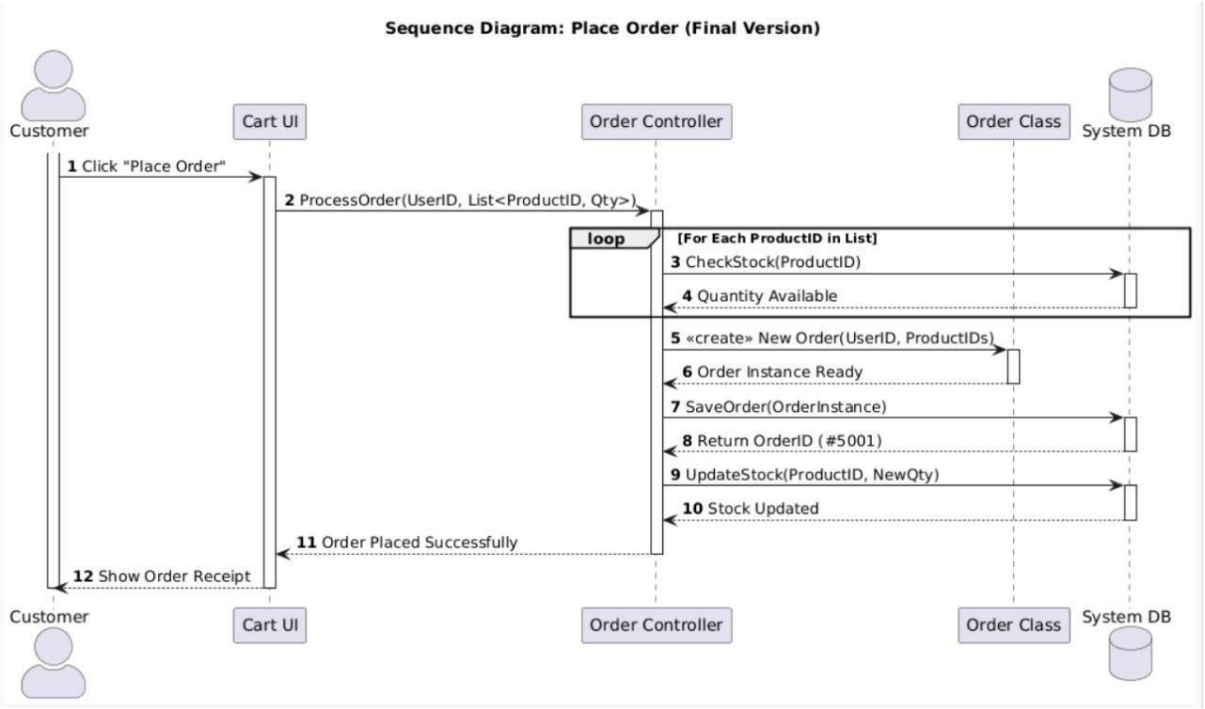


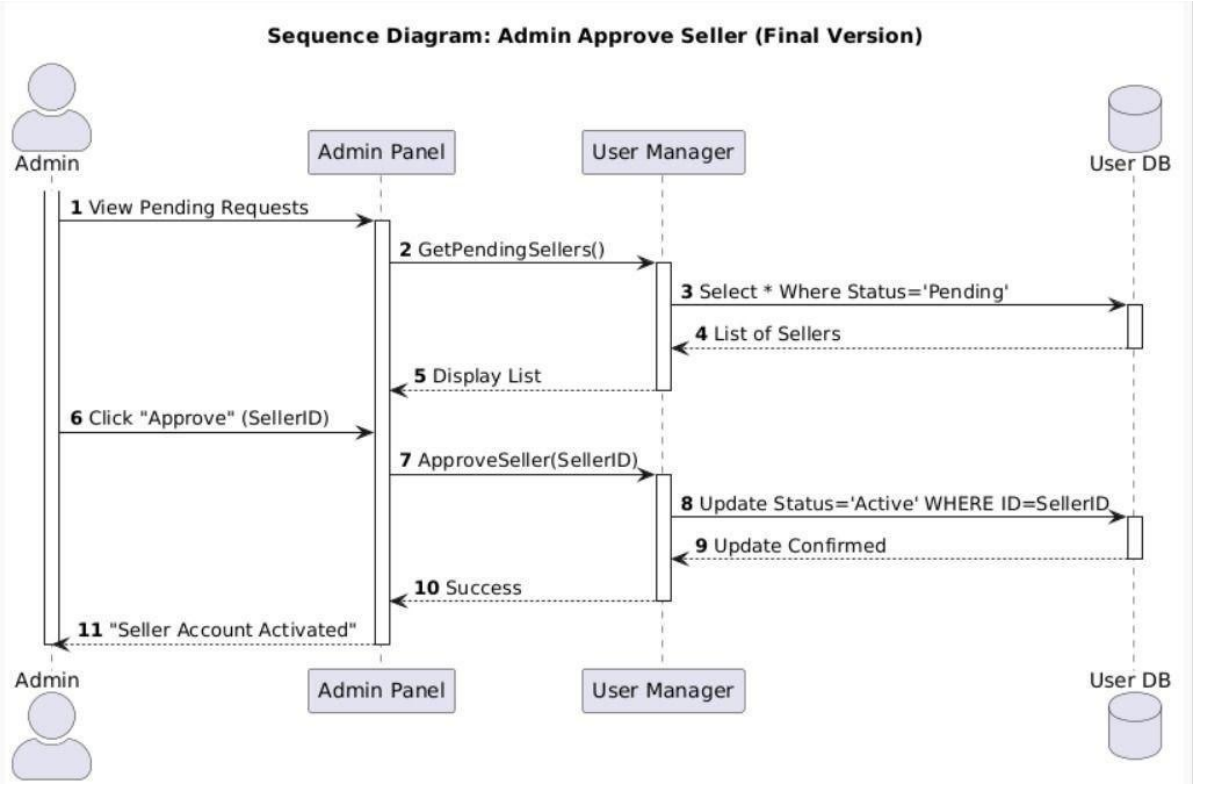
4- Sequence Diagram

This sequence diagram illustrates the interaction between the system components and the user during the order placement process. It shows the sequence of messages exchanged to complete the transaction



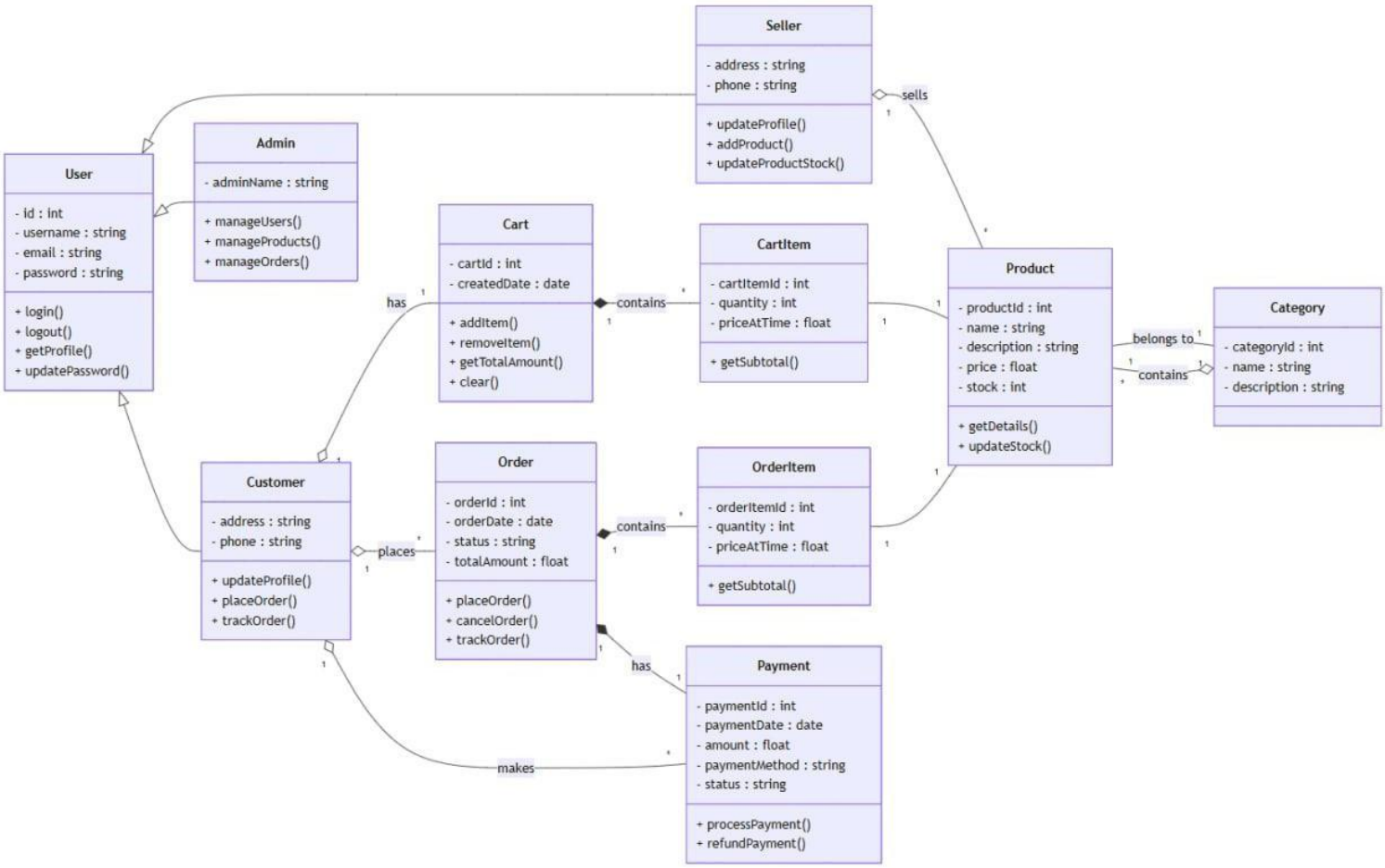



Sequence Diagram: Place Order (Final Version)
Customer
Cart UI
Order Controller
Order Class
System DB
1 Click "Place Order"
2 ProcessOrder(UserID, List<ProductID, Qty>)
loop
[For Each ProductID in List]
3 CheckStock(ProductID)
4 Quantity Available
5 «create» New Order(UserID, ProductIDs)
6 Order Instance Ready
7 SaveOrder(OrderInstance)
8 Return OrderID (#5001)
9 UpdateStock(ProductID, NewQty)
10 Stock Updated
11 Order Placed Successfully
12 Show Order Receipt
Customer
Cart UI
Order Controller
Order Class
System DB


Sequence Diagram: Admin Approve Seller (Final Version)
Admin
Admin Panel
User Manager
User DB
1 View Pending Requests
2 GetPendingSellers()
3 Select * Where Status='Pending'
4 List of Sellers
5 Display List
6 Click "Approve" (SellerID)
7 ApproveSeller(SellerID)
8 Update Status='Active' WHERE ID=SellerID
9 Update Confirmed
10 Success
11 "Seller Account Activated"
Admin
Admin Panel
User Manager
User DB

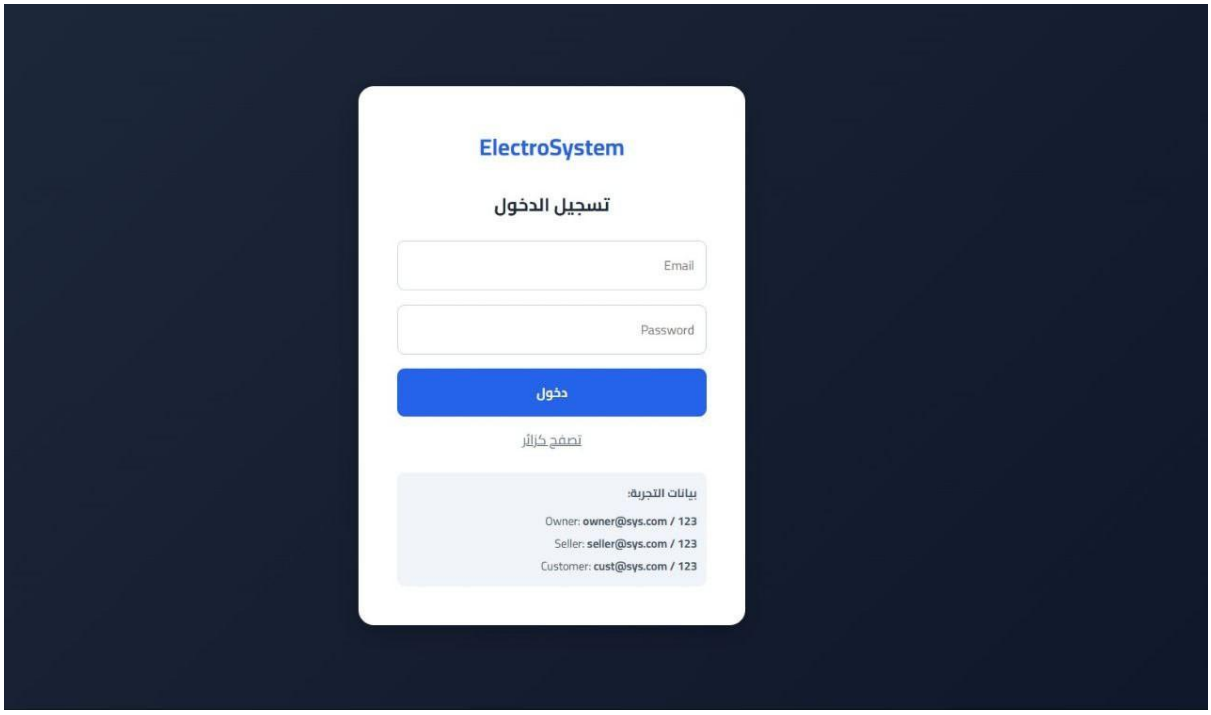
5- Class Diagram

This class diagram represents the static structure of the E-Commerce System, showing the main classes, their attributes, methods, and the relationships between them.

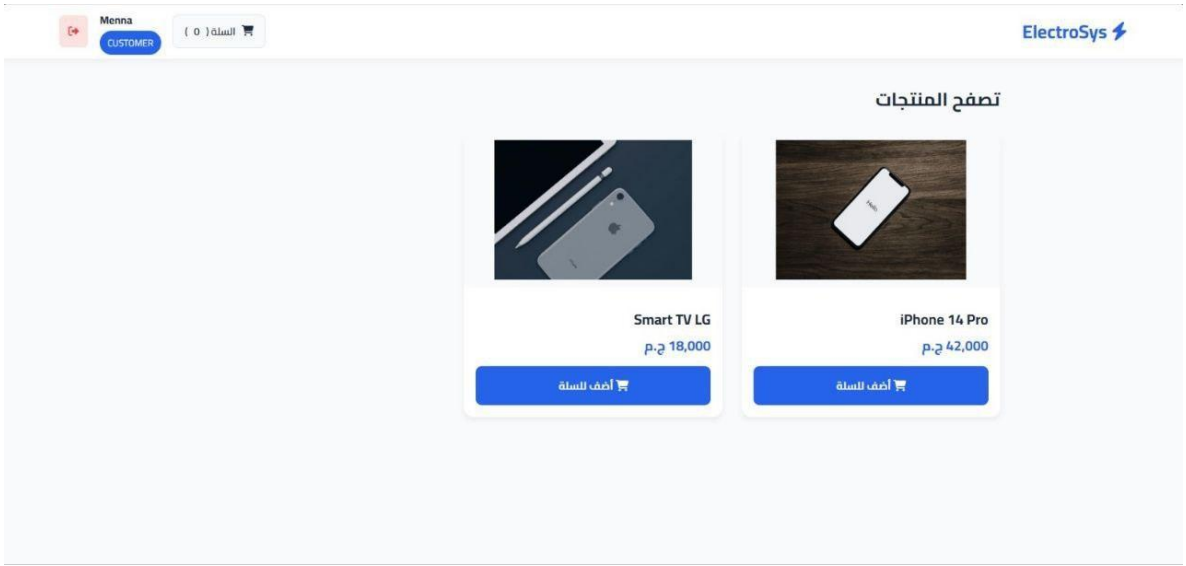


6- GUI

This screen allows users to log into the system using their registered credentials.
Users must enter a valid email and password to access their account.

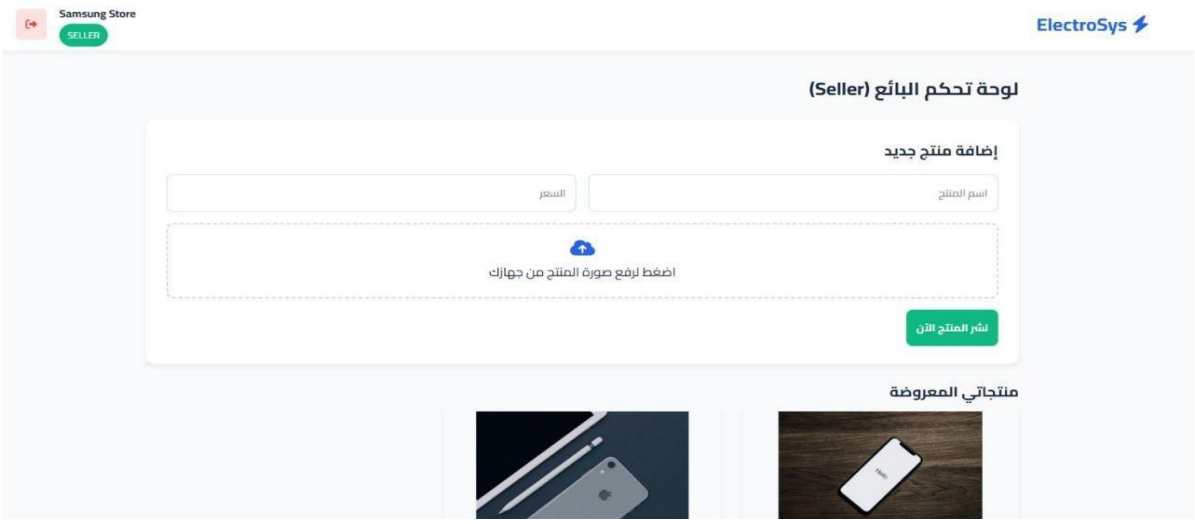


This screen displays all available products, allowing users to browse, search, and filter items before adding them to the cart.



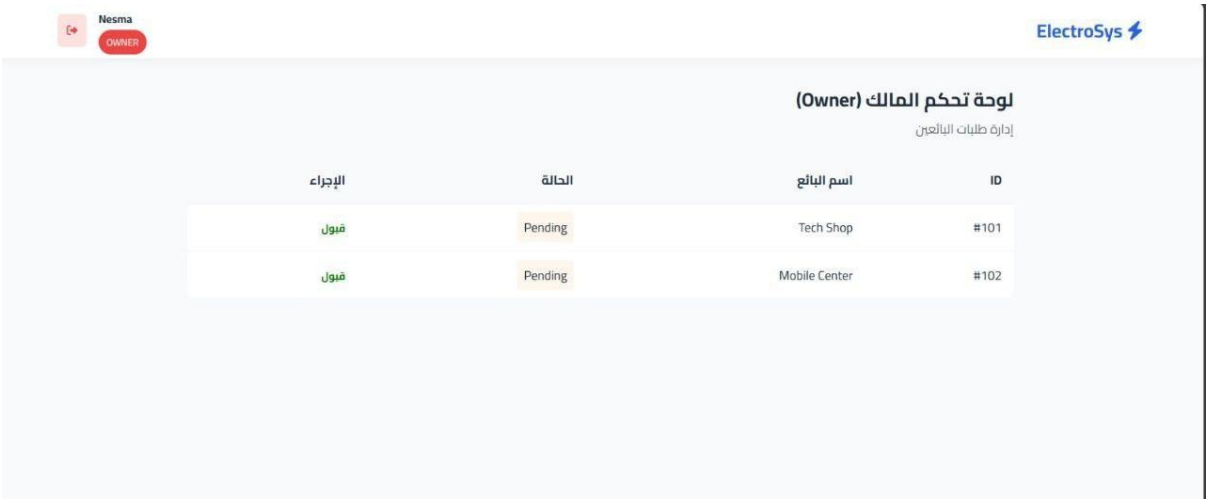
This screen shows the items added to the shopping cart, allowing users to update quantities or remove products before proceeding to checkout.

This screen allows the seller to add a new product to the system by entering details such as product name, description, price, quantity, and category. The product will then be visible to customers on the product listing page.



This screen allows new customers to create an account by providing their personal information, email, and password. Registration is required before making any purchases.

This screen allows the system owner or administrator to view, edit, and delete all products in the system. It provides a complete overview of product details such as name, category, price, quantity, and seller information.



Live_Demo:

A live demonstration of the E-Commerce System was conducted to showcase its main functionalities. The demo included login, product browsing and search, adding items to the cart, completing the checkout and payment process, seller product addition, and administrator product management. This demonstration illustrates how the system works in real-time, highlighting its interactive features and user-friendly interface.