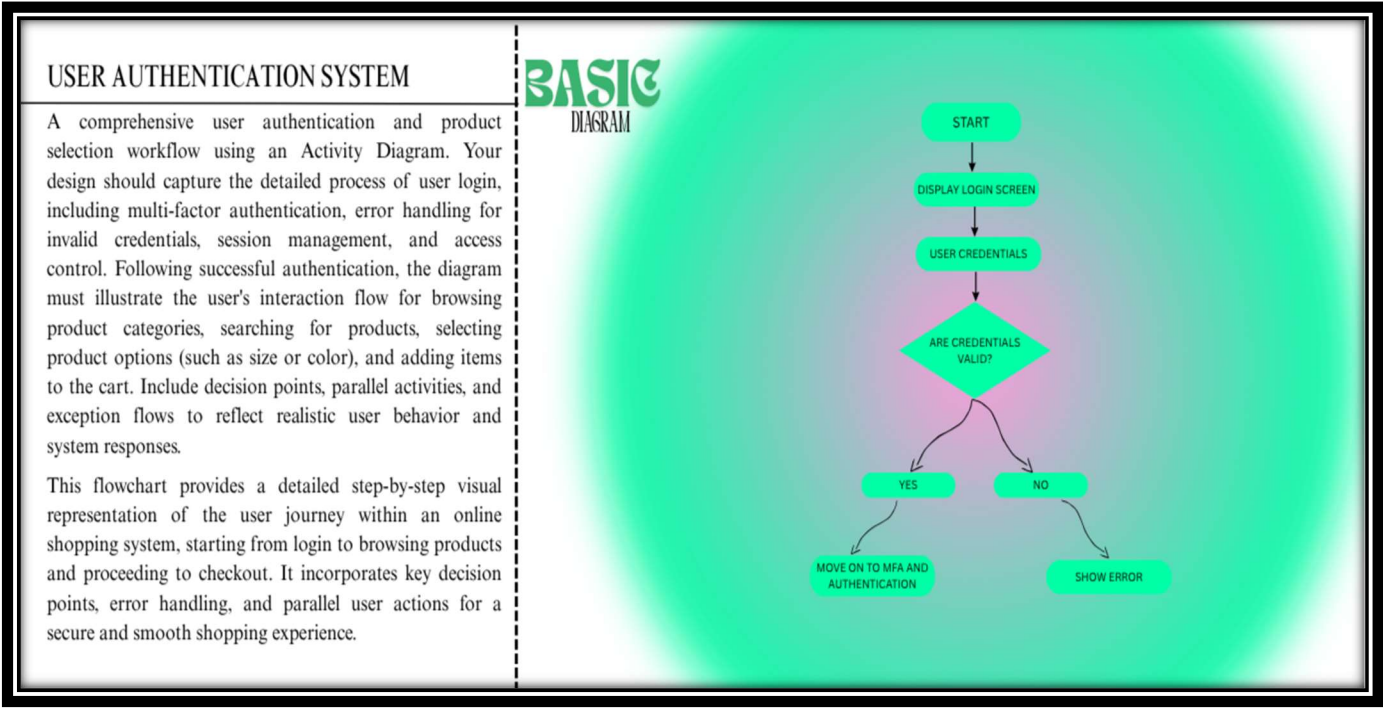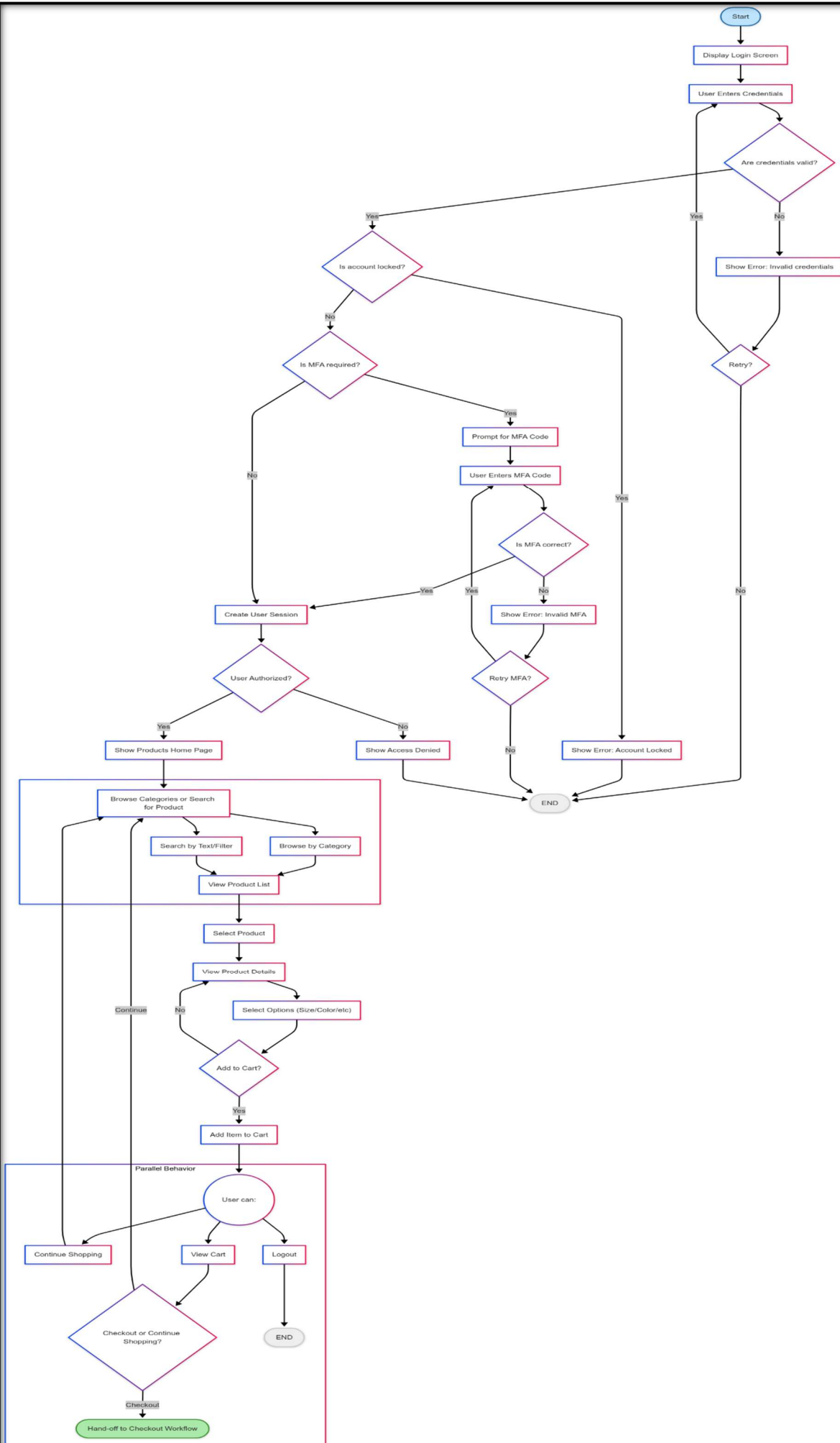# User Login and Shopping Process:

Design a comprehensive user authentication and product selection workflow using an Activity Diagram. Your design should capture the detailed process of user login, including multi-factor authentication, error handling for invalid credentials, session management, and access control. Following successful authentication, the diagram must illustrate the user's interaction flow for browsing product categories, searching for products, selecting product options (such as size or color), and adding items to the cart. Include decision points, parallel activities, and exception flows to reflect realistic user behavior and system responses.

OVERVIEW:

This flowchart illustrates the **end-to-end interaction flow** of a user accessing and using an online shopping system—from login to product selection and cart management. It includes login validation, Multi-Factor Authentication (MFA), authorization checks, and shopping behaviors like browsing, filtering, and cart operations.

DIAGRAM:

```
                                                          Start

                                                    Display Login Screen

                                                    User Enters Credentials

                                                 Are credentials valid?
                                          Yes                                No

                 Is account locked?
          Yes                                                          Show Error: Invalid credentials

                                No
                       Is MFA required?                                              Retry?
                  No                    Yes                                    Yes          No

                                   Prompt for MFA Code

                                   User Enters MFA Code

                                              Is MFA correct?
                                         Yes            No

                       Create User Session        Show Error: Invalid MFA
                   Yes                    Yes
              User Authorized?                    Retry MFA?
         Yes                  No             No

    Show Products Home Page      Show Access Denied    Show Error: Account Locked
                                                                        No

          Browse Categories or Search                              END
                 for Product

          Search by Text/Filter    Browse by Category

                 View Product List

                 Select Product

                 View Product Details
                            No       Select Options (Size/Color/etc)

                 Add to Cart?
                         Yes

    Continue         Add Item to Cart

          Parallel Behavior

                 User can:

    Continue Shopping    View Cart         Logout

                 Checkout or Continue              END
                       Shopping?

                 Checkout
          Hand-off to Checkout Workflow
```

1. Login and Authentication Process:

Start → Display Login Screen

- The process begins by displaying the login screen to the user.

User Enters Credentials

- The user provides their email/username and password.

Are credentials valid?

- If **No**:
  - Show error: **"Invalid credentials"**
  - Option to **Retry?**
    - If **No**, the flow ends.
- If **Yes**:
  - Proceed to check account status.

Is account locked?

- If **Yes**, display error: **"Account Locked"**, and **End**.
- If **No**, check if MFA is required.

Is MFA required?

- If **Yes**:
  - Prompt for MFA code.
  - User enters code.
  - Validate: Is MFA correct?
    - If **No**: Show **"Invalid MFA"**, offer retry.
      - If retry fails again: **Account is locked**.
    - If **Yes**: Proceed to session creation.
- If **No**: Proceed to session creation.

Create User Session → User Authorized?

- If **Yes**:
  - Proceed to main shopping experience.
- If **No**:
  - Show **Access Denied**, and End.

2. Product Browsing and Selection

Show Products Home Page

- User lands on the homepage to begin shopping.

Browse Categories or Search for Product

- Two options:
  - **Search by Text/Filter**

- o **Browse by Category**
- Both lead to: View Product List → Select Product

View Product Details → Select Options

- User views detailed info like description, images, etc.
- Then selects options (e.g., size, color).

Add to Cart?

- If **Yes**: Add Item to Cart
- If **No**: Can continue browsing.

3. Post-Selection User Actions

Parallel User Actions

After selecting or adding items, the user can perform parallel actions:

- Continue Shopping
- View Cart
- Logout (ends session)

Checkout or Continue Shopping?

- Decision point:
  - o If **Checkout**:
    - ▪ Hand-off to **Checkout Workflow**
  - o If **Continue**, return to product search.

Conclusion:

This flowchart clearly maps out the **typical journey of a user** through an e-commerce system, including:

- **Secure login with MFA**
- **Authorization control**
- **Flexible shopping options**
- **Cart and product management**
- **Parallel user actions**

It emphasizes a secure and user-friendly design by integrating robust error handling, retry mechanisms, and modular behaviors, making it ideal for a scalable online shopping application.