SENG 438- Lab report

**Exploratory Test Plan**

**Objective**

The goal of this exploratory test is to identify defects in the ATM simulation system by simulating real-world user interactions. The test will focus on core functionalities such as authentication, transactions, and system behavior in both normal and edge-case scenarios.

**Functions Being Targeted**

We will test a broad range of functions to ensure coverage across multiple aspects of the ATM system. The primary focus areas include:

1. **Authentication & Session Management**
   * Card insertion and PIN validation
   * Handling of incorrect PIN attempts (lockout mechanism)
   * Session start and termination
2. **Transaction Types**
   * Cash withdrawal (valid and invalid cases)
   * Deposits and envelope insertion
   * Fund transfers between accounts
   * Balance inquiries
3. **System Controls**
   * ATM startup and shutdown functionality
   * Response to unexpected system inputs (e.g., canceling transactions at different stages)
4. **Error Handling & User Feedback**
   * System response to invalid inputs (e.g., unsupported transactions, invalid account selections)
   * Handling of insufficient funds or ATM cash shortages
   * User feedback messages (clarity and correctness)

**Approach**

To ensure an efficient and thorough test, we will adopt the following approach:

1. **Broad Coverage with Focus on Key Transactions**
   * Instead of testing all functions equally, we will prioritize functions that users interact with the most (withdrawals, deposits, balance inquiries).
   * We will also test rare but critical scenarios, such as incorrect PIN handling and insufficient funds, to verify the robustness of the system.
2. **Balanced Testing Strategy**
   * We will perform both **shallow** (testing a broad range of features quickly) and **deep** (stress-testing critical functionalities) testing.
   * For each function, we will check:
     + **Happy path:** Expected user interactions that should work smoothly.
     + **Edge cases:** Unusual but possible interactions (e.g., withdrawing more money than available, inserting an unreadable card).
3. **Test Case Development**
   * **Common Scenarios:** Standard ATM interactions such as deposits, withdrawals, and balance inquiries.
   * **Exceptional Scenarios:** Incorrect PINs, ATM cash depletion, session timeouts, invalid transactions.
   * **Negative Testing:** Attempting invalid actions to verify the system’s handling of errors and security measures.
4. **Test Execution Plan**
   * First, familiarize ourselves with the ATM system’s user interface and basic operations.
   * Perform a structured test of each transaction type, documenting all observed behaviors.
   * Attempt transactions under varying conditions (e.g., low ATM cash levels, incorrect inputs).
   * Record defects as they are found, ensuring sufficient detail for reproduction and debugging.

**Key Details to Record**

For each test, we will document:

* **Test scenario**
* **Initial system state**
* **Steps performed**
* **Expected outcome**
* **Actual outcome**
* **Severity of the issue (if a defect is found)**

**Justification**

This plan ensures efficient and thorough coverage by balancing functional, edge-case, and negative testing. It prioritizes commonly used functions while also checking for system robustness and error handling. By combining structured testing with exploratory techniques, we maximize the chances of uncovering defects before the regression phase.

**Selected Exploratory Tests**

1. **System Startup**  
   *Focus:* Verify that the ATM starts correctly.  
   *Test:* Turn the system “on” to initiate startup.  
   *Why:* Ensures that the system transitions from an off state to requesting the initial cash amount.
2. **Card Insertion & Valid PIN Entry (Session Start)**  
   *Focus:* Test the basic login process.  
   *Test:* Insert a valid (readable) card and then enter the correct PIN.  
   *Why:* Confirms that the ATM accepts a valid card and PIN combination and presents the transaction menu.
3. **Invalid PIN Handling**  
   *Focus:* Test error handling for authentication.  
   *Test:* Insert a valid card but then enter an incorrect PIN.  
   *Why:* Checks whether the system correctly identifies and handles an invalid PIN, prompting for a re-entry.
4. **Legitimate Withdrawal Transaction**  
   *Focus:* Verify a standard cash withdrawal.  
   *Test:* Select a withdrawal transaction with an amount that is within both the account balance and the available ATM cash.  
   *Why:* Confirms that cash is dispensed correctly, a proper receipt is printed, and the transaction is logged.
5. **Withdrawal with Insufficient ATM Cash**  
   *Focus:* Test handling of a cash-out request when the machine’s cash is insufficient.  
   *Test:* Attempt to withdraw an amount greater than the current cash available in the ATM (even if the account balance is sufficient).  
   *Why:* Ensures that the system checks the ATM’s cash reserve and alerts the user appropriately.
6. **Withdrawal with Insufficient Account Balance**  
   *Focus:* Test account balance verification.  
   *Test:* Attempt to withdraw an amount that exceeds the account’s available balance.  
   *Why:* Verifies that the system prevents overdrafts and informs the user about insufficient funds.
7. **Legitimate Deposit Transaction**  
   *Focus:* Confirm proper deposit processing.  
   *Test:* Choose a deposit transaction, enter a valid deposit amount, and simulate envelope insertion.  
   *Why:* Checks that the system accepts the deposit, prints the correct receipt, and updates the account balance.
8. **Legitimate Transfer Transaction**  
   *Focus:* Test money transfer between accounts.  
   *Test:* Select a transfer transaction, choose valid source and target accounts, and enter an acceptable transfer amount.  
   *Why:* Validates that the transfer occurs correctly with updated balances and that the receipt and log are accurate.
9. **Legitimate Balance Inquiry Transaction**  
   *Focus:* Verify account balance display.  
   *Test:* Initiate a balance inquiry for an account (e.g., checking).  
   *Why:* Confirms that the correct balance is displayed and that a receipt is printed.
10. **Transaction Cancellation**  
    *Focus:* Test the ability to cancel an in-progress transaction.  
    *Test:* Start a transaction (for example, during the withdrawal process) and press the “Cancel” key.  
    *Why:* Ensures that the system immediately stops the transaction and displays an appropriate cancellation message.

**Exploratory (Manual Non-scripted) Testing – 1st pair**

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| --- | --- | --- | --- | --- | --- | --- |
| **Test Case #** | **Use Case** | **Function Being Tested** | **Initial System State** | **Input** | **Expected Output** | **The actual outcome** |
| 1 | System Startup | System is started when the switch is turned "on" | System is off | Activate the "on" switch | System requests the initial cash amount | System requested the initial cash amount |
| 2 | Session | System reads a customer's ATM card | System is on and idle | Insert a readable card | Card is accepted; system asks for entry of PIN | Card was accepted; system asked for entry of PIN |
| 3 | Session | System accepts customer's PIN | System prompts for PIN entry | Enter correct PIN (e.g., 42) | System displays a menu of transaction types | System displayed a menu of transaction types |
| 4 | Session | System handles an invalid PIN | System prompts for PIN entry | Enter an incorrect PIN | Error message is displayed; system prompts for re-entry of PIN | Error message was displayed; system prompts for re-entry of PIN |
| 5 | Withdrawal | System performs a legitimate withdrawal transaction properly | System displays withdrawal options | Select a withdrawal amount within account balance and ATM cash | Cash is dispensed; receipt printed with correct amount and updated balance; transaction logged | Wrong amount of cash is dispensed than what is selected; receipt printed with incorrect amount requested but correct correlating updated balance; transaction logged with incorrect amount |
| 6 | Withdrawal | System verifies sufficient ATM cash for withdrawal | ATM is started with limited cash relative to request | Select a withdrawal amount greater than available ATM cash | System displays a message indicating insufficient ATM cash; prompts user to choose a different amount | System displays a incorrect message indicating insufficient ATM cash when there is sufficient cash; prompts user to choose a different amount |
| 7 | Withdrawal | System verifies sufficient account balance for withdrawal | System prompts for withdrawal amount | Select a withdrawal amount exceeding account balance | System displays a message indicating insufficient funds; offers the option to perform another transaction | System displays a incorrect message indicating insufficient funds; offers the option to perform another transaction |
| 8 | Deposit | System performs a legitimate deposit transaction properly | System prompts for deposit amount and envelope insertion | Enter a valid deposit amount; simulate envelope insertion | Envelope accepted; receipt printed showing deposit amount and updated balance; transaction logged | Envelope accepted; receipt printed shows correct deposit amount but updated wrong balance amount and wrong amount available; transaction logged correctly |
| 9 | Transfer | System performs a legitimate transfer transaction properly | System prompts for transfer details (source, destination, amount) | Select valid source and destination accounts; enter a valid transfer amount | Transfer completed; receipt printed with correct details and updated balances; transaction logged | Transfer completed; receipt printed with wrong details and wrong updated balances; transaction logged incorrectly |
| 10 | Inquiry | System performs a legitimate balance inquiry transaction | System displays the transaction menu | Choose balance inquiry; select an account (e.g., Checking) | Receipt printed showing correct account balance; transaction logged | Receipt printed showing correct account balance; transaction logged |
| 11 | Transaction Cancellation | Customer cancels a transaction before completion | System is in the middle of a transaction (e.g., during withdrawal) | Press the "Cancel" key | System displays a cancellation message; transaction aborted; returns to the transaction menu or ejects card | System does not display a cancellation message; transaction aborted; ejects card |

**Exploratory (Manual Non-scripted) Testing – 2nd pair**

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| **Test Case** | **Use Case** | **Function Being Tested** | **Initial System State** | **Input** | **Expected Output** | **The actual outcome** |
| 1 | System Startup and Cash Initialization | ATM startup and cash initialization | ATM is off | Press the power “on” button and enter $20 bills | ATM powers on and indicating the next step | ATM powers on and asks for inserting card |
| 2 | Valid Card Insertion | Card recognition and acceptance | ATM is on and idle | Insert a valid card (card number “1”) | Card is accepted; system prompts for PIN entry | Same as expected |
| 3 | Unreadable/Invalid Card Insertion | Handling of an invalid or unreadable card | ATM is on and idle | Insert an unreadable or invalid card | Card is ejected | Asking for PIN |
| 4 | Correct PIN Entry | PIN validation | After valid card insertion, PIN prompt is displayed | Enter correct PIN “42” | PIN is validated; transaction menu is displayed | Same as expected |
| 5 | Incorrect PIN Entry and Re-Entry | Handling of incorrect PIN and re-entry process | After valid card insertion; PIN prompt is displayed | Enter an incorrect PIN then re-enter the correct PIN “42” | First attempt rejected with an error; on correct re-entry, the transaction menu is displayed | Same as expected |
| 6 | Withdrawal - Valid | Processing a withdrawal transaction | Transaction menu is displayed; account and ATM have sufficient funds | Select withdrawal; enter a valid amount within account balance and ATM cash limits | Correct amount of cash is dispensed | cash dispensed is the amount entered + $20, which is correct |
| 7 | Withdrawal – Insufficient Account Funds | Withdrawal processing when account funds are low | Transaction menu is displayed; account balance is lower than the requested amount | Select withdrawal; enter an amount exceeding the account balance | Error message “Insufficient funds” is displayed; no cash is dispensed | No error message is displayed, charged $20 |
| 8 | Withdrawal – Cancellation | Ability to cancel a withdrawal transaction | Withdrawal process initiated | Begin a withdrawal and press “Cancel” at the account or amount selection stage | no cash is dispensed | Withdrawal still went through |
| 9 | Deposit - Valid | Processing a deposit transaction | Transaction menu is displayed; deposit option is available | Select deposit; choose an account; enter a valid deposit amount; simulate envelope insertion | Correct Amount is deposited into respective account, ATM adds deposited number to the overall balance. | Incorrect Value is displayed, every deposit subtracts $10 from balance |
| 10 | Deposit - Cancellation | Cancelling a deposit transaction | Deposit process initiated | Press “Cancel” during the deposit process | The deposit process is cancelled; prompts user on another transaction | Same as expected, however the only defect is the incorrect spelling of “would”. |
| 11 | Balance Inquiry | Displaying the account balance | Transaction menu is displayed; account is available | Select balance inquiry; choose the account | Shows account balance of the respective account; Shows an accurate number | Outcome as expected. |
| 12 | Transfer - Valid | Transferring funds between accounts | Transaction menu is displayed; both source and destination accounts are active | Select transfer; choose source and destination accounts; enter a valid transfer amount | Transfers correct amount from bank A to bank B, maintaining correct values. | Incorrect amount transferred. Deducts $0.50 from input transfer amount. |
| 13 | Transfer Insufficient Account Funds | Handling invalid input during transfer | Transfer process initiated | Enter an invalid (e.g., negative) amount | If invalid amount is inputted, notifies user and directs user for next step | **ATM Freezes with blank screen** |
| 14 | Transfer – Cancellation | Handling cancellation  during transfer | Transfer process initiated | Start a transfer then press “Cancel” | Transferring of balance is cancelled leaving both accounts unaffected | Cancel button does not work, transfer goes through regardless. |
| 15 | Multiple Transactions | Managing multiple transactions in one session | Transaction menu is displayed after successful authentication | Execute a series of transactions sequentially (e.g., deposit, then withdrawal, then balance inquiry) | Consistent balance account throughout the process | Multiple transactions break logic, will show insufficient funds when withdrawing even if there is |

**Manual Scripted Testing**

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| **Test Case #** | **Use Case** | **Function Being Tested** | **Initial System State** | **Input** | **Expected Output** | **The actual outcome** |
| 2 | System Startup | System accepts initial cash amount | System is requesting cash amount | Enter a legitimate amount | System is on | System is on |
| 3 | System Startup | Connection to the bank is established | System has just been turned on | Perform a legitimate inquiry transaction | System output should demonstrate that a connection has been established to the Bank | System output demonstrates that a connection has been established to the Bank |
| 4 | System Shutdown | System is shut down when the switch is turned “off” | System is on and not servicing a customer | Activate the "off" switch | System is off | System is off |
| 6 | Session | System rejects an unreadable card | System is on and not servicing a customer | Insert an unreadable card | Card is ejected; System displays an error screen; System is ready to start a new session | Card is ejected; System displays an error screen; System is ready to start a new session |
| 8 | Session | System allows customer to perform a transaction | System is displaying menu of transaction types | Perform a transaction | System asks whether customer wants another transaction | System asks whether customer wants another transaction |
| 9 | Session | System allows multiple transactions in one session | System is asking whether customer wants another transaction | Answer yes | System displays a menu of transaction types | System displays a menu of transaction types |
| 10 | Session | Session ends when customer chooses not to do another transaction | System is asking whether customer wants another transaction | Answer no | System ejects card and is ready to start a new session | System ejects card and is ready to start a new session |
| 12 | Withdrawal | System asks customer to choose an account to withdraw from | Menu of transaction types is being displayed | Choose Withdrawal transaction | System displays a menu of account types | System displays a menu of account types |
| 13 | Withdrawal | System asks customer to choose a dollar amount to withdraw | Menu of account types is being displayed | Choose checking account | System displays a menu of possible withdrawal amounts | System displays a menu of possible withdrawal amounts |
| 17 | Withdrawal | Withdrawal transaction can be cancelled by the customer prior to choosing amount | System is displaying menu of account types | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 18 | Withdrawal | Withdrawal transaction can be cancelled by the customer prior to choosing amount | System is displaying menu of dollar amounts | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 19 | Deposit | System asks customer to choose an account to deposit to | Menu of transaction types is being displayed | Choose Deposit transaction | System displays a menu of account types | System displays a menu of account types |
| 20 | Deposit | System asks customer to enter a dollar amount to deposit | Menu of transaction types is being displayed | Choose checking account | *System displays a request for the customer to type a dollar amount* | System displays a request for the customer to type a dollar amount |
| 21 | Deposit | System asks customer to insert an envelope | System is displaying a request for the customer to type a dollar amount | Enter a legitimate dollar amount | System requests that the customer insert an envelope | System requests that the customer insert an envelope |
| 23 | Deposit | Deposit transaction can be cancelled by the customer prior to inserting an envelope | System is displaying menu of account types | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 24 | Deposit | Deposit transaction can be cancelled by the customer prior to inserting an envelope | System is requesting customer to enter a dollar amount | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 25 | Deposit | Deposit transaction can be cancelled by the customer prior to inserting an envelope | System is requesting customer to insert an envelope | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 26 | Transfer | System asks customer to choose an account to transfer from | Menu of transaction types is being displayed | Choose Transfer transaction | System displays a menu of account types specifying transfer from | System displays a menu of account types specifying transfer from |
| 27 | Transfer | System asks customer to choose an account to transfer to | Menu of account types to transfer from is being displayed | Choose checking account | System displays a menu of account types specifying transfer to | System displays a menu of account types specifying transfer to |
| 28 | Transfer | System asks customer to enter a dollar amount to transfer | Menu of account types to transfer to is being displayed | Choose savings account | System displays a request for the customer to type a dollar amount | System displays a request for the customer to type a dollar amount |
| 30 | Transfer | Transfer transaction can be cancelled by the customer prior to entering amount | System is displaying menu of account types specifying transfer from | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 31 | Transfer | Transfer transaction can be cancelled by the customer prior to entering amount | System is displaying menu of account types specifying transfer to | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 32 | Transfer | Transfer transaction can be cancelled by the customer prior to entering amount | System is requesting customer to enter a dollar amount | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 33 | Inquiry | System asks customer to choose an account to inquire about | Menu of transaction types is being displayed | Choose Inquiry transaction | System displays a menu of account types | System displays a menu of account types |
| 35 | Inquiry | Inquiry transaction can be cancelled by the customer prior to choosing an account | System is displaying menu of account types | Press "Cancel" key | System displays an appropriate message and offers the option to do another transaction | System displays an appropriate message and offers the option to do another transaction |
| 36 | Invalid PIN Extension | Customer is asked to reenter PIN | System is asking for entry of PIN | Enter an incorrect PIN; attempt an inquiry transaction | Customer is asked to re-enter PIN | Customer is asked to re-enter PIN |
| 37 | Invalid PIN Extension | Correct re-entry of PIN is accepted | Request to re-enter PIN is being displayed | Enter correct PIN | Original transaction completes successfully | Original transaction completes successfully |
| 38 | Invalid PIN Extension | Incorrect re-entry of PIN is not accepted | Request to re-enter PIN is being displayed | Enter incorrect PIN | Appropriate message is displayed and re-entry of PIN is requested | Appropriate message is displayed and outputted “Your card has been retained, please contact your bank.” |
| 39 | Invalid PIN Extension | Correct re-entry of PIN on the second try is accepted | Request to re-enter PIN is being displayed | Enter incorrect PIN first, then correct PIN | Original transaction completes successfully | Original transaction completes successfully |
| 40 | Invalid PIN Extension | Correct re-entry of PIN on the third try is accepted | Request to re-enter PIN is being displayed | Enter incorrect PIN twice, then correct PIN | Original transaction completes successfully | Original transaction completes successfully |

**Regression Testing (Version 1.1)**

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| **Test Case #** | **Use Case** | **Function Being Tested** | **Initial System State** | **Input** | **Expected Output** | **The actual outcome** | **Status** |
| 5 | Withdrawal | System performs a legitimate withdrawal transaction properly | System displays withdrawal options | Select a withdrawal amount within account balance and ATM cash | Cash is dispensed; receipt printed with correct amount and updated balance; transaction logged | Cash is dispensed; a receipt is printed showing the correct amount and updated balance; the transaction is logged. | RESOLVED |
| 6 | Withdrawal | System verifies sufficient ATM cash for withdrawal | ATM is started with limited cash relative to request | Select a withdrawal amount greater than available ATM cash | System displays a message indicating insufficient ATM cash; prompts user to choose a different amount | The system displays a message indicating insufficient cash in the ATM and prompts the user to select a different amount. | RESOLVED |
| 7 | Withdrawal | System verifies sufficient account balance for withdrawal | System prompts for withdrawal amount | Select a withdrawal amount exceeding account balance | System displays a message indicating insufficient funds; offers the option to perform another transaction | The system displays a message indicating insufficient funds and provides the option to proceed with another transaction. | RESOLVED |
| 8 | Deposit | System performs a legitimate deposit transaction properly | System prompts for deposit amount and envelope insertion | Enter a valid deposit amount; simulate envelope insertion | Envelope accepted; receipt printed showing deposit amount and updated balance; transaction logged | The envelope is accepted; a receipt is printed displaying the correct deposit amount but an incorrect updated balance, which is one less than the actual amount, and the wrong available balance is shown; however, the transaction is logged correctly. | IN-PROGRESS |
| 9 | Transfer | System performs a legitimate transfer transaction properly | System prompts for transfer details (source, destination, amount) | Select valid source and destination accounts; enter a valid transfer amount | Transfer completed; receipt printed with correct details and updated balances; transaction logged | The transfer is completed; a receipt is printed containing the correct details and updated balances; the transaction is logged. | RESOLVED |
| 11 | Transaction Cancellation | Customer cancels a transaction before completion | System is in the middle of a transaction (e.g., during withdrawal) | Press the "Cancel" key | System displays a cancellation message; transaction aborted; returns to the transaction menu or ejects card | The system displays a cancellation message, aborts the transaction, and either returns to the transaction menu or ejects the card. | RESOLVED |