Penn State University

IST 311-003

Spring 2020

Final Exam

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Q1	**/25**
Q2	**/25**
Q3	**/25**
Q4	**/25**
Total Grade:	**/100**

Question: 1

(a) (5 Pts.) Define the term "Waterfall Model".

One of the first standard approaches, it follows a rigid structure of planning, analysis, design, coding and testing. It is not flexible to changes.

(b) (5 Pts.) Why is the Iterative Model considered to be much more preferable than the Waterfall Model when it comes to the software development process?

The iterative model is much more flexible. Features are added with each iteration anyway.

(c) (5 Pts.) Name the 4 main phases of the Unified Process.

1. Inception - early planning
2. Elaboration - In-depth planning
3. Construction - development/testing
4. Transition - Deployment/migration

(d) (5 Pts.) What is a usage case used for and what are its basic components?

To provide a high level overview of how actors will interact with a system. Actors and scenarios make up a use case.

(e) (5 Pts.) What are the 3 usage-case formats?

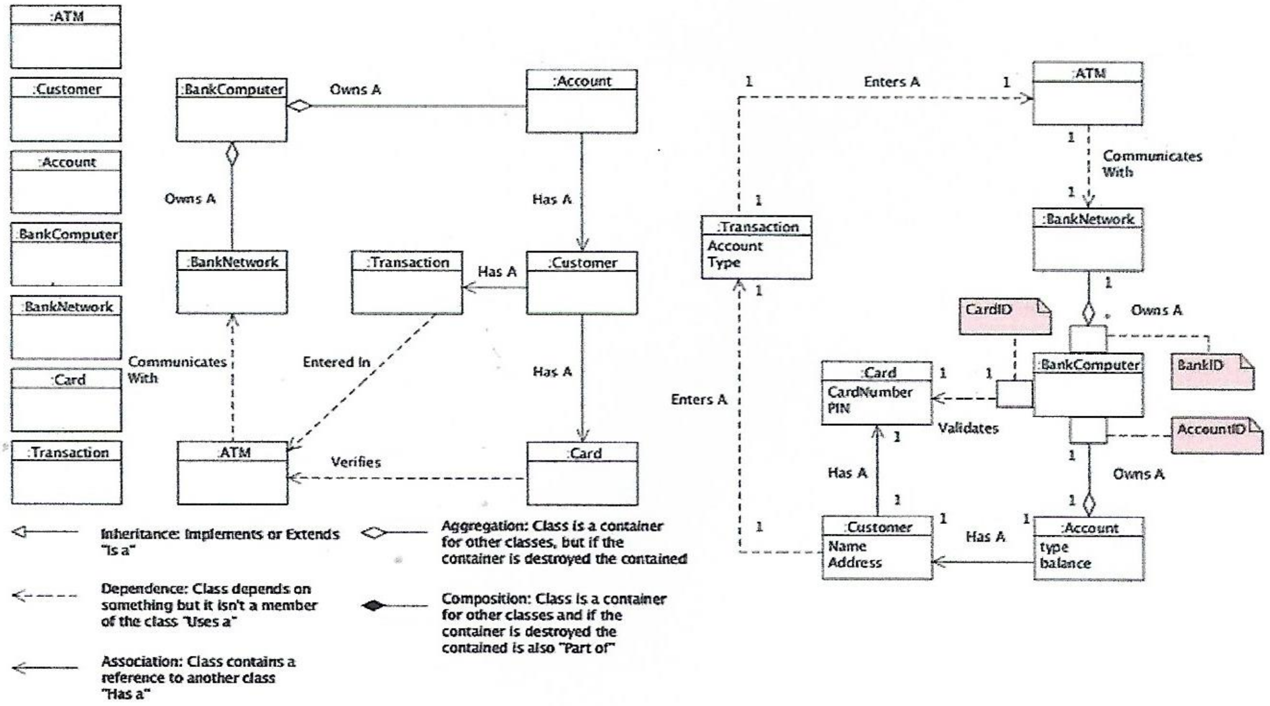
Brief - very short, complete

Casual - Many scenarios, bigger

Full dress - Every possible variation.

Question: 2

Consider the following domain model:



:ATM
:Customer
:Account
:BankComputer
:BankNetwork
:Card
:Transaction
:BankComputer
Owns A
:Account
Owns A
Has A
:BankNetwork
:Transaction
Has A
:Customer
Communicates With
Entered In
Has A
:ATM
Verifies
:Card
1
Enters A
1
:ATM
1
Communicates With
1
1
:Transaction
Account
Type
1
:BankNetwork
1
CardID
Owns A
:Card
CardNumber
PIN
1
1
:BankComputer
BankID
Enters A
Validates
AccountID
1
1
Has A
Owns A
1
1
1
:Customer
Name
Address
1
Has A
1
:Account
type
balance
Inheritance: Implements or Extends "Is a"
Aggregation: Class is a container for other classes, but if the container is destroyed the contained
Dependence: Class depends on something but it isn't a member of the class "Uses a"
Composition: Class is a container for other classes and if the container is destroyed the contained is also "Part of"
Association: Class contains a reference to another class "Has a"

(a) (10 Pts.) Why is a domain model considered to be more comprehensive than a class diagram? It reveals a lot more about how info flows and is related.

(b) (5 Pts.) How many objects/classes are in the domain model above?

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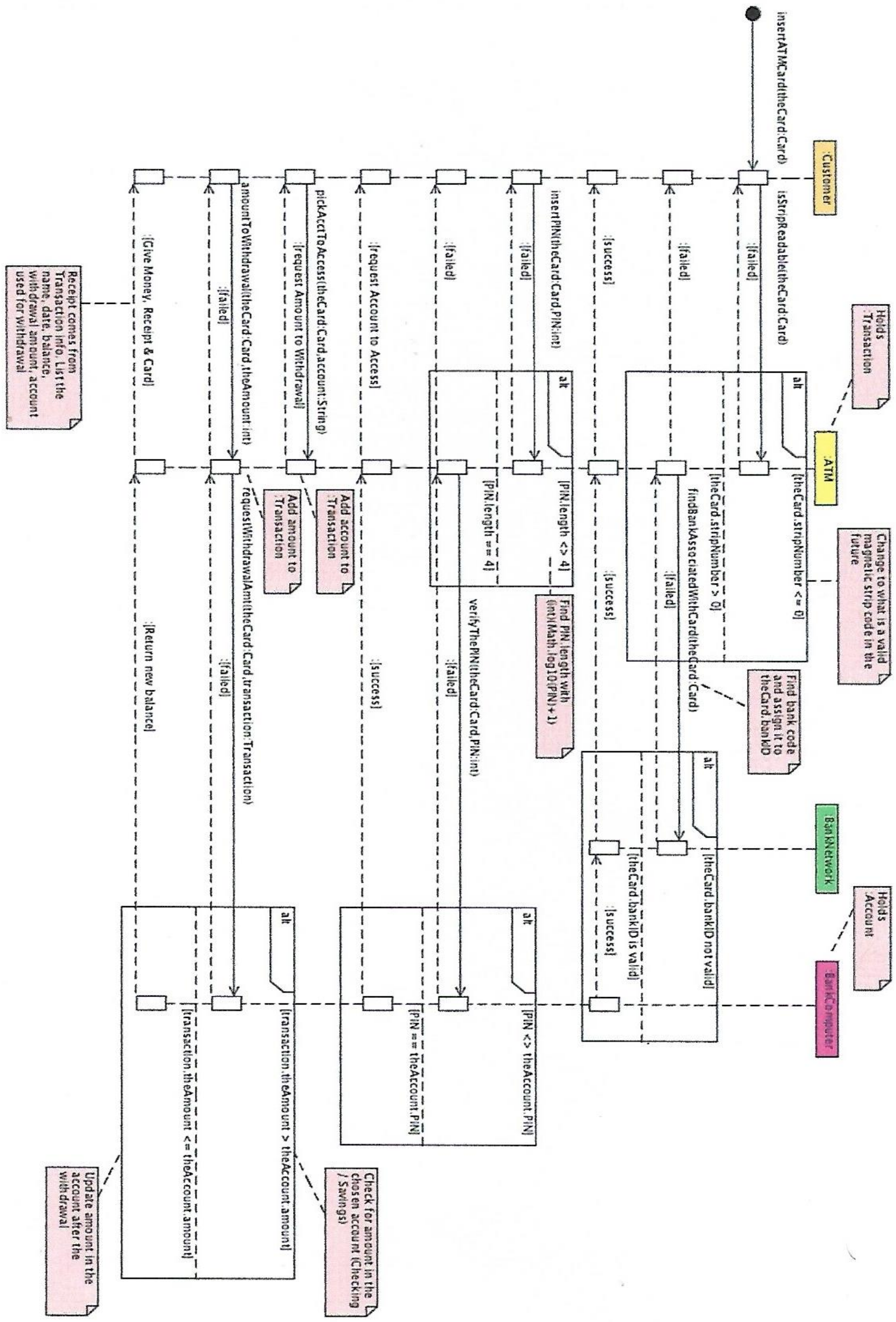
(c) (5 Pts.) According to the domain model above, what is the relationship between the customer and account classes? (Inheritance, Dependence, [✓ Association], Aggregation, or Composition). Circle one of the answers between parentheses.

(d) (5 Pts.) What do the numbers on the two sides of each arrow in a domain model indicate?

Cardinality : 1 to 1 or many to 1 relationships etc.

Question: 3

Consider the following sequence diagram:


:Customer
:ATM
:BankNetwork
:BankComputer
Holds :Transaction
Holds :Account
Change to what is a valid magnetic strip code in the future
insertATMCard(theCard:Card)
isStripReadable(theCard:Card)
alt
[theCard.stripNumber <= 0]
:[failed]
[theCard.stripNumber > 0]
findBankAssociatedWithCard(theCard:Card)
Find bank code and assign it to theCard.bankID
alt
[theCard.bankID not valid]
:[failed]
[theCard.bankID is valid]
:[success]
:[success]
insertPIN(theCard:Card,PIN:int)
alt
[PIN.length <> 4]
:[failed]
[PIN.length == 4]
Find PIN.length with (int)(Math.log10(PIN)+1)
verifyThePIN(theCard:Card,PIN:int)
alt
[PIN <> theAccount.PIN]
:[failed]
[PIN == theAccount.PIN]
:[success]
:[request Account to Access]
pickAcctToAccess(theCard:Card,account:String)
Add account to :Transaction
:[request Amount to Withdrawal]
amountToWithdrawal(theCard:Card,theAmount:int)
Add amount to :Transaction
requestWithdrawalAmt(theCard:Card,transaction:Transaction)
alt
[transaction.theAmount > theAccount.amount]
Check for amount in the chosen account (Checking / Savings)
:[failed]
:[failed]
[transaction.theAmount <= theAccount.amount]
:[Return new balance]
:[Give Money, Receipt & Card]
Update amount in the account after the withdrawal
Receipt comes from Transaction info. List the name, date, balance, withdrawal amount, account used for withdrawal

(a) (5 Pts.) What does the vertical axis on a sequence diagram indicate?

Time.

According to the sequence diagram above:

(b) (5 Pts.) What happens if a bank customer accessing an ATM machine inserts a PIN number with a number of digits not equal to 4?

It will fail back to insert PIN (the Card: card, PIN: int)

They will be asked again.

(c) (5 Pts.) If a bank customer accessing an ATM machine inserts a PIN number that has any 4 digits in it, what is the next step to be executed?

Verify The PIN (theCard: Card, PIN: int), verify theAccount.PIN== PIN

(d) (5 Pts.) Once a bank customer has successfully picked and accessed their account, what happens if they try to withdraw an amount greater than the available balance?

fail: They will be prompted again

(e) (5 Pts.) And if they try to withdraw an amount less than the available balance, what steps are executed next according to the sequence diagram?

Amount in the account is updated, new balance is returned and receipt is printed.

Question: 4

Consider the following Java code from our ATM-software project we discussed in class:

```
1 import java.util.Scanner;
2 public class ATM {
3       private Transaction theTransaction = null;
4       private BankNetwork networkOfBanksOnATM = null;
5       static Scanner userInput = new Scanner(System.in);
        ATM(BankNetwork networkOfBanksOnATM){
            this.networkOfBanksOnATM = networkOfBanksOnATM;
        }
        public boolean isStripReadable(Card theCard){
        int numberOfDigitsInStrip = (int) (Math.log10(theCard.getStripNumber())+1);
            theTransaction = new Transaction(theCard.getStripNumber());
            if(numberOfDigitsInStrip == 10){
                return true;
            } else {
                return false;
            }
        }
                                      .
                                      .
                                      .
                                      .
```

(a) (5 Pts.) When do you need to import the library file "java.util.Scanner" into your code?

I would do it at the top as it is so it has global scope, but any time before line 5 static Scanner userInput...

(b) (5 Pts.) Why is the class "ATM" declared as public and not private?

So isStripReadable can be used by other classes.

(c) (5 Pts.) Why is the function "isStripReadable" declared as Boolean?

It can only be readable or not. Those are the only options.

(d) (5 Pts.) Assume that the strip number of the card inserted into the ATM machine by the bank customer is 10000 (ten thousand), according to the code above, what value is stored in the integer variable "numberOfDigitsInStrip"?

$10000 \log_{10} = 4 + 1 = 5$

(e) (5 Pts.) Assume that the strip number of the card inserted into the ATM machine by the customer is 10000 (ten thousand), according to the code above, what value is returned by the function "isStripReadable"?

false