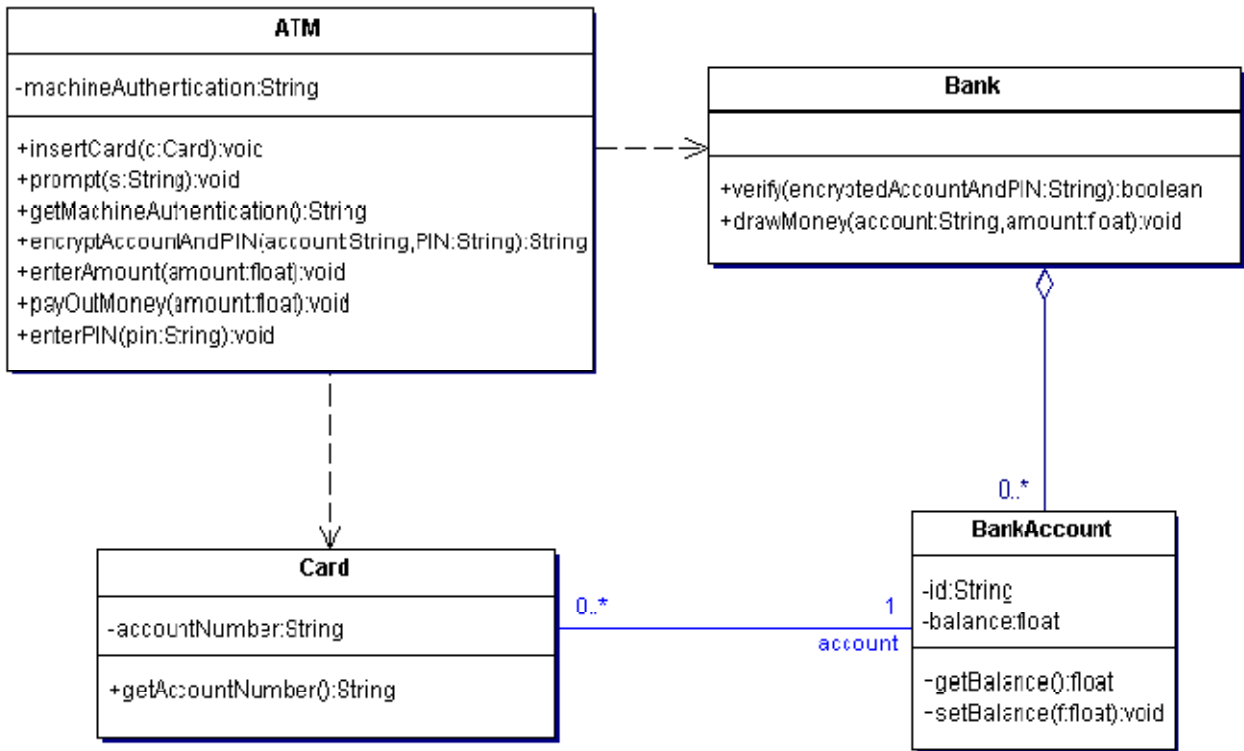# Assignment 1

1. Consider the case of customer withdrawing money from teller in a bank. Identify the actors and use cases details and also draw the use case diagram.

2. For the example in question no 1 , draw the Sequence diagram

3. Draw sequence diagram for making a hotel reservation (The Reservation window sends a makeReservation() message to a HotelChain. The HotelChain then sends a makeReservation() message to a Hotel. If the Hotel has available rooms, then it makes a Reservation and a Confirmation)

4. Consider the Railway Reservation System. There are a number of trains and each train stops in one or more stations. Each train has a predetermined number of seats available in each of classes (First class, First AC, Second AC, Third AC, Sleeper and so on) . The fare between two stations is determined by the class of travel and the distance. Passenger can enquire about the availability of seats between any two stations and for any class. The Railway Reservation System should be able to handle the queries and perform the necessary reservation/ cancellation operations. Draw a class diagram for the case study.

5. A Bachelor level student can take course at a university. Courses can be lectures or lab classes .Each Student must take at least one course .Each course is held by the research department .Each research Department has a at least one professor and 0 to 30 research assistant. Student, Professor and research assistants have a lot in common: They have name, a first name, date of birth, address, contact etc. Which diagram type can be used to describe this? Draw such a diagram for this.

6. Consider a simple telephone that is used to receive and make call phones calls . Identify the various states and draw a state transition diagram. Clearly state any assumptions you have make.

7. Draw activity diagram for Withdraw money from a bank account through an ATM. (The three involved classes (people, etc.) of the activity are **Customer, ATM, and Bank**.)

8. Draw the state transition diagram for , login verification part of an online banking system system of XYZ Company . Logging in consists of entering a valid social security number and personal id number, then submitting the information for validation.

   Logging in can be factored into four non-overlapping states: **Getting SSN**, **Getting PIN**, **Validating**, and **Rejecting**. From each state comes a complete set of **transitions** that determine the subsequent state.

9. Draw Class diagram for, customer order from a retail catalog. The central class is the **Order**. Associated with it are the **Customer** making the purchase and the **Payment**. A **Payment** is one of three kinds: **Cash**, **Check**, or **Credit**. The order contains **OrderDetails** (line items), each with its associated **Item**.

10. "A patient calls the clinic to make an appointment for a yearly checkup. The receptionist finds the nearest empty time slot in the appointment book and schedules the appointment for that time slot. " . Find all the use cases , actor and draw use case diagram for Taking Appointment in Dental Hospital.

11. **Draw Use case as well as class diagram for the following problem**

    A school of business operates international business in 10 location throughout the globe. The school has its first 9000 graduates in 1998. The school keeps track of each students name, country of birth, current address. In order to maintain strong ties to its alumni, the school holds various events around the world. Events have title, date, location and time. The school needs to keep track of which graduates have attended which events. For an attendance by a graduate at an event, a comment is recorded about information. School officials learns from that graduate at that events. As with the events, school records information learned from graduates. When an official knows that he or she will be meeting or talking to graduate, a report is produced showing the latest information about the graduate and the information learned during the past two years from that graduate from all contacts and events the graduate attended

12. Which four types of relationships are valid in Use case Diagram
    - a. Association
    - b. Generalization
    - c. Subtyping
    - d. Include
    - e. Merge
    - f. Extract
    - g. Refractor
    - h. Extends

13. What are the different types of relationship that can be established while constructing use case diagram? What is the conceptual difference between "include" and "extend" relationship in use case diagram? Explain.

14. Define Encapsulation. Explain how does Encapsulation and Abstraction concepts work together in object orientation?

15. True or false:
    a. An interface defines operation implementations.
    b. An aggregation implicitly defines a 1: n relationship.
    c. Navigability defines for implementation, which class keeps reference(s) to the other class.
    d. Composition means, that an object throws an exception when it is deleted.

16. Create a sequence diagram for the following collaboration. Use the classes and methods on the diagram.

    A customer wants to draw money from his bank account. He enters his card into an ATM (automated teller machine). The ATM machine prompts Enter PIN. The customer enters his PIN. The ATM (internally) retrieves the bank account number from the card. The ATM encrypts the PIN and the account number and sends it over to the bank. The bank verifies the encrypted Account and PIN number. If the PIN number is correct, the ATM displays „Enter amount", draws money from the bank account and pays out the amount.

ATM

-machineAuthertication:String

+insertCard(c:Card):voic
+prompt(s:String):void
+getMachineAuthentication():String
+encryptAccountAndPIN(account:String,PIN:String):String
+enterAmount(amount:float):void
+payOutMoney(amount:float):void
+enterPIN(pin:String):void

Bank

+verify(encryotedAccountAndPIN:String):boolean
+drawMoney(account:String,amount:float):void

Card

-accountNumber:String

+getAccountNumber():String

0..*   account   1

BankAccount

-id:String
-balance:float

-getBalance():float
-setBalance(f:float):void

0..*

17. The following Use Case diagram contains several use cases. Describe each dependency (not use case) between the use cases present in the diagram in one sentence each. Number the dependencies for this purpose. What is the conceptual difference between the "include" and the "extend" relationship?
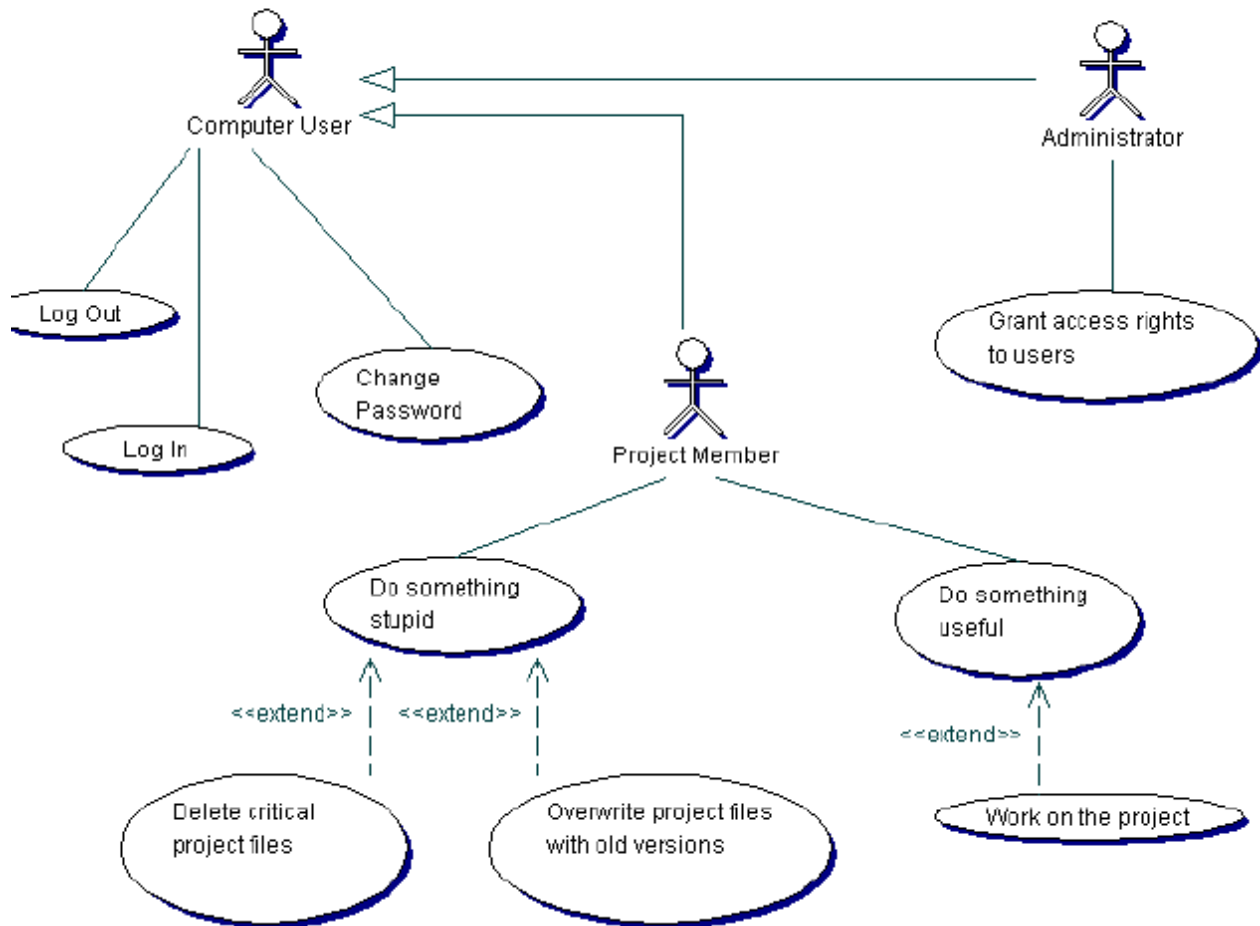
18. Have a look at the use case diagram of Q17 , Can a project member log in (following the use cases)? If yes, why; if no, why not? How many use cases are defined for an administrator?

19. Our problem domain is an **information system for a video rental store**. Simplifying assumptions and details:

- It is a stand-alone store, not part of a larger organization.
- Rents only videos, not computer games or other items.
- A "video" can be in any medium: tape, DVD, and so on.
- The rental charge may vary by medium. For example, DVD rentals are more expensive than tapes.
- The store does not sell anything. For example, there are no sales of videos or food.
- All transactions are rentals.
- The input medium by which membership and video rentals are captured is not important.
- Cash-only payments.
- On completion of a rental, the customer receives a transaction report with 'typical' information on—uses your judgment.
- Each renter has a separate membership.

a. Identify at least 4 primary use cases and related actors. Draw the results in a UML use case diagram.

b. Bounded by the provided *Rent Videos* use case, create a conceptual model and illustrate it in UML notation. Show concepts, associations, and attributes.

c. Bounded by the provided *Rent Videos* use case, create a system sequence diagram in the UML notation. Show actors and system events.

Self Practice Questions

2. Define Object Oriented Analysis and Object oriented Design. Differentiate between Object oriented Model and Structured Model of System Development.
3. Differentiate between Object oriented analysis and Object oriented design.
4. What do you mean by Object Model? Explain the Basic Principles of Object Orientation in details (Abstractions, Encapsulations, Inheritance and Polymorphism, modularity ….).
5. What do you mean by Encapsulation? Practically (in class level) how can you implement encapsulation?
6. Differentiate between Encapsulation and Abstractions.
7. Advantages of OO over Structured Methodology of System Development.
8. Explain the role of Abstraction and Modularity for managing the complexity that can arise during developments of Software products.
9. Define UP and RUP. Explain the basic phases of UP (Inception, Elaborations, Constructions and Transition) .
10. What are the key benefits of using UP as agile development Process? (Reason behind using UP)
11. Explain the Agile Principles.
12. Explain the different types of Requirements. What are the key difficulties that have to be faced during requirement gathering process?
13. Explain various steps for Object oriented analysis.
14. How to Create a Domain Model? Briefly describe the process/methods of creating domain model.
15. What do you mean by Use Case? Describe the Standard format for Use case Scenario Description
16. What is Use case diagram? Explain with Example.
17. Differentiate between Use case extends and use case includes relationships.

18. What is UML? UML is a Language for constructing, specifying, visualizing and documenting. Explain it with examples.
19. Explain the importance (**Reasons for modeling)** of building Models. Describe different types of models that we have to create for development of OO Software.
20. Explain origin of UML. What are the basic building blocks of UML? Explain them briefly.
21. What is Object? Is object and class are same thing? if not differentiate between them.
22. What are the essential things of Class diagram? Explain class diagram with suitable example.
23. Develop the class diagram for Hospital Management System. (Identify and list Various Objects and corresponding Classes, find attributes and operations, develop relationship between classes and refine the diagram)
24. Explain the process of converting Class diagram to object diagram with suitable examples.
25. Is Link and Associations are same things? If not differentiate them with suitable examples.
26. Differentiate between Aggregation and Composition with suitable diagrams. Is there any relationship between association and aggregation.
27. Explain different types of Relationships that have to be identified during designing a class diagrams.
28. Is Conceptual Class Diagram (Domain Class Diagram) and Design Class diagram is same thing? if not compare between them with suitable examples.
29. What do you mean by cardinality/ Multiplicity in class diagram?
30. What are the different types of Visibility that have to be determined during OOD? Explain them with suitable diagrams and examples.
31. What is the Role of Note Icon in UML?
32. Define UML. What is the basic building Block of UML? Describe different perspectives that can be model using UML?
33. What do you mean by interactions between Object? How Objects can communicate with each other(Inter Object Communication Process) – Hint – by message passing
34. Explain the role of Collaboration Diagrams with suitable examples.
35. What are the advantages of Sequence Diagram over Collaboration diagrams. Explain with examples.
36. Write down the importance of State transition diagram for modeling the requirement of OO Systems. Explain the steps to create state transition. Support your process with suitable diagrams.
37. Develop a State transition diagrams for washing of clothes in Automatic Washing Machine, Calling on Telephone System, Withdraw of Money from ATM, Baking of Cake in Micro-oven, University Registration Process, Ordering System.

38. What is the difference between State transition diagram and activity diagram? Explain the use of Merge and Fork, Branch, and Join node and Swim lanes in activity diagram.
39. What are the benefits of using iterative and incremental development process? Explain briefly.
40. What do you mean by object Patterns (Architectural and Design Patterns) ? Explain the various types of Patterns defined by GRASP.
41. Explain Briefly about MVC (Model View Controller) Framework pattern in Object Design.
42. How can you convert the design into Code? Explain them in details.
43. What do you mean by collection class? Explain with examples codes.
44. What is the importance of Exception handling? Explain different blocks of exception handling codes with suitable examples. Support you explanation with piece of Object oriented programming language codes.
45.
46. Define Use case. For the following Requirements :

    Identify Key actors, Key use cases and develop the use case scenarios and use case diagram

    Requirements Statement for Example ATM System

    The software to be designed will control a simulated automated teller machine (ATM) having a magnetic stripe reader for reading an ATM card, a customer console (keyboard and display) for interaction with the customer, a slot for depositing envelopes, a dispenser for cash (in multiples of Rs 500), a printer for printing customer receipts, and a key-operated switch to allow an operator to start or stop the machine. The ATM will communicate with the bank's computer over an appropriate communication link.

    The ATM will service one customer at a time. A customer will be required to insert an ATM card and enter a personal identification number (PIN) - both of which will be sent to the bank for validation as part of each transaction. The customer will then be able to perform one or more transactions. The card will be retained in the machine until the customer indicates that he/she desires no further transactions, at which point it will be returned - except as noted below.

    A customer must be able to make a cash withdrawal from any suitable account linked to the card. Approval must be obtained from the bank before cash is dispensed. A customer must be able to make a deposit to any account linked to the card, consisting of cash and/or checks in an envelope. The customer will enter the amount of the deposit into the ATM, subject to manual verification when the envelope is removed from the machine by an operator. Approval must be obtained from the bank before physically accepting the envelope. A customer must be able to make a transfer of money between any two accounts linked to the card. A customer must be able to make a balance inquiry of any

account linked to the card. A customer must be able to abort a transaction in progress by pressing the Cancel key instead of responding to a request from the machine.

47. How can you represent system's dynamic behaviors? Develop the System Sequence diagram for Case Study Given in question no 45.

48. What is the difference between Conceptual Class Diagram and Design Class Diagram? For the case study given in question no. 45, Find candidate objects, their corresponding class, relationships and develop the class diagram.

49. Create object oriented implementation codes (Classes and their implementation methods) from class diagram created in question no 47 and sequence diagram in question no 46.

50. Crate implementation code for Monopoly Game class diagram created in your Design Phase.

51. Explain the key ideas of USDP? (Hint: Use-case driven, Architecture-centric, Iterative and incremental)

52. Write short notes on
    a. CRC Cards and its use
    b. Different Phases of RUP (Rational Unified Process)/UP (Unified Process) in Software Development Process.
    c. Domain Model
    d. Use Case Realization
    e. Interface vs Implementation , Interface vs Abstract Class
    f. Use of Association Class
    g. Relationship Between Class diagram and interaction diagram
    h. Abstract class and its importance
    i. Use of Swim lanes in activity Diagram
    j. Use of Join and Fork in Activity Diagram
    k. Branch and Merge in Activity Diagram
    l. A constraint in UML Class Diagram
    m. Use case generalization
    n. Purpose of Deployment Diagram
    o. Object Flow in activity Diagra

Exercises: Self Practice Use-Case & Statechart, activity, class diagram ,sequence and collaboration diagram for following system

- the football league
- a personnel communication system
- an automatic washing machine
- a kitchen
- A coke factory
- Teaching of OOAD class
- Student examination

- Bike servicing
- Noodles Factory
- Medical shop
- Spaghetti preparation
- Film theater
- An Automatic refrigerator
- An automatic door lock
- **Finger based attendance**
- Irish based attendance
- **Central Library**
- TV news room
- College Reception
- Hotel Reservation
- Bus ticket reservation
- News Agency Management
- Air Transportation System
- Video Cassette Recorder
- Credit Card Payment
- Vehicle Registration
- Automatic Photocopy Machine
- Voting Machine
- Departmental Store
- Medical diagnosis