I. ATM System
Consider an automated teller machine (ATM). The user puts a card into a slot and enters a four-digit personal identification number (PIN). If the PIN is incorrect, the card is ejected. Otherwise, the user may perform the following operations on up to four different bank accounts:

- Deposit any amount. When a deposit is made, the customer is asked to enter a specific dollar amount describing the deposit. The bank records the amount, but it is not directly added to the balance until the deposit has been checked and verified by the branch teller that opens the deposit envelopes. At any time, the customer can cancel the current transaction and then either start again from the first screen or exit altogether, retrieving their card. A receipt is printed showing the date, amount deposited, and account number.

- Withdraw money from their account. The amount of money that can be withdrawn is limited by the amount of money in the account and a maximum daily limit amount stored by the bank as part of the customer's bank records. When withdrawing money, customers are to be offered the choice of fast cash - $25, $50 and $100 amounts or the choice of entering a specific dollar amount. Only after the ATM has confirmed that it has successfully dispensed the cash, will the amount be deducted from the customer's balance. In addition to the money, the user is given a receipt showing the date, amount withdrawn, account number, and account balance after the withdrawal.

- Determine account balance. This is displayed on the screen.
- Transfer funds between two accounts. Again, the account from which the funds are transferred must not be overdrawn. The user is given a receipt showing the date, amount transferred, and the two account numbers.

There is no need to consider the details of the constituent hardware components such as the reader, printer, and cash dispenser. Instead, simply assume that when the ATM sends commands to those components, they are correctly executed.
Draw the following diagrams for the ATM system and explain them in detail.
Note that the description of the following diagrams is available in lecture note and online book.

1. Mind Map

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Card   Customer   Transaction   Authorization

Cash   Account

Pin    Receipt

```

2. System Context

```
AcceptCard
ReturnCard
GetPIN

VerifyPIN

ATM System

Balance
Deposit
Transfer
Withdraw

Authorization System

Banking System
```
3. Static type mode (attributes, association, static invariants)

Static Invariants:

**Card::pin-confirmed** (pin: integer) =
(pin.length = 4) &
(self.pin = pin)

**Account::withdraw-confirmed** (C1: Cash) =
(self.balance >= C1.amount) &
(C.unit = 1 25 || C1.unit = 50 || C1.unit = 100)

**Account::transfer-confirmed** (A1: Account, A2: Account, amount: float) =
Not (A1 = null) &
Not (A2 = null) &
A2.balance >= amount