

CSI 518 Software Engineering, Spring 2002
Midterm Examination
11:15 – 12:35 March 26, 2002

An automated teller machine (ATM) is a machine through which bank customers can perform a number of the most common financial transactions. The machine consists of a display screen, a bank card reader, numeric and special input keys, a money dispenser slot, a deposit slot and a receipt printer. When the machine is idle, a greeting message is displayed. The keys and deposit slot will remain inactive until a bank card has been entered. When a bank card is inserted, the card reader attempts to read it. If the card cannot be read, the user is informed that the card is unreadable, and the card is ejected. If the card is readable, the user is asked to enter a personal identification number (PIN). The user is given feedback as to the number of digits entered at the numeric keypad, but not the specific digits entered. If the PIN is entered correctly, the user is shown the main menu. Otherwise, the user is given up to two additional chances to enter the PIN correctly. Failure to do so on the third try causes the machine to keep the bank card. The user can retrieve the card only by dealing directly with an authorized bank employee. The main menu contains a list of the transactions that can be performed. These transactions are:

- Deposit funds to an account,
- Withdraw funds from an account,
- Transfer funds from one account to another, and
- Query the balance of any account.

The user can select a transaction and specify all relevant information. When a transaction has been completed, the system returns to the main menu. At any time after reaching the main menu and before finishing a transaction the user may press the cancel key. The transaction being specified is canceled, the user's card is returned, the receipt of all transactions is printed, and the machine once again becomes idle.

- If a deposit transaction is selected, the user is asked to specify the account to which the funds are to be deposited and the amount of the deposit, and is asked to insert a deposit envelope.
- If a withdrawal transaction is selected, the user is asked to specify the account from which funds are to be withdrawn and the amount of the withdrawal. If the account contains sufficient funds, the funds are given to the user through the cash dispenser.
- If a transfer of funds is selected, the user is asked to specify the account from which the funds are to be withdrawn, the account to which the funds are to be deposited, and the amount of the transfer. If sufficient funds exist, the transfer is made.
- If a balance inquiry is selected, the user is asked to specify the account whose balance is requested. The balance is not displayed, but is printed on the receipt. The machine should be available and secure to users 24/7 and the maximum downtime should not exceed one hour per maintenance and the maximum maintenance activities should not exceed two per month.

1. Write a testable functional requirement and a testable nonfunctional requirement; explain why they are testable and how you would test them. (20 points)
2. In developing this system, what would be the top priority quality and how you would achieve this quality requirement? (10 points)
3. Give a high level design of the system using UML. Your design should include: A. a use case diagram, B. a sequence diagram for a use case, C. the class diagram of the system, D. a statechart diagram for an object, E. the activity diagram of the system. (50 points)
4. Describe how to compute CK metrics, given the UML specifications of the system. (20 points).

