SOOAD

UNIT 4

OBJECT ORIENTED ANALYSIS & DESIGN

UNIT -4 Use Case, Class & Object Diagram

- Use - Case Diagram
- Class Diagram
- Object Diagram

USE – CASE DIAGRAM

UNIT -4 Use Case Diagram

- **Use -Case Diagram**
  - Introduction
  - Scope of Use-Case Diagram
  - Benefits of Use-Case Diagram
  - Elements of Use-Case Diagram
    - Actors
    - Use-Cases
    - Relatioship Between Actor and User Case
    - Relationship Between Use-Cases
    - Relationship Between Actors
  - Guidelines for design of Use-Case Diagram
  - Case Study

UNIT -4 Use Case Diagram

- Use Case diagram provide a simple, fast means to decide and describe the purpose of project.
- The Use-Case diagram is used to identify the primary elements and processes that form the system.
- The purpose of a use case diagram in UML is to demonstrate the different ways that a user might interact with a system.
- The Primary elements are terms *"Actors"*
- The Process are called *"Use-Cases"*

UNIT -4 Use Case Diagram

- **Use- Case Diagram often used to**
  - Used to gather the requirements of a system.
  - Used to get an outside view of a system.
  - Identify the external and internal factors influencing the system.
  - Show the interaction among the requirements are actors.

UNIT -4 Use Case Diagram

- **Scope of Use-Case Diagrams**
  - It capture the **functional requirements** of a system.
  - The main purpose of it is to **present a graphical view of the functionality** provided by a system in terms of
    - Actors
    - Thier goals
    - Any dependencies between Use-Cases

UNIT -4 Use Case Diagram

- **Benefits of a Use-Case Diagrams**

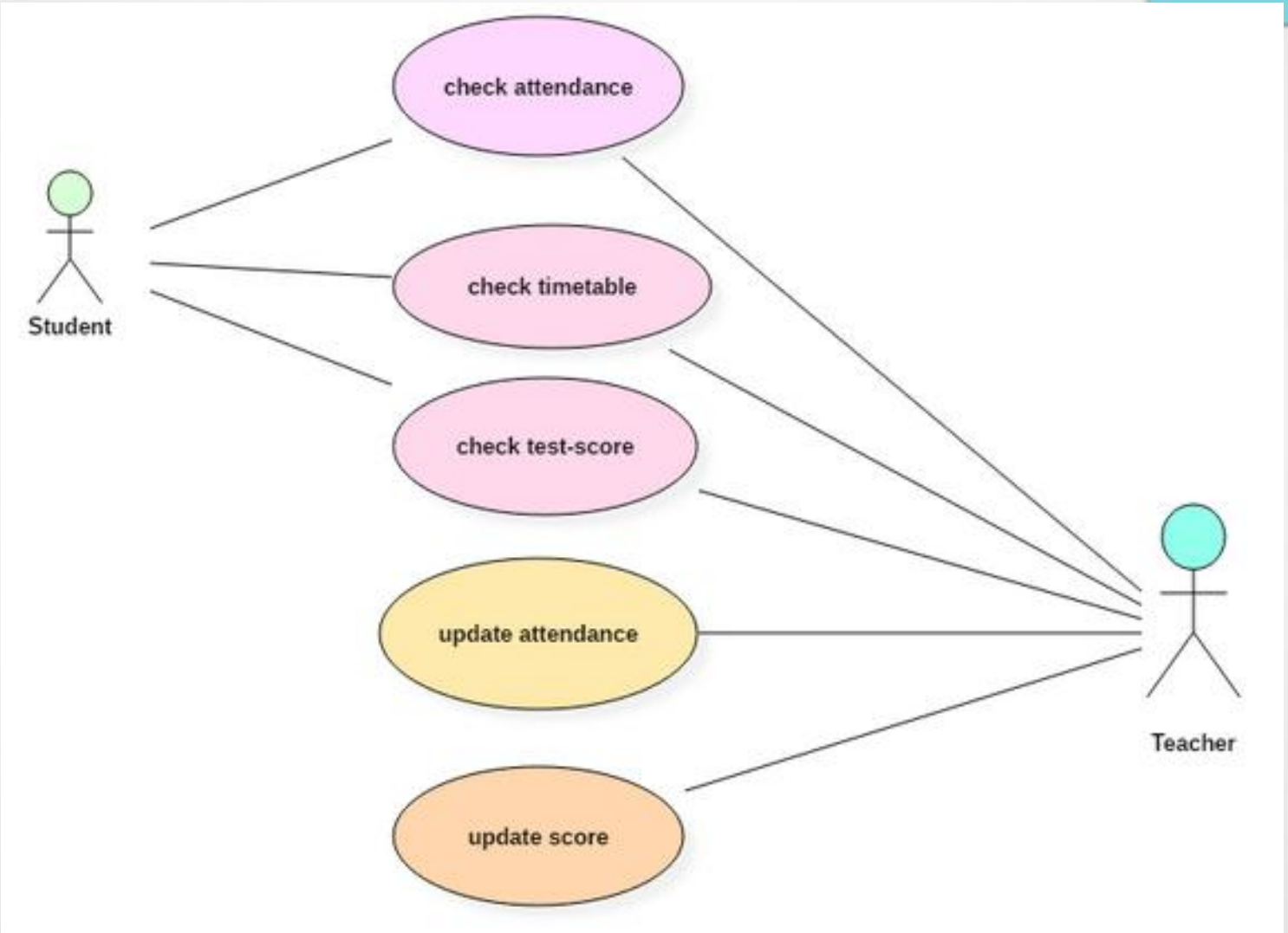
The better our understanding of the use-cases, the easier, more focused, and more appropriate will be the work that follows.

Use-cases are the context that allows us to easily picture where, within a project's lie, a particular element will fit, thus promoting clearer decision-making throughout design and development.

UNIT -4 Use Case Diagram

- **Benefits of a Use-Case Diagrams**
  - If we consider the roles played by the actors and their goals, the use-case model can very rapidly emerge.
  - Can distill a complex project into a more easy picture.
  - Well-constructed model can be easily understood by all the stakeholders.
  - Powerful aid to collaborative development.
  - Ensure that scope is under control from the outset.
  - An implementation neutral picture of the project.
  - It is transportable. No special tools are required.
  - Use-case driven development is a mindset, as much as it a technique.

UNIT -4 Use Case Diagram



UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - To define a project's use-cases, we need to consider two concepts
    - Actors
    - Their goals and how they relate
  - Following are the list of elements:
    - Actors
    - Use-cases
    - Relationships between Actor and Use Case
    - Relationships between Use-cases
    - Relationships between Actors

UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - **Actors**
    - An actor represents a coherent set of roles that users of use-cases play when interacting with these use-cases.
    - An actor represents a role that a human, a hardware device, or even another system plays with the system.

UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - **Actors**
    - Identify actors in the system by asking the following questions:
      - Who uses the main functionality of the sytem?
      - Which hardware devices does the system need to handle?
      - Which other systems does the system need to interacth with?
      - What noun/subjects are used to describe the system?

UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - **Actors**
    - Example:
      - Human
      - Systems / Software
      - Hardware
      - Timer / Clock

Must serve as sources and destinations for data

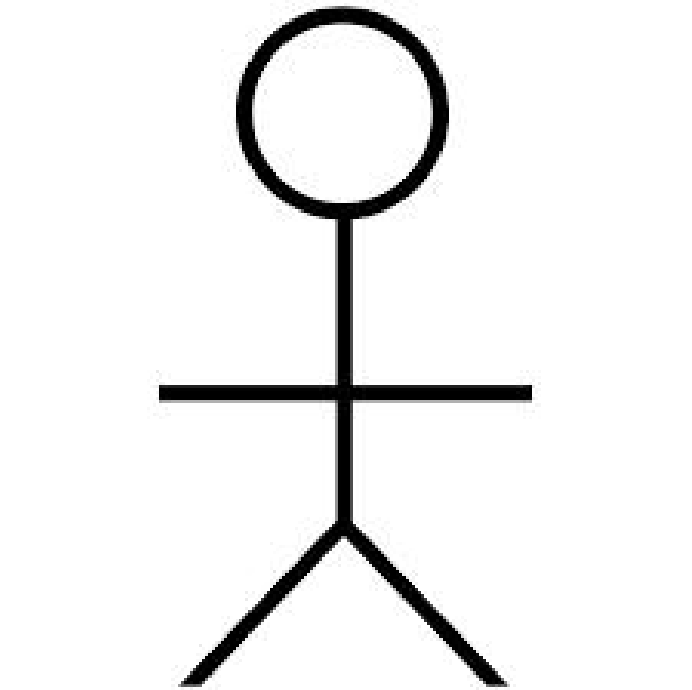
Must be external to the system

UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - **Actors**
    - Characteristics:
      - Are external to the system
      - Interact with the system
      - Actor classes have actors instances or objects that represent specific actors.

UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - **Actors**



UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - **Use-Cases**
    - A use-case is a description of a set of sequences of actions, including variants, that a system performs to produce an observable result of value to an actor.
    - Use cases are used to represent high-level functionalities and how the user will handle the system.
    - A use case represents a distinct functionality of a system, a component, a package, or a class.
    - It is denoted by an oval shape with the name of a use case written inside the oval shape.

UNIT -4 Use Case Diagram

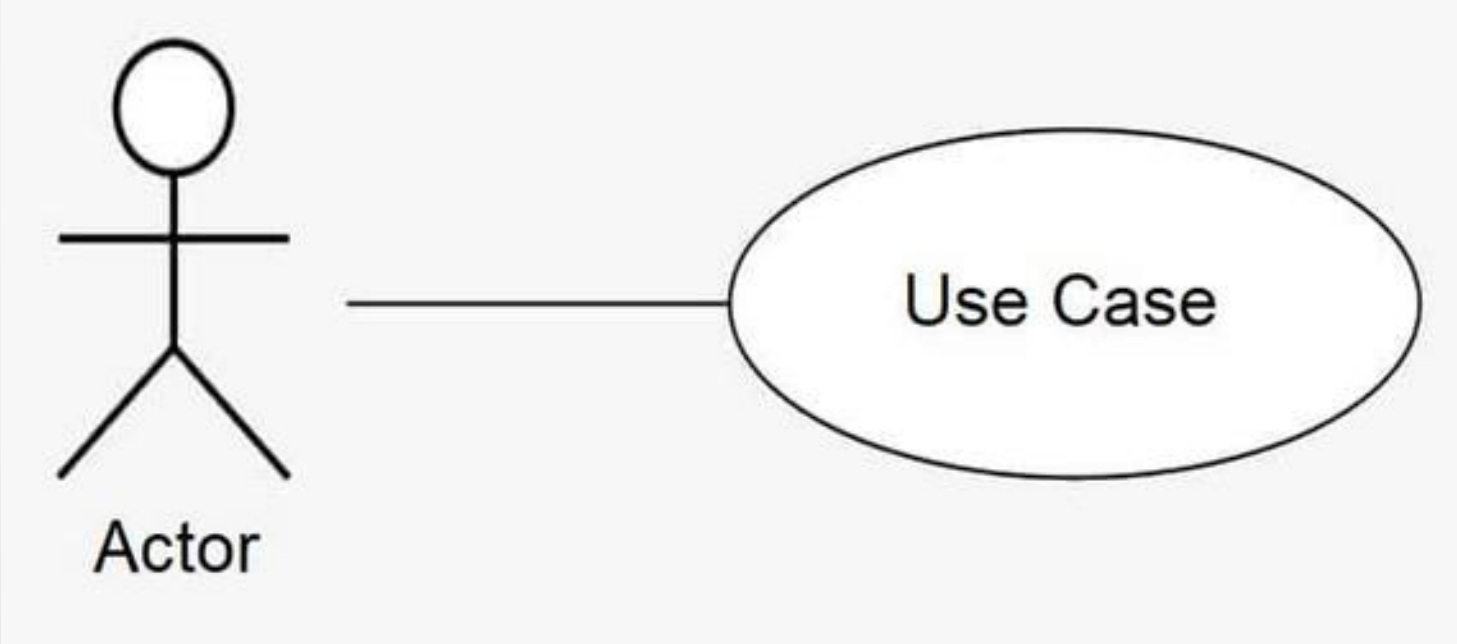
- **Elements of Use-Case Diagram**
  - **Use-Cases**
    - **Use-Cases describes what system does, but it does not specify how it does it.**
    - Identify use-case in the system by asking the following question:
      - What funcitons do the system perform?
      - What functions do the actors require?
      - What input/output do the system need?
      - What verbs are used to describe the system?

UNIT -4 Use Case Diagram

- **Elements of Use-Case Diagram**
  - **Use-Case**

UNIT -4 Use Case Diagram

- **Relationships between Actor and Use-Case**
  - The participation of an actor in a use-case can communicate with each other.

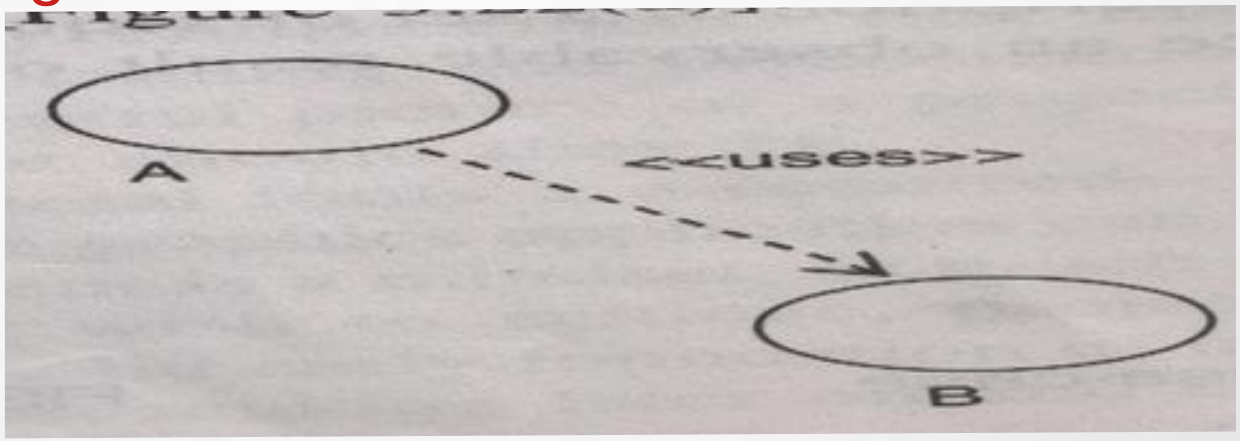


UNIT -4 Use Case Diagram

- **Relationships between Use-Cases**
  - Uses / Includes
  - Extends

UNIT -4 Use Case Diagram

- **Relationships between Use-Cases – Uses / Includes**
  - An include relationship between two use-cases means that the sequence of behaviours described in the included use-case is included in the sequence of the base use-case.
  - It is like calling a subroutine.



UNIT -4 Use Case Diagram

- **Relationships between Use-Cases - include**

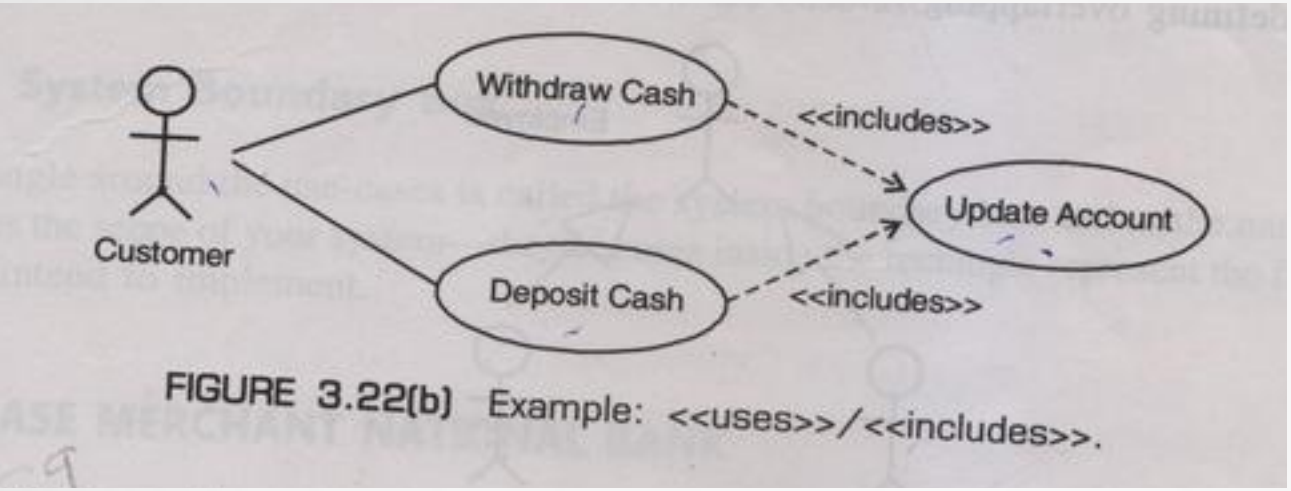
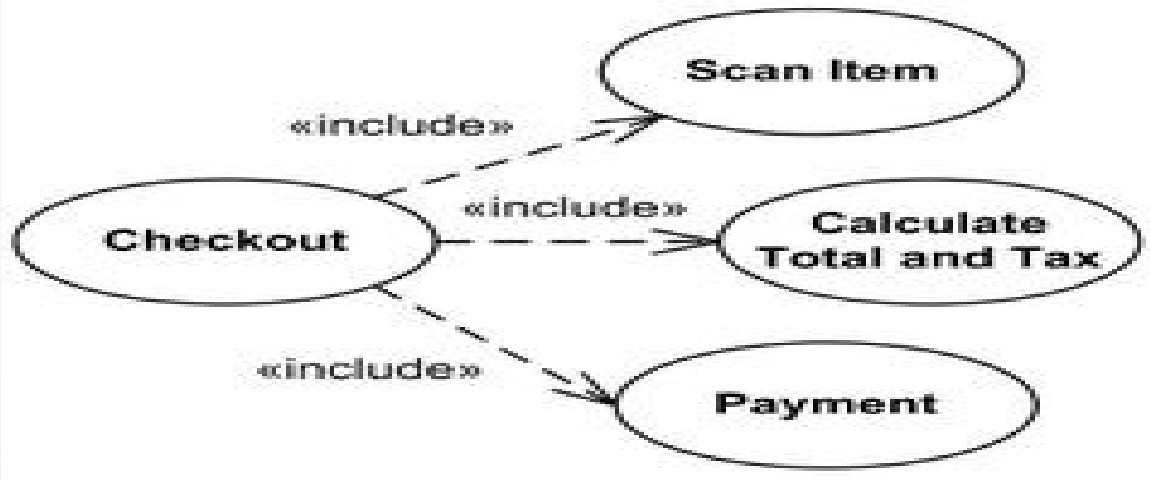


FIGURE 3.22(b) Example: <<uses>>/<<includes>>.



UNIT -4 Use Case Diagram

- **Relationships between Use-Cases – Extends**
  - Provides a way of capturing a variant to a use-case.
  - Extensions are not true use-cases but changes to steps in an existing use-case.
  - The extends relationship includes the condition that must be satisfied if the extension is to take place, and references to the extension points which define the locations in the base use case where the additions are to be made.

UNIT -4 Use Case Diagram

- **Relationships between Use-Cases - Extends**

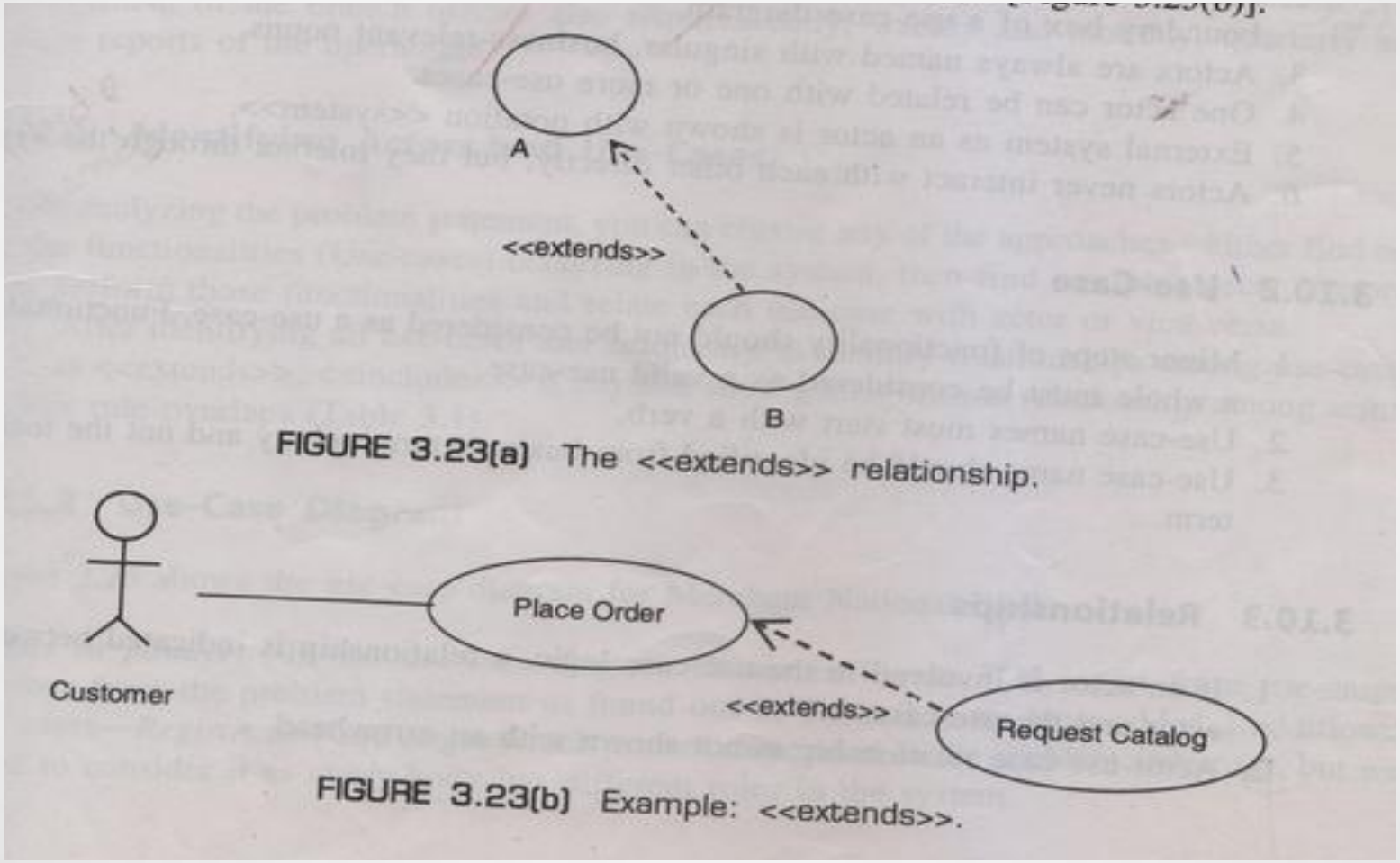
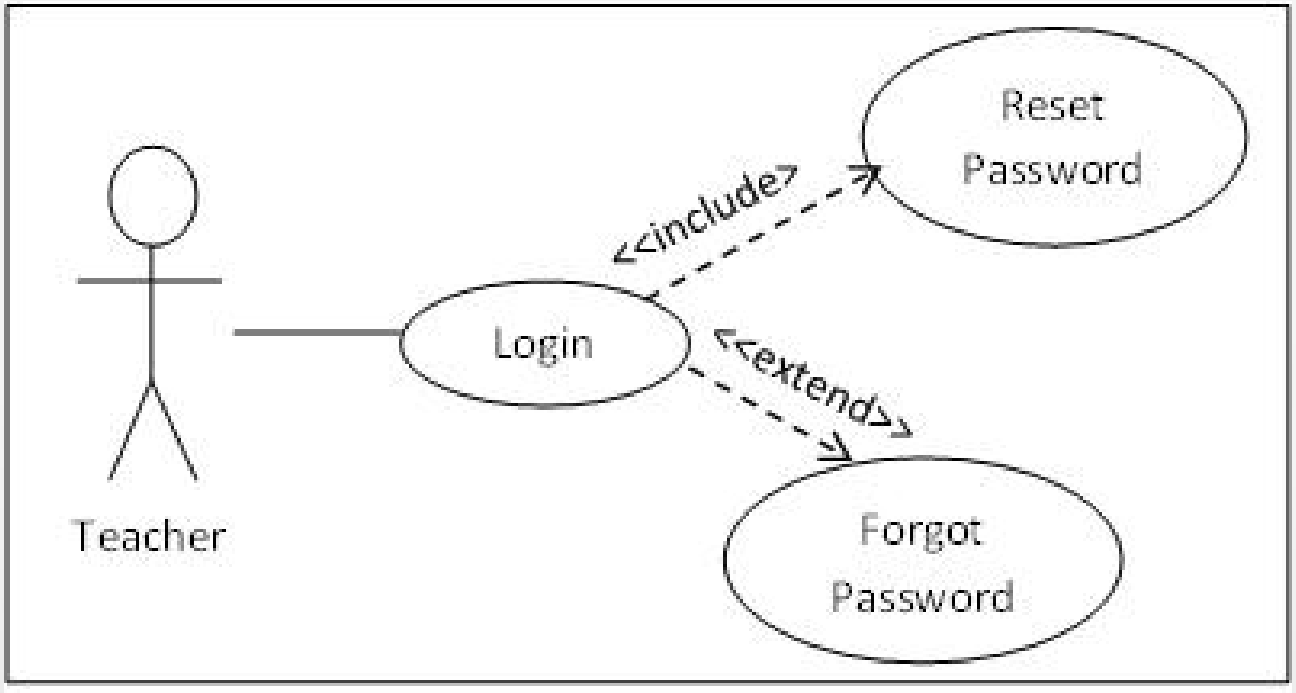
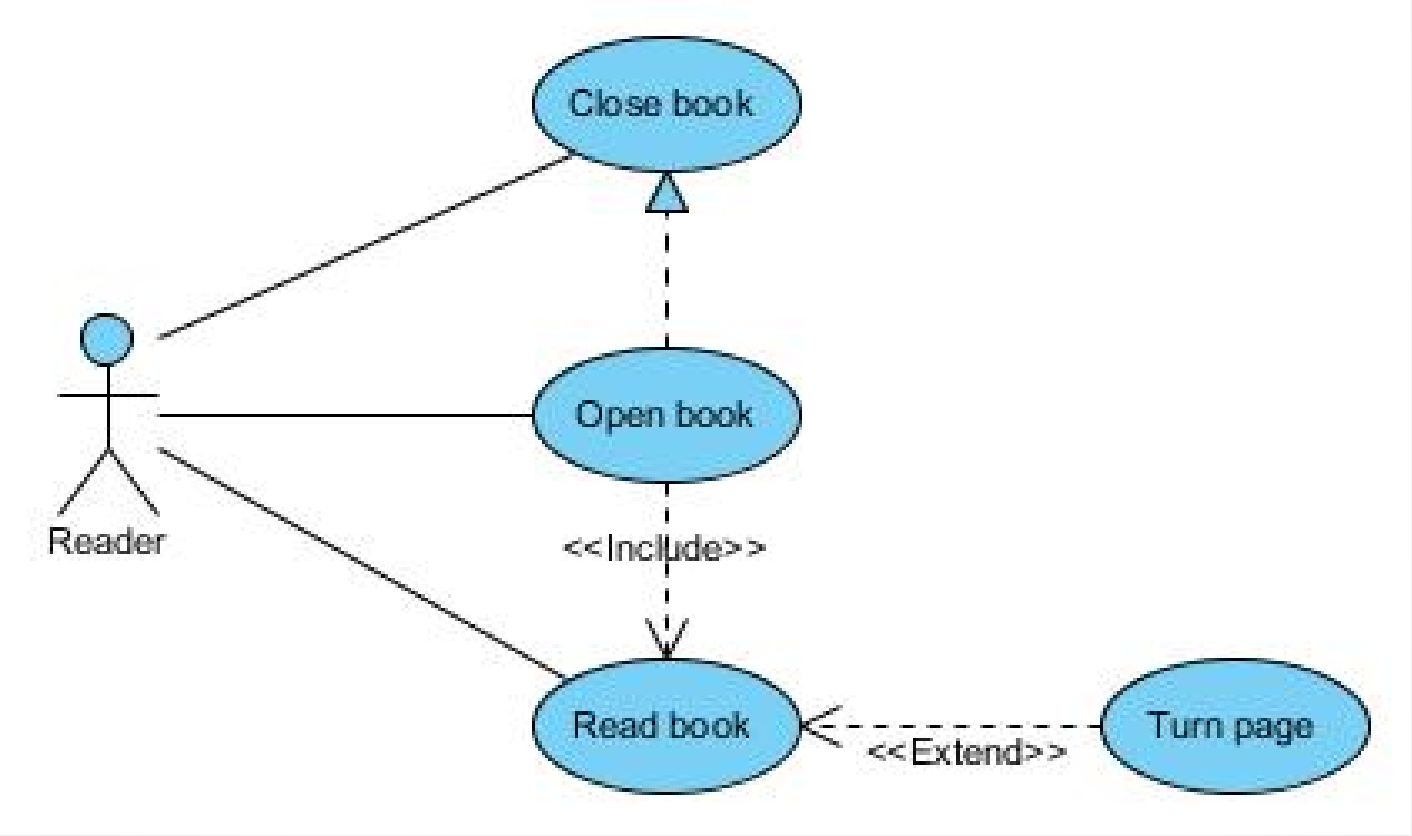


FIGURE 3.23(a) The <<extends>> relationship.

FIGURE 3.23(b) Example: <<extends>>.

UNIT -4 Use Case Diagram




Close book
Open book
Reader
<<Include>>
Read book
Turn page
<<Extend>>

UNIT -4 Use Case Diagram

- **Relationships between Actors**
  - The only relationship between actors on a use-case diagram is generalization.

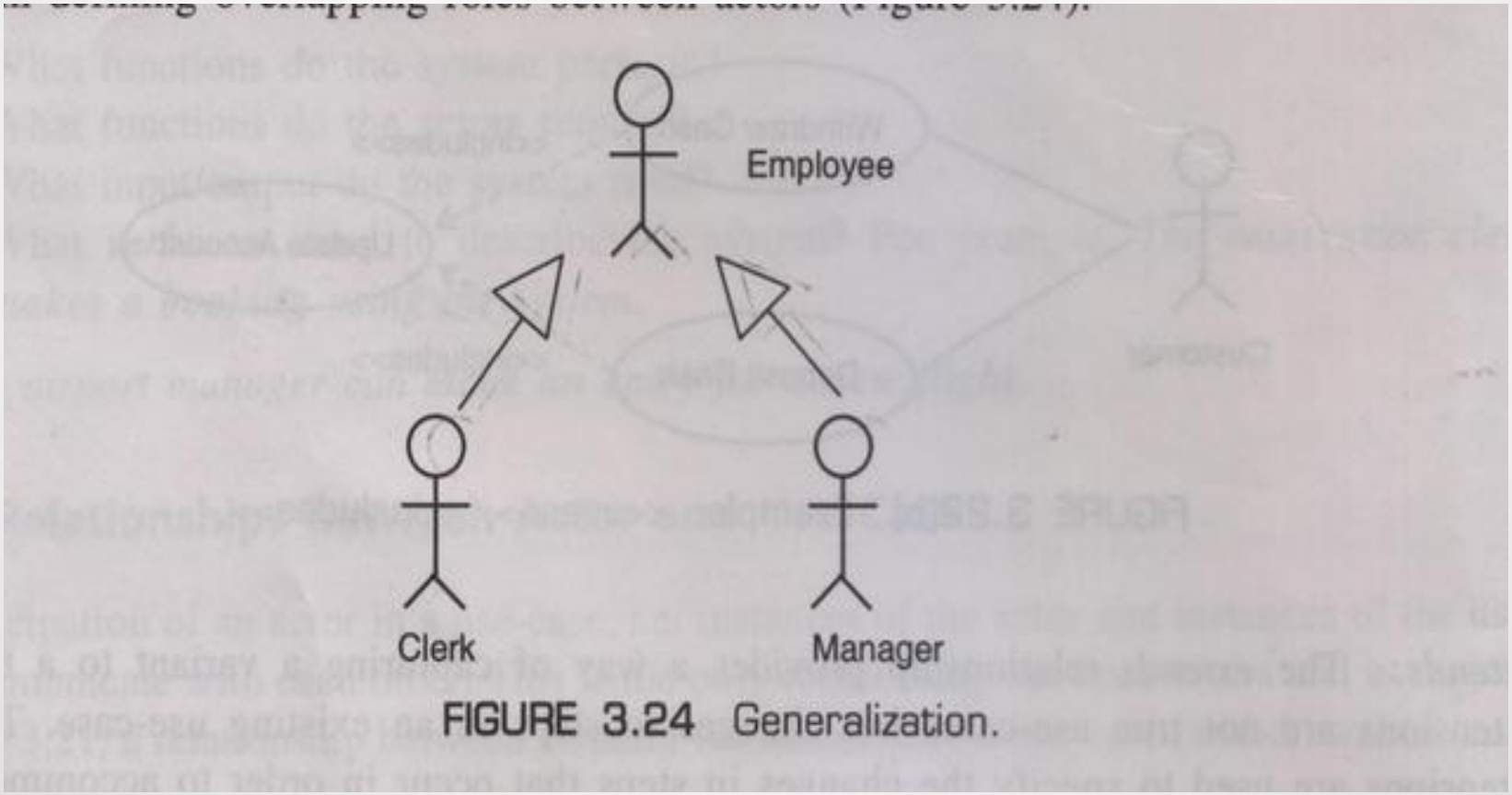
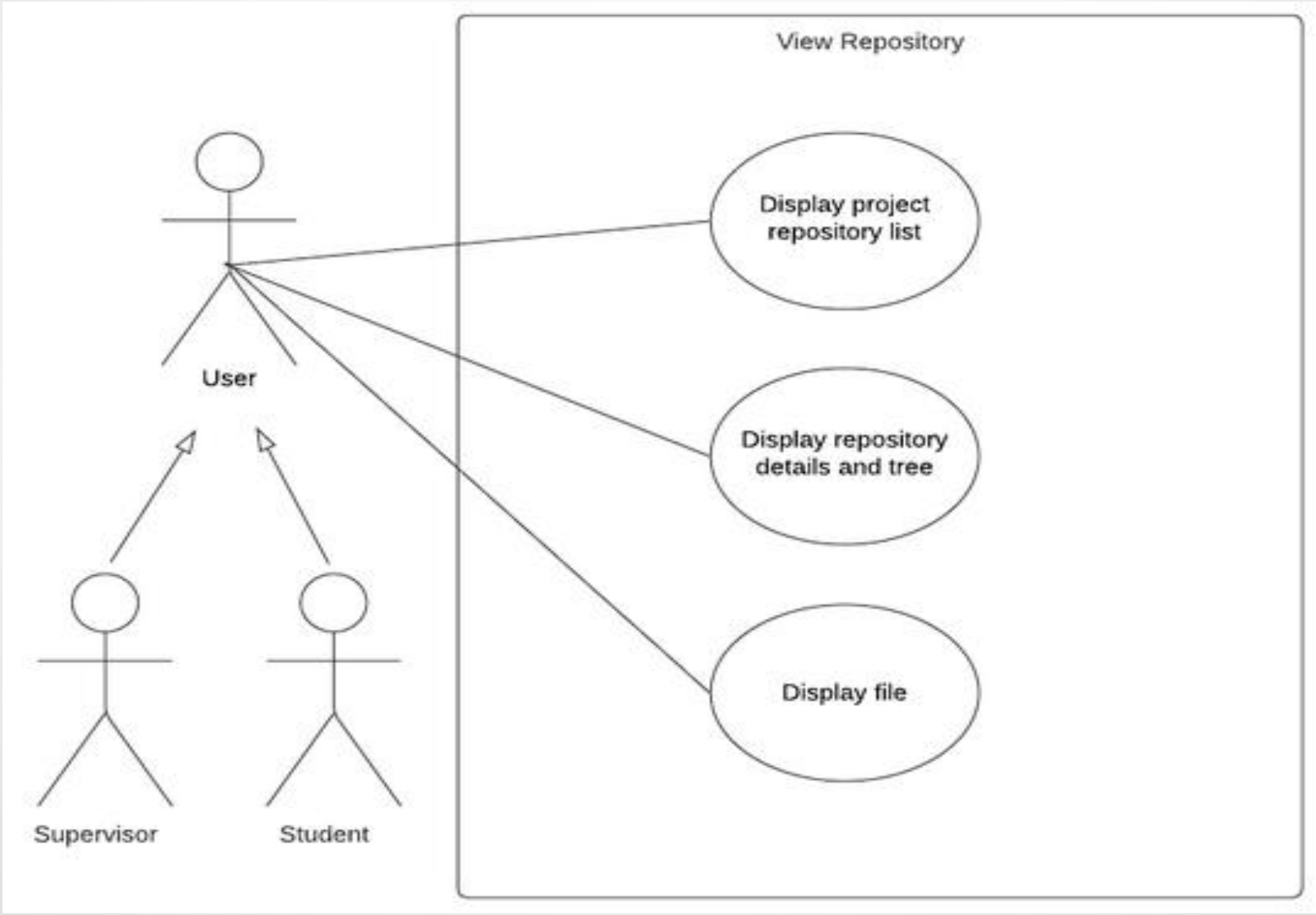


FIGURE 3.24 Generalization.

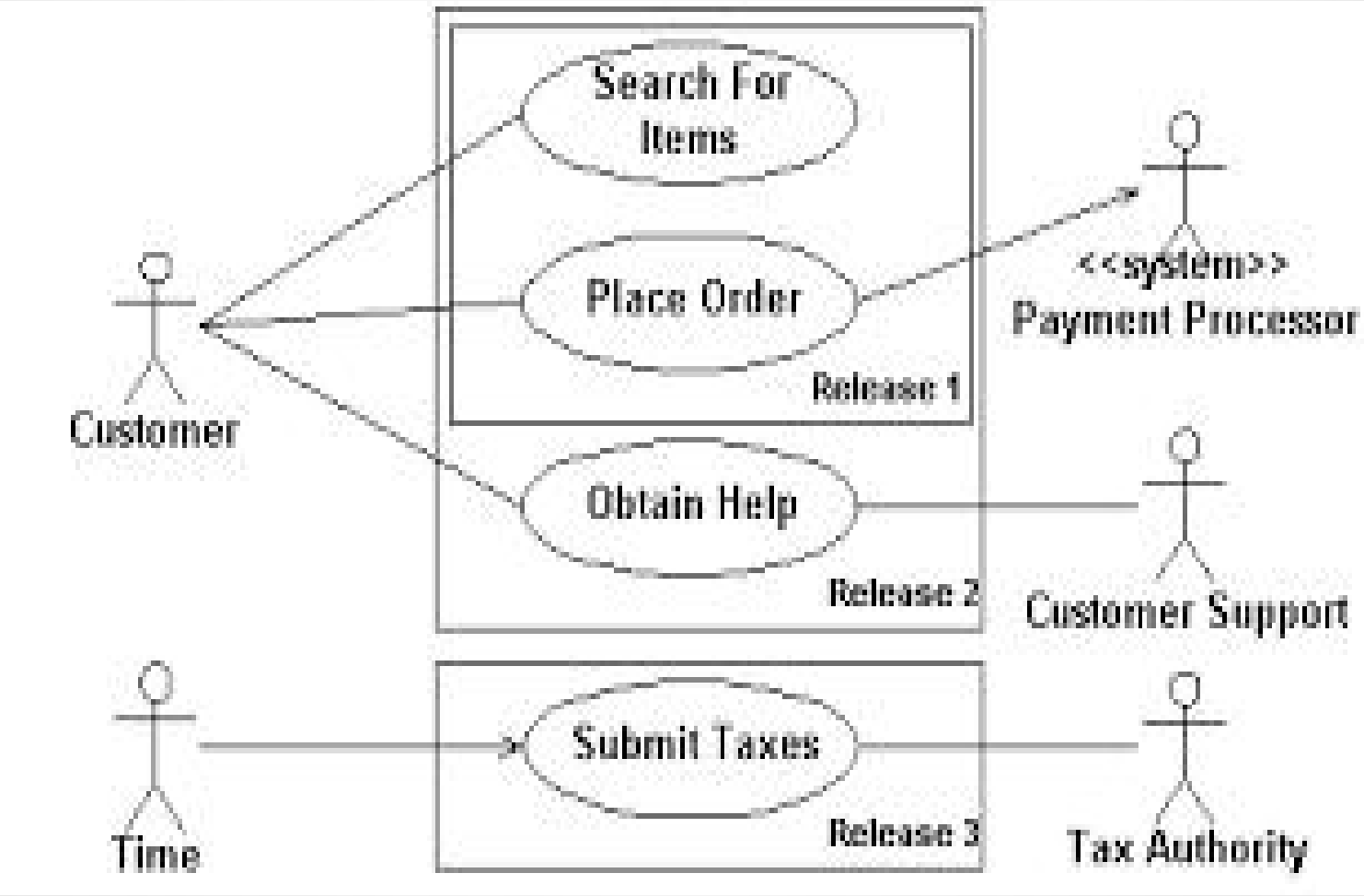
UNIT -4 Use Case Diagram

- **Relationships between Actors**



UNIT -4 Use Case Diagram

- **Guidelines for Design of Use-Case Diagrams**
  - **Actors**
    - Primary actors are **placed in the top-left corner** of the diagram
    - Actors are **external object**, so always shown outside of the system boundary box of use case
    - Actors are always **name with singular noun.**
    - One actor **can be related with one or more use cases.**
    - External system as an actor is shown **with notation <<system>>.**
    - Actors **never interact with each other directly**, but they interact through the system.


Search For Items
Place Order
Release 1
Obtain Help
Release 2
Submit Taxes
Release 3
Customer
Time
<<system>>
Payment Processor
Customer Support
Tax Authority

UNIT -4 Use Case Diagram

- **Guidelines for Design of Use-Case Diagrams**
  - **Use-Case**
    - **Minor steps of functionality** should not be considered as a use-case.
    - Use-case **names must start with a verb.**
    - Use-case **name should be identified from business terminology and not the technical term.**

UNIT -4 Use Case Diagram

- **Guidelines for Design of Use-Case Diagrams**
  - **Relationships**
    - If an actor is involved in the use case logic, a **relationship is indicated between the actor and the use-case.**
    - Actor-use **case relationship is not shown with an arrowhead.**
    - Use case **relationships like <<extends>> or <<includes>> should be used only when necessary**
    - An **included use case is placed to the right of the including use cases**
    - An **extending use case is placed below the base use case.**

UNIT -4 Use Case Diagram

- **Tips for use-case diagram:**
  - A use case diagram should be as simple as possible.
  - A use case diagram should be complete.
  - A use case diagram should represent all interactions with the use case.
  - If there are too many use cases or actors, then only the essential use cases should be represented.
  - A use case diagram should describe at least a single module of a system.
  - If the use case diagram is large, then it should be generalized.

CASE STUDY - 1

CASE STUDY: MERCHANT NATIONAL BANK

- Merchant national bank has its head office in Mumbai and its branches in several parts of India. The bank has several types of accounts like saving a/c, current a/c, PPF a/c, fixed deposit a/c, locker a/c, NRI a/c, and many others. Every account type may or may not be offered for a particular branch. The customers can open any number of joint or single accounts in any branch of the bank. They will be allowed to access his account from any of the branch.

  The customers do various transactions on their account such as debiting, crediting, depositing and withdrawing local and non-local cheqes, making and depositing drafts, operating the locker, making and withdrawing fixed deposits, etc.

  Periodically, the bank calculates interest as per the current rates of interest and credits it to the accounts of the account holders. From time to time, the head office requires management reports from the branches. The management of the branch office also requires daily, weekly and monthly, quaterly and annual reports of the operations.

UNIT -4 Use Case Diagram

- **Draw the use-case diagram for any case study**

TABLE 3.1 Actors and corresponding use-cases for Merchant National Bank

Sr. No.	*Actors*	*Use Cases*		
		Base	*Include*	*Extends*
1	Customer	Open Account Access Account Operate locker	Check Balance	
2	Customer	Deposit Cash/Cheque		
		Withdraw Money Cash/Cheque	Check Balance	
3	Accounting Clerk	Credit interest to Customers' account		
4	Bank Manager	Generate Reports		

UNIT -4 Use Case Diagram

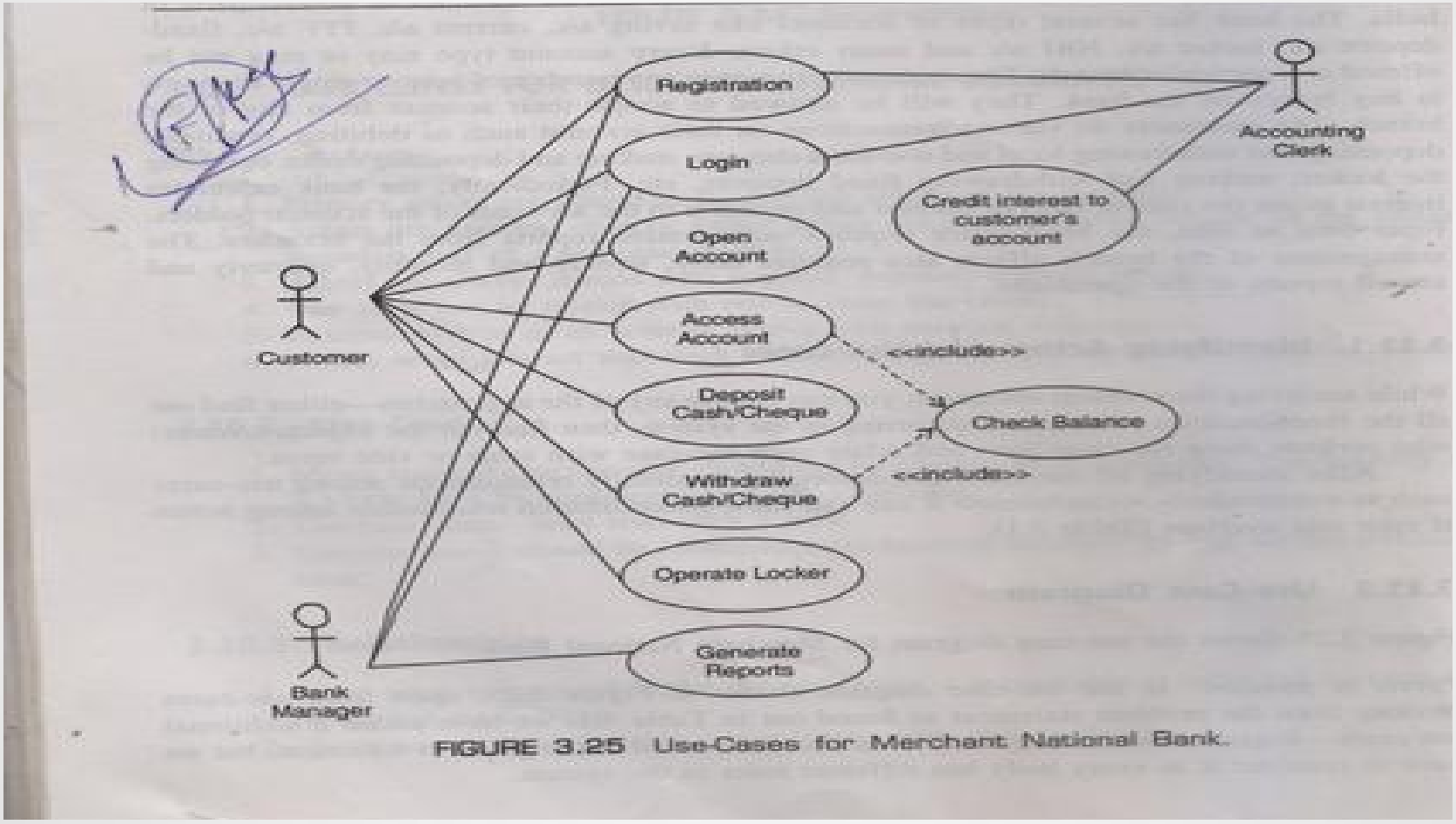


FIGURE 3.25 Use-Cases for Merchant National Bank.

CASE STUDY 2

STUDENT LOAN SYSTEM

- A University gives loans to students. Before getting a loan, there is an evaluation process afer which if the loan is approved, agreement is reached. A transaction records each step of the evaluation process, and another transaction records teh overall loan agreeement. A student can take any number of loans, but only one can be active at any time. Each loan is initiated by a seperate transaction. Then, the student repays the loan with a series of repayments. Each repayment transaction is recorded. After the complete settlement, finally the loan account is closed.

  Two output functions are desired:

  1. an inquiry function that prints out the loan balance for any student

STUDENT LOAN SYSTEM

2. a repayment acknowledgement sent to each student after payment is received by the university.

The university loan office decides to implement the student loans on a single processor. Inquires should be processed as soon as they are received. However, repayment acknowledgements need only be processed at the end of each day.

For the above application,create appropriate diagrams.

STUDENT LOAN SYSTEM

First, we will identify actors and their corresponding use-cases as listed in Table 8.1. There are two actors in the system namely

- Student (Person)
- Loan officer at university (Person)

TABLE 8.1 Actors and corresponding use-cases for student loan system

Actors	*Use Cases*		
	Base	*Include*	*Extends*
Student	Registration Login Loan enquiry Apply for loan Loan balance enquiry Repay loan		
Loan officer at University	Registration Login Sanction loan Prepare loan agreement Generate loan balance statement Generate payment acknowledgement		

STUDENT LOAN SYSTEM

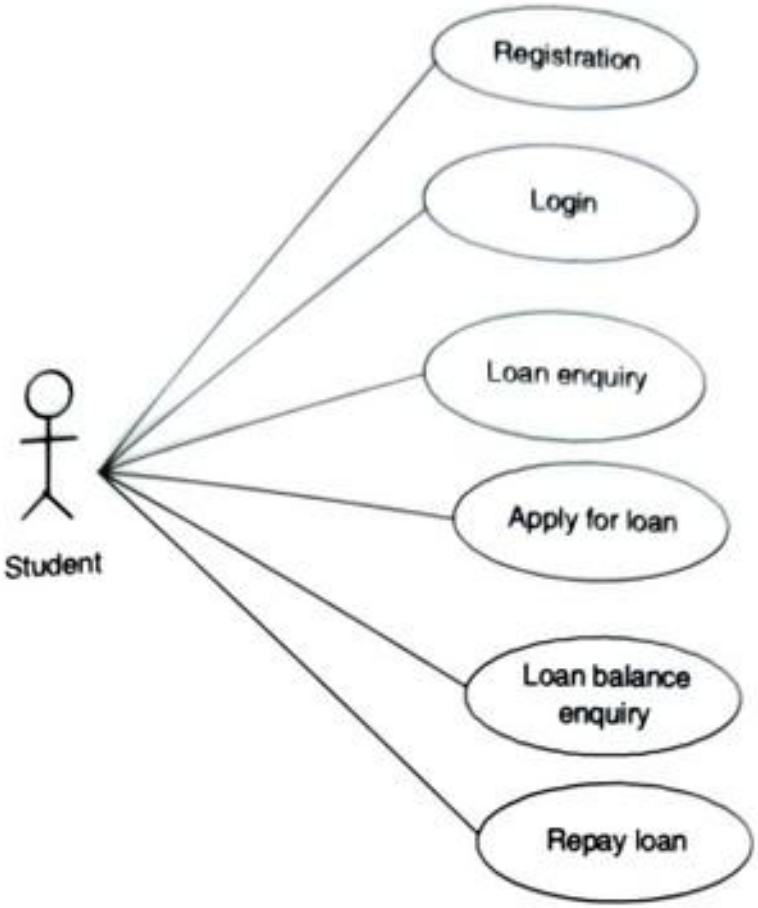


FIGURE 8.9 Use-case diagram for the student.

STUDENT LOAN SYSTEM

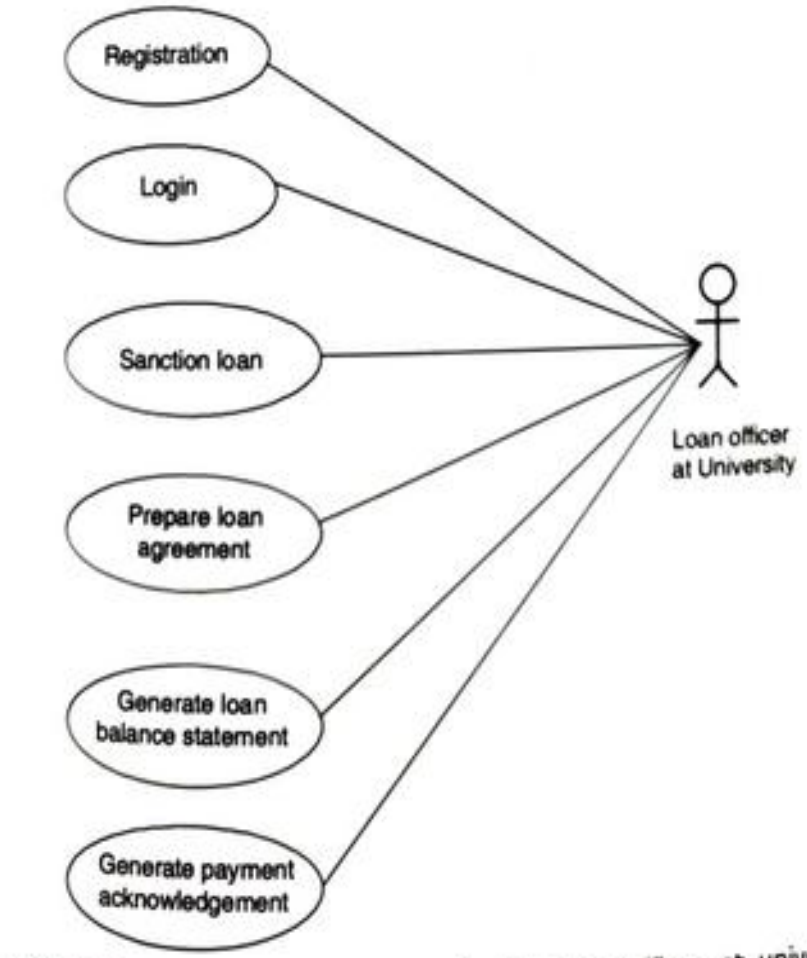


FIGURE 8.10 Use-case diagram for the loan officer at university.

STUDENT LOAN SYSTEM

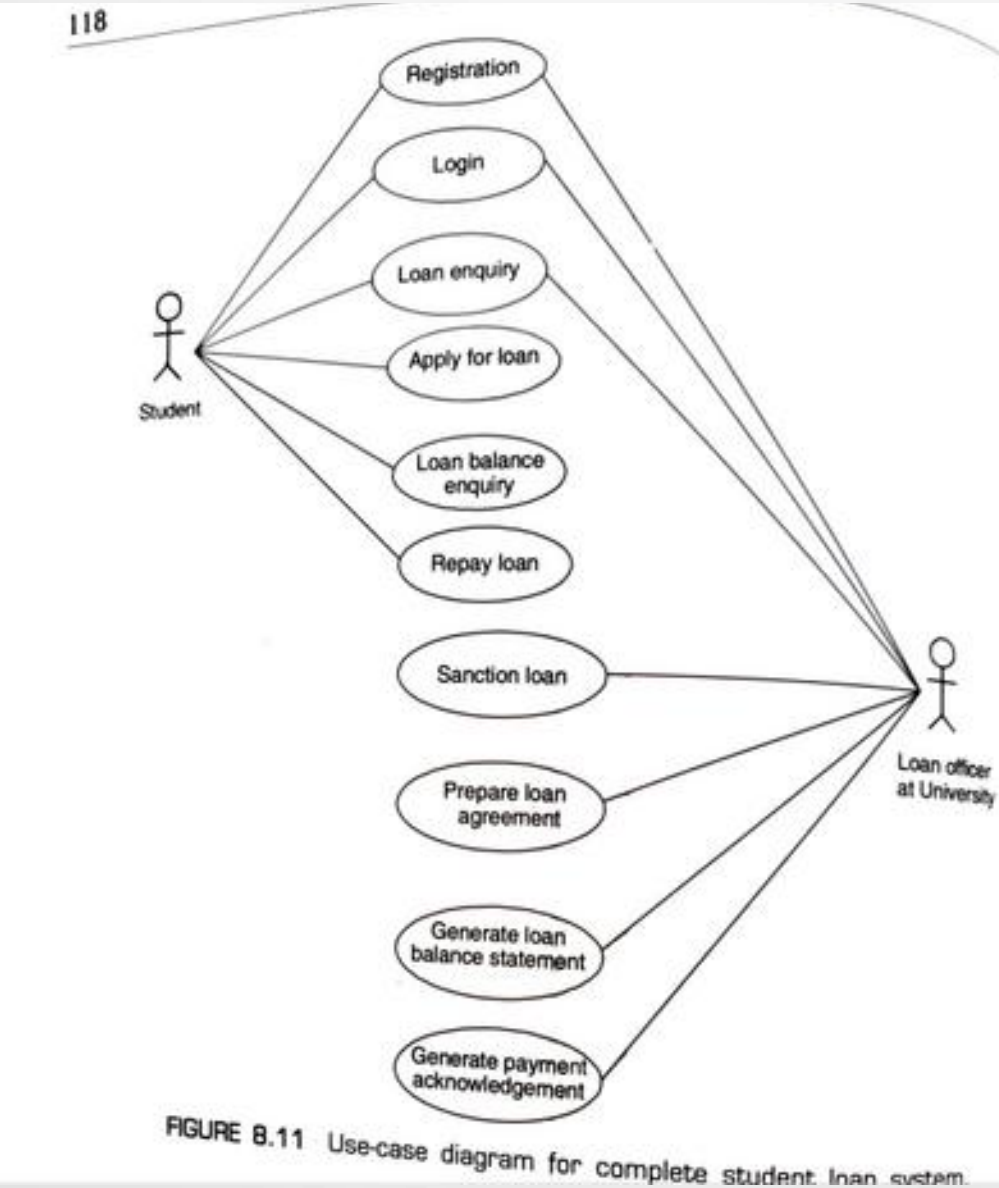


FIGURE 8.11 Use-case diagram for complete student loan system.