Exercise Question: Use Case Diagram for an Online Banking System

Below is the description of the functionalities of an online banking system. The use case diagram should capture the interactions between users and the system for performing basic banking operations.

Scenario:

1. **Actors:**
    - **Customer**: A user who has a bank account and uses the online banking system.
    - **Bank Administrator**: A user who manages the online banking system.
2. **Use Cases for Customer:**
    - **Login**: The customer logs into the online banking system.
    - **View Account Balance**: The customer views their account balance.
    - **Transfer Funds**: The customer transfers funds to another account.
    - **Pay Bills**: The customer pays bills online.
    - **Logout**: The customer logs out of the online banking system.
3. **Use Cases for Bank Administrator:**
    - **Manage Customer Accounts**: The bank administrator manages customer accounts (e.g., create, update, delete accounts).
    - **Generate Reports**: The bank administrator generates various financial reports.

Your use case diagram should include:

- The actors `Customer` and `Bank Administrator`.
- The use cases listed above for each actor.
- The associations between actors and use cases to show which actor performs which use case.

The use case diagram should be simple and clear enough to illustrate the interactions between the actors and the online banking system, focusing on the primary functionalities.

Exercise Question: Sequence Diagram for User Login Process

Draw a sequence diagram to model the user login process in a web application. The sequence diagram should capture the interactions between the user, the web browser, and the authentication server.

Scenario:

1. The user opens the login page on the web browser.
2. The user enters their username and password and clicks the “Login” button.
3. The web browser sends the login credentials to the authentication server.
4. The authentication server verifies the credentials.
5. The authentication server sends a response back to the web browser indicating whether the login is successful or failed.
6. The web browser displays a welcome message if the login is successful, or an error message if the login failed.

Your sequence diagram should include:

- The interactions between the user, web browser, and authentication server.
- The order of messages exchanged during the login process.
- The return messages indicating the result of the login attempt.

The sequence diagram should be simple and clear enough to illustrate the basic interactions and message flow between the actors involved in the user login process.

Exercise Question: Sequence Diagram for Online Shopping Checkout Process

Draw a sequence diagram to model the checkout process in an online shopping system. The sequence diagram should capture the interactions between the customer, the online store's web application, the payment gateway, and the inventory system.

Scenario:

1. The customer initiates the checkout process by clicking the "Checkout" button on the web application.
2. The web application displays the order summary and prompts the customer to enter shipping details.
3. The customer enters the shipping details and submits them.
4. The web application sends the order details to the payment gateway to process the payment.
5. The payment gateway processes the payment and sends a confirmation back to the web application.
6. Upon successful payment, the web application updates the inventory system to reduce the stock of the purchased items.
7. The inventory system confirms the stock update.
8. The web application sends an order confirmation to the customer and displays a confirmation page.

Your sequence diagram should include:

- The interactions between the customer, web application, payment gateway, and inventory system.
- The order of messages exchanged during the checkout process.
- The return messages confirming actions such as payment confirmation and stock update.

The sequence diagram should be detailed and clear enough to illustrate the interactions and message flow between the actors involved in the online shopping checkout process.

Exercise Question: Activity Diagram for Making a Cup of Coffee

Draw an activity diagram to model the process of making a cup of coffee. The activity diagram should capture the steps involved in preparing the coffee from start to finish.

Scenario:

1. Start the process.
2. Fill the kettle with water.
3. Boil the water in the kettle.
4. While the water is boiling, get a cup.
5. Put a coffee filter in the coffee maker.
6. Add coffee grounds to the filter.
7. Once the water has boiled, pour the hot water into the coffee maker.
8. Wait for the coffee to brew.
9. Pour the brewed coffee into the cup.
10. Add sugar and milk if desired.
11. Stir the coffee.
12. End the process by enjoying the cup of coffee.

Your activity diagram should include:

- The sequence of actions from start to finish.
- Decision points, if any (e.g., whether to add sugar and milk).
- Parallel activities that can happen simultaneously (e.g., getting a cup while the water is boiling).
- The start and end points of the process.

The activity diagram should be simple and clear enough to illustrate the steps and flow of activities involved in making a cup of coffee.

Exercise Question: Activity Diagram for Online Shopping Cart Checkout Process

Draw an activity diagram to model the online shopping cart checkout process. The activity diagram should capture the key steps involved, including decision-making and looping through items in the cart.

Scenario:

1. Start the process.
2. User logs into the online shopping platform.
3. User reviews items in the shopping cart.
4. For each item in the cart:
   - Check if the item is in stock.
   - If the item is not in stock, remove it from the cart and notify the user.
   - If the item is in stock, proceed to the next item.
5. After all items are checked, the user decides whether to proceed to checkout.
   - If the user decides not to proceed, they can continue shopping or log out.
   - If the user decides to proceed, they move to the payment step.
6. User enters payment details.
7. Process the payment.
8. Check if the payment is successful.
   - If the payment fails, notify the user and prompt them to re-enter payment details.
   - If the payment is successful, confirm the order.
9. End the process.

Your activity diagram should include:

- The sequence of actions from start to finish.
- Decision points (e.g., whether items are in stock, whether the user decides to proceed to checkout, whether the payment is successful).
- A loop for checking each item in the cart.
- The start and end points of the process.

The activity diagram should be simple and clear enough to illustrate the steps, decision points, and looping involved in the online shopping cart checkout process.

Exercise Question: Class Diagram for a Library Management System

Draw a class diagram to model a basic library management system. The class diagram should capture the key classes and their relationships involved in managing books, members, and borrowing transactions.

Scenario:

1. **Book**: Represents a book in the library.
   - Attributes: `title`, `author`, `ISBN`, `publicationYear`, `status` (available, borrowed)
   - Methods: `borrow()`, `return()`
2. **Member**: Represents a library member.
   - Attributes: `memberID`, `name`, `address`, `phoneNumber`
   - Methods: `register()`, `updateDetails()`
3. **BorrowTransaction**: Represents a borrowing transaction.
   - Attributes: `transactionID`, `borrowDate`, `returnDate`
   - Methods: `initiateTransaction()`, `closeTransaction()`
4. Relationships:
   - A `Member` can borrow multiple `Books`.
   - A `Book` can be borrowed by multiple `Members` over time, but only by one member at a time.
   - A `BorrowTransaction` links a `Member` and a `Book`.

Your class diagram should include:

- The classes `Book`, `Member`, and `BorrowTransaction`.
- The attributes and methods for each class.
- The relationships between the classes, such as associations and multiplicities.

The class diagram should be simple and clear enough to illustrate the key classes, their attributes, methods, and relationships involved in the library management system.

Exercise Question: State Machine Diagram for a Washing Machine

Draw a state machine diagram to model the behavior of a washing machine. The state machine diagram should capture the various states the washing machine goes through during a washing cycle.

Scenario:

1. **States:**
    - **Idle**: The washing machine is powered on but not doing anything.
    - **Filling Water**: The washing machine is filling with water.
    - **Washing**: The washing machine is washing clothes.
    - **Rinsing**: The washing machine is rinsing clothes.
    - **Spinning**: The washing machine is spinning to remove water from clothes.
    - **Completed**: The washing cycle is complete, and the machine is ready to be unloaded.
2. **Transitions:**
    - From **Idle** to **Filling Water** when the user starts the machine.
    - From **Filling Water** to **Washing** when the water level reaches the required amount.
    - From **Washing** to **Rinsing** when the washing cycle is complete.
    - From **Rinsing** to **Spinning** when the rinsing cycle is complete.
    - From **Spinning** to **Completed** when the spinning cycle is complete.
    - From **Completed** to **Idle** when the user unloads the machine and resets it.

Your state machine diagram should include:

- All the states listed above.
- Transitions between the states with appropriate labels indicating the events or conditions that trigger the transitions.
- The initial state (Idle) and the final state (Completed).

The state machine diagram should be simple and clear enough to illustrate the states and transitions involved in the washing machine's operation during a washing cycle.