

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**  
“JnanaSangama”, Belgaum -590014, Karnataka.



**LAB REPORT**  
on  
**Object Oriented Modelling and Design**

*Submitted by*

**Shreshtha Aggarwal (1BM19CS155)**

*in partial fulfillment for the award of the degree of*  
**BACHELOR OF ENGINEERING**  
*in*  
**COMPUTER SCIENCE AND ENGINEERING**



**B.M.S. COLLEGE OF ENGINEERING**  
(Autonomous Institution under VTU)  
**BENGALURU-560019**  
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**B. M. S. College of Engineering,  
Bull Temple Road, Bangalore 560019**  
(Affiliated To Visvesvaraya Technological University, Belgaum)  
**Department of Computer Science and Engineering**



**CERTIFICATE**

This is to certify that the Lab work entitled "**LAB COURSE Object Oriented Modelling and Design**" carried out by **Shreshtha Aggarwal (1BM19CS155)**, who is bonafide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the academic year 2021-2022. The Lab report has been approved as it satisfies the academic requirements in respect of a **Object Oriented Modelling and Design- (20CS6PCOMD)** work prescribed for the said degree.

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## Index Sheet

<b>Sl. No.</b>	<b>Experiment Title</b>	<b>Page No.</b>
<b>1.</b>	<b>College Information System</b>	<b>4</b>
<b>2.</b>	<b>Hostel Management System</b>	<b>15</b>
<b>3.</b>	<b>Stock Maintenance System</b>	<b>27</b>
<b>4.</b>	<b>Coffee Vending Machine</b>	<b>39</b>
<b>5.</b>	<b>Online Shopping System</b>	<b>50</b>
<b>6.</b>	<b>Railway Reservation System</b>	<b>62</b>
<b>7.</b>	<b>Graphic Editor</b>	<b>73</b>

## Course Outcomes

<b>CO1</b>	Ability to apply the knowledge of class, State & Interaction Modeling using Unified Modeling Language to solve a given problem.
<b>CO2</b>	Ability to analyze a System for a given requirement using Unified Modeling language.
<b>CO3</b>	Ability to design a given system using high level strategy.
<b>CO4</b>	Ability to conduct practical experiment to solve a given problem using Unified Modeling language.

## Exercise 1: College Information System

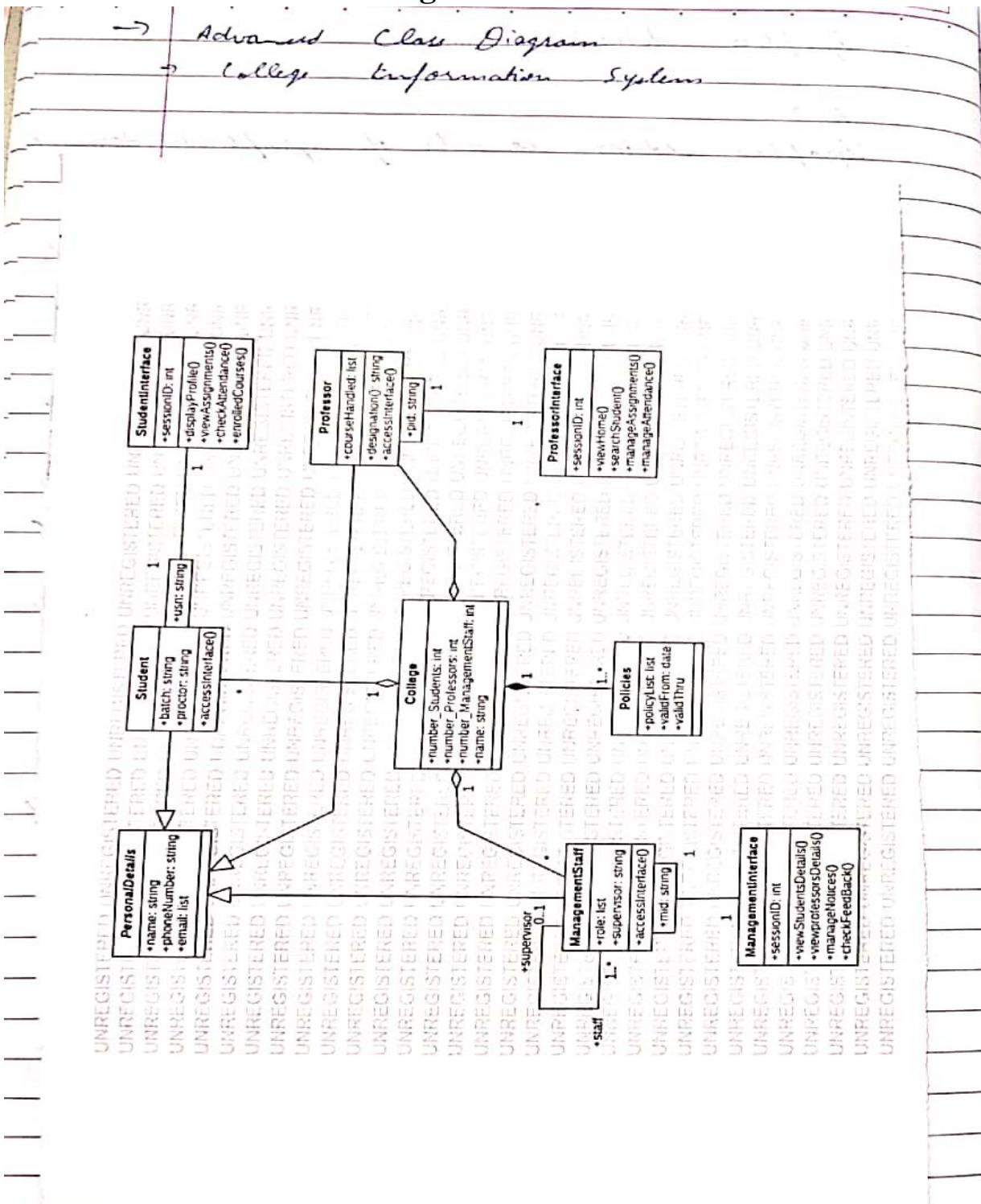
### 1. Write SRS

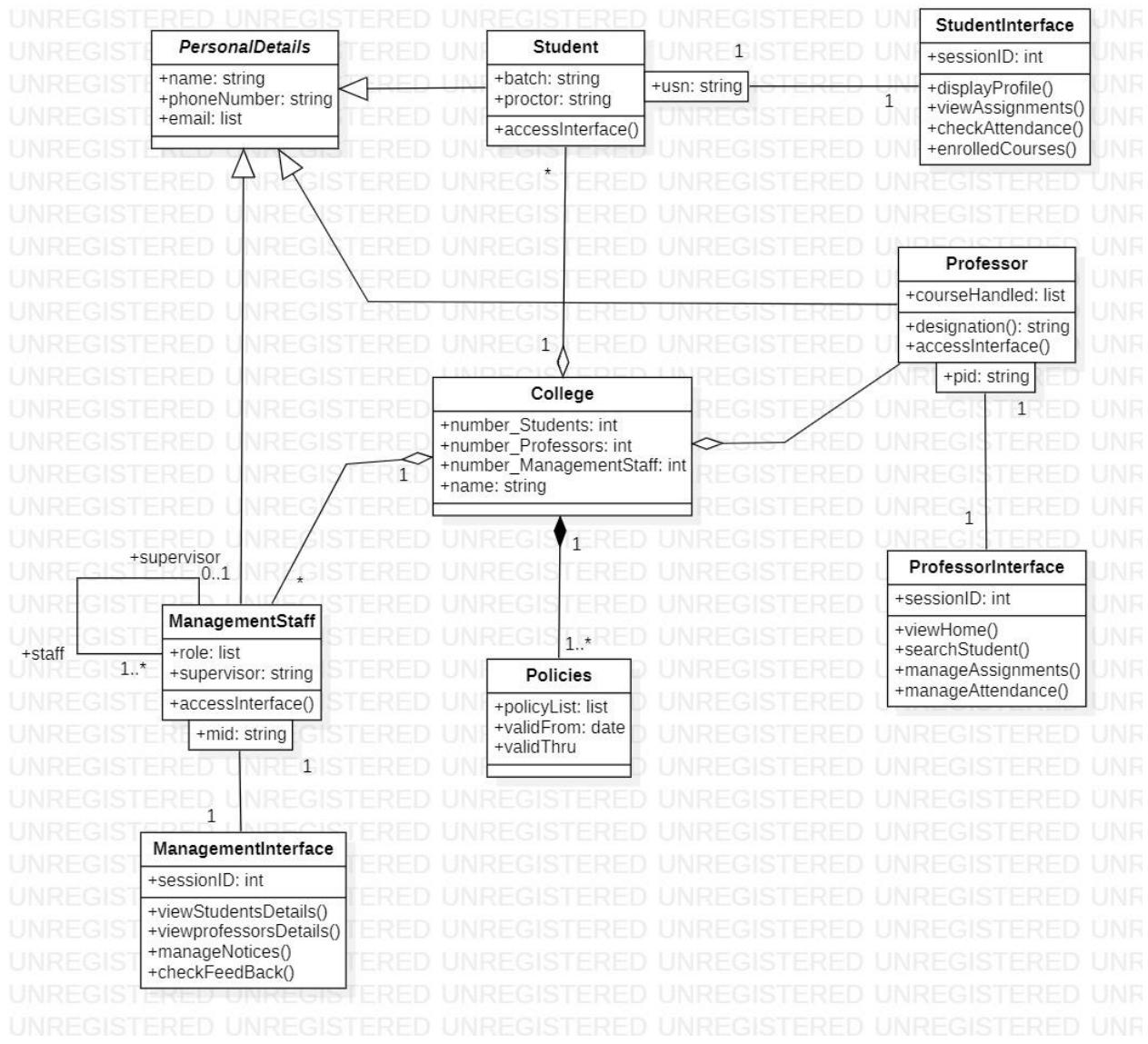
→ College Information System

SRS →

- The admin should be able to edit, add, view teachers of the respective class and details.
- The admin can add, edit and view student personal and academic details.
- Teachers should view student detail.
- Teachers should be able to add and edit marks.
- The department should be able to view department student details and edit them.
- The COE should be able to add student marks & give the results.
- Admission & account
- Placement office should be able to add, edit & view company details.

## 2. Draw the advanced class diagram





The below shown class diagram contains the following classes: Admin, Department, Staff, Course, Teaching, Non-Teaching, Placement, COE, Student, Hostel, Facility, Library with multiplicities as shown.

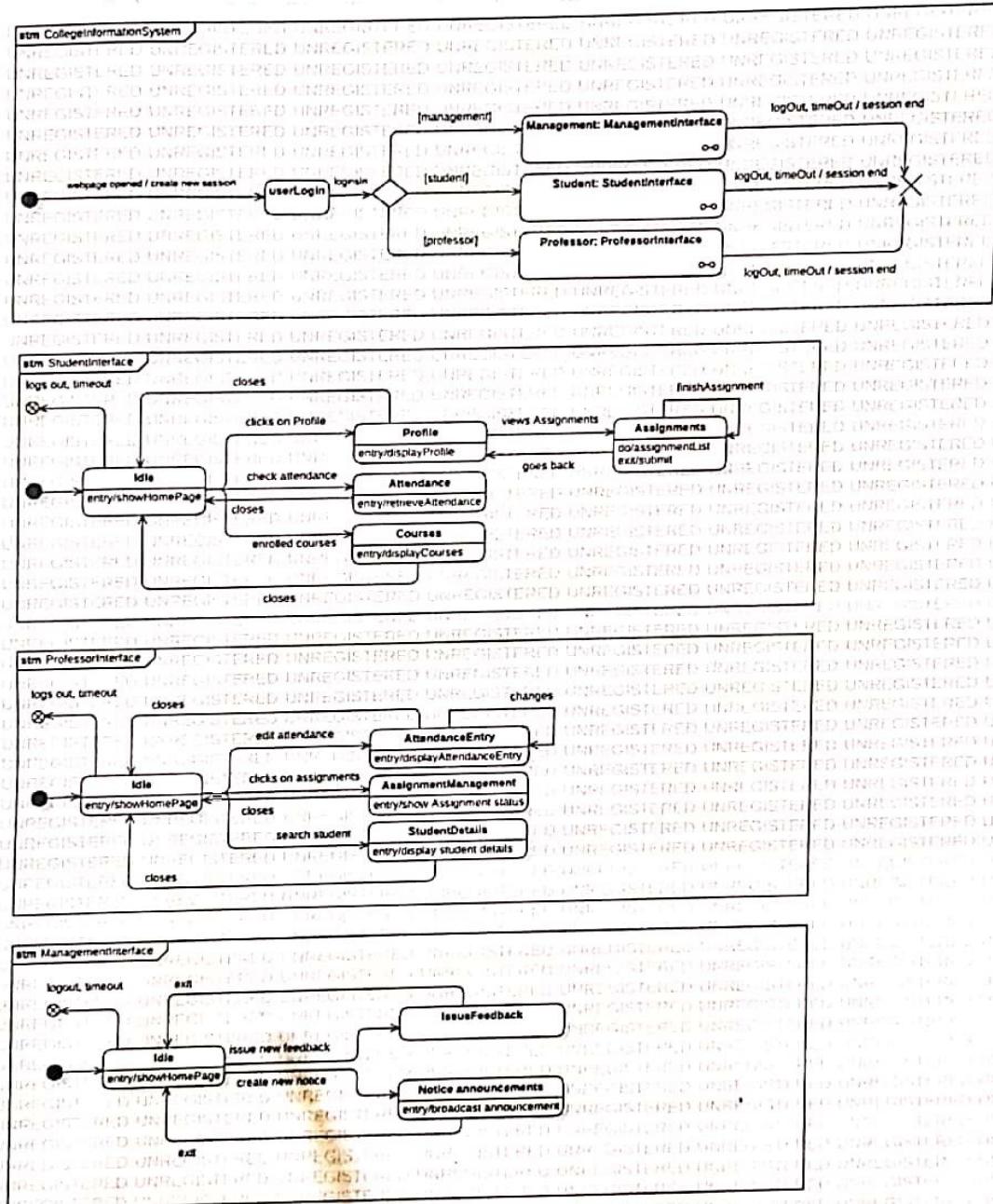
Association: Admin handles Department, Placement and COE, Student gets Facility, Courses are chosen by student.

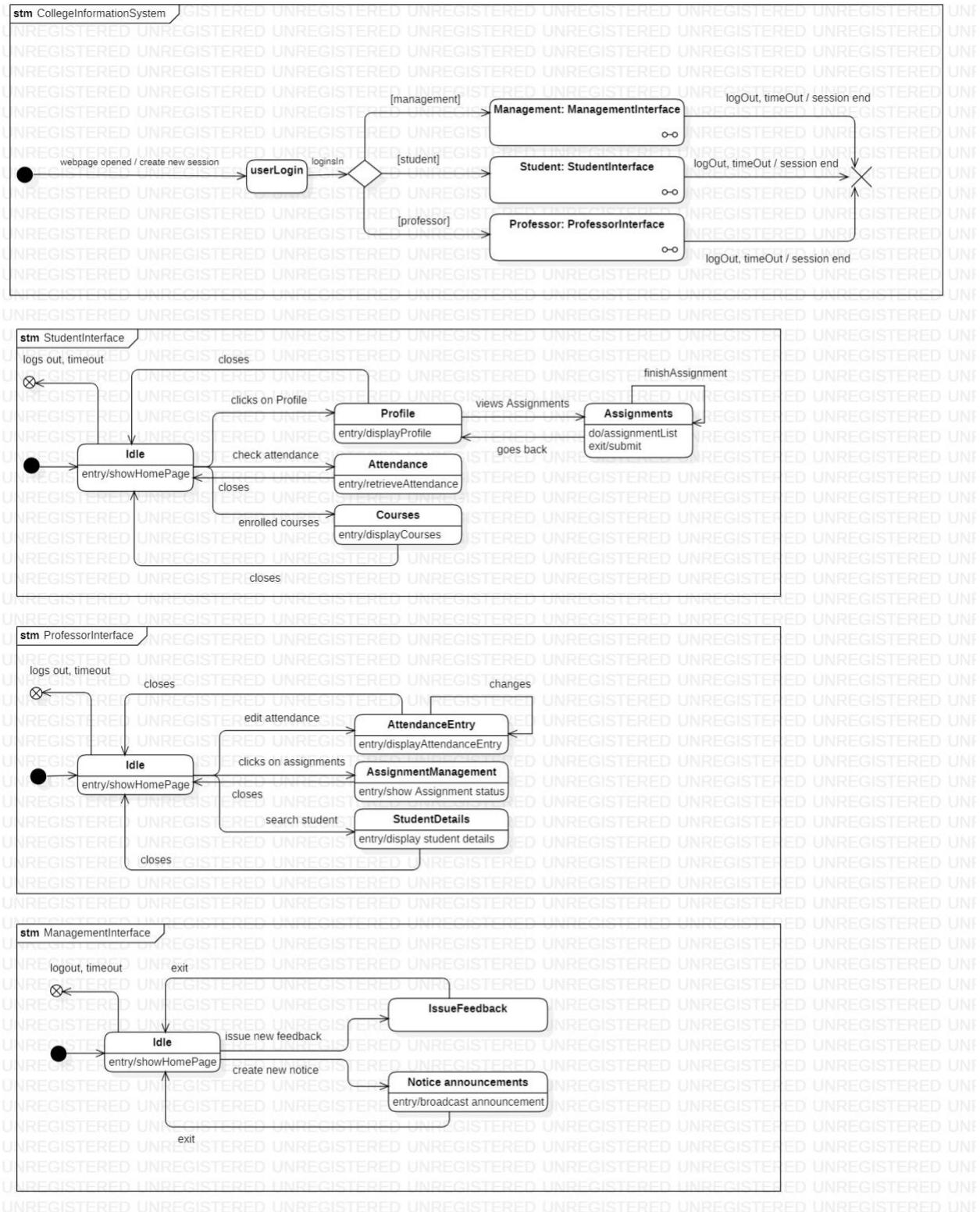
Generalization: Hostel, library are generalized to Facility class.

Aggregation: Staff consists (aggregate of) Teaching and Non-Teaching. Composition: Department has (or is composed of) Course and Staff.

### 3. Draw the advanced state diagram

→ Advance State Diagram  
→ College Information System

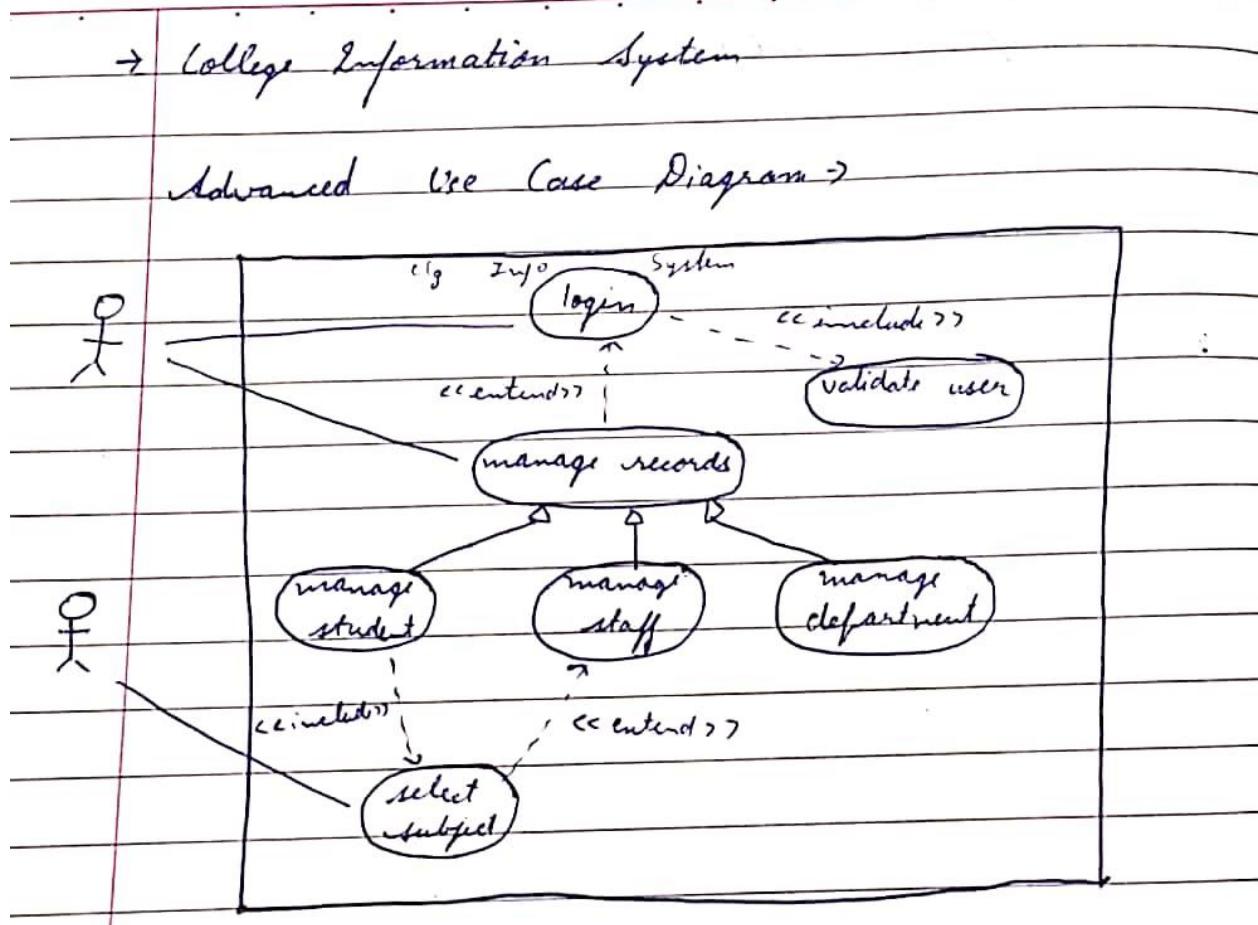


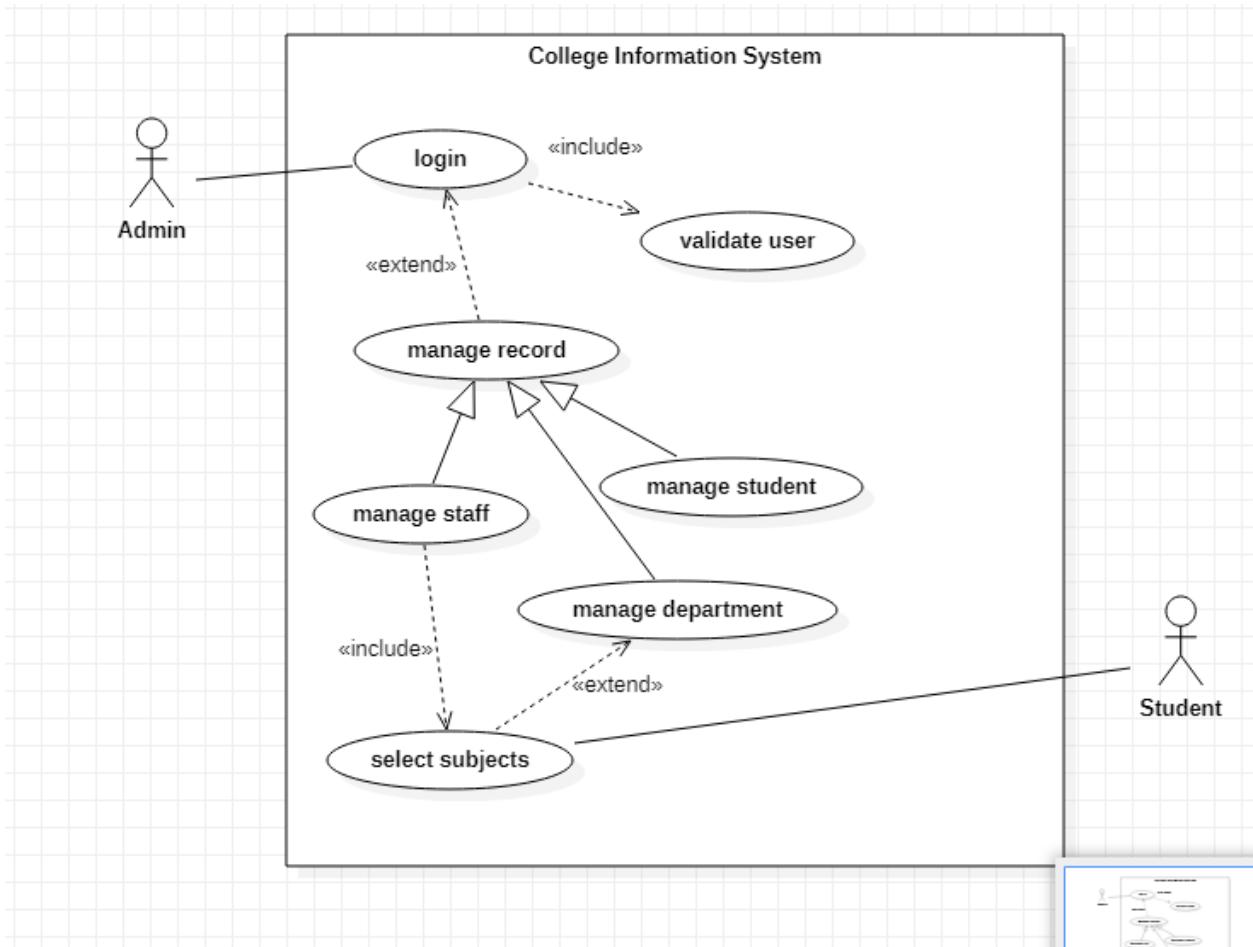


## **Give a description of the scenario considered for developing the model.**

The advanced state diagram depicted below contains one nested state and one submachine, which on successful login shows the course details and profileView procedure of student. It contains initial state and termination state with Courses as a nested state including the required simple states. It also has a submachine state named ProfileView with initial, termination state along with simple states; Display profile, Edit, Save.

#### 4. Draw the advanced use case diagram

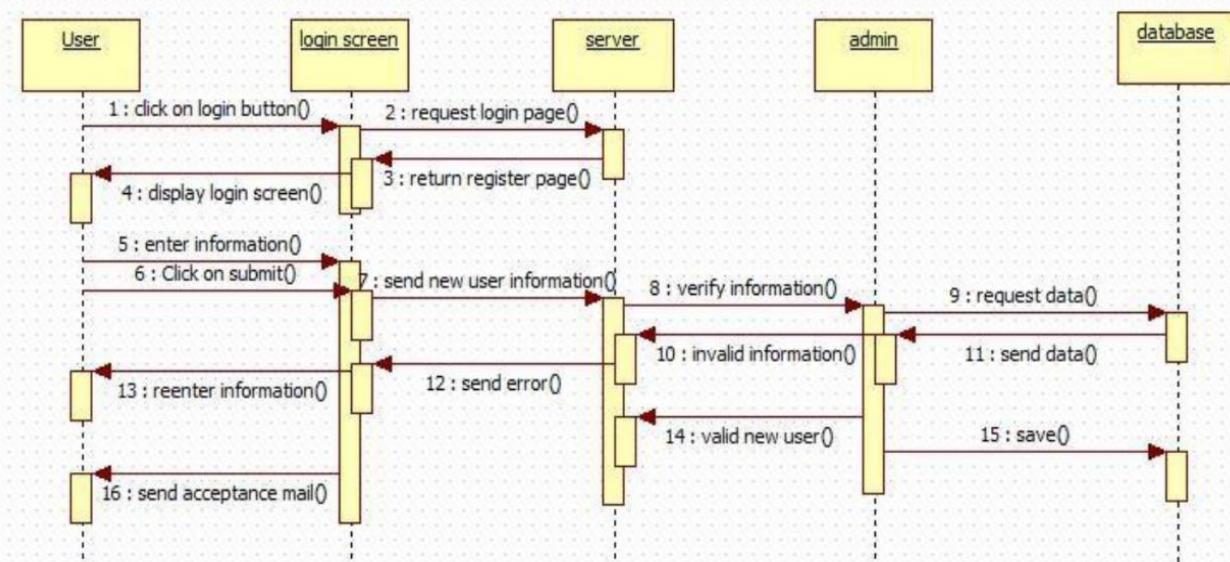
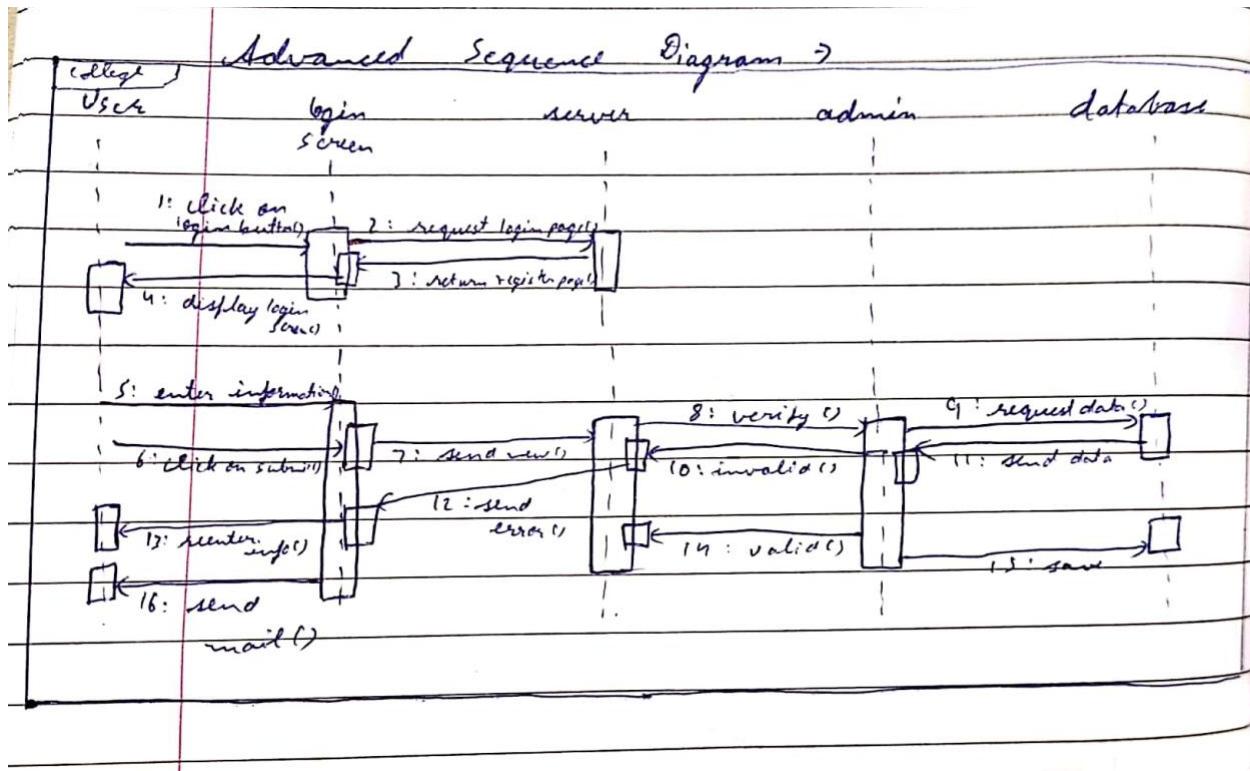




## Give a description of the scenario considered for developing the model

The advanced use case diagram has extra functionalities which includes extends, includes and generalization. The show available books use case extends view books use case, view events use case includes add events and remove events, issue books use case includes verify student and check availability of book.

## 5. Draw the advanced sequence diagram

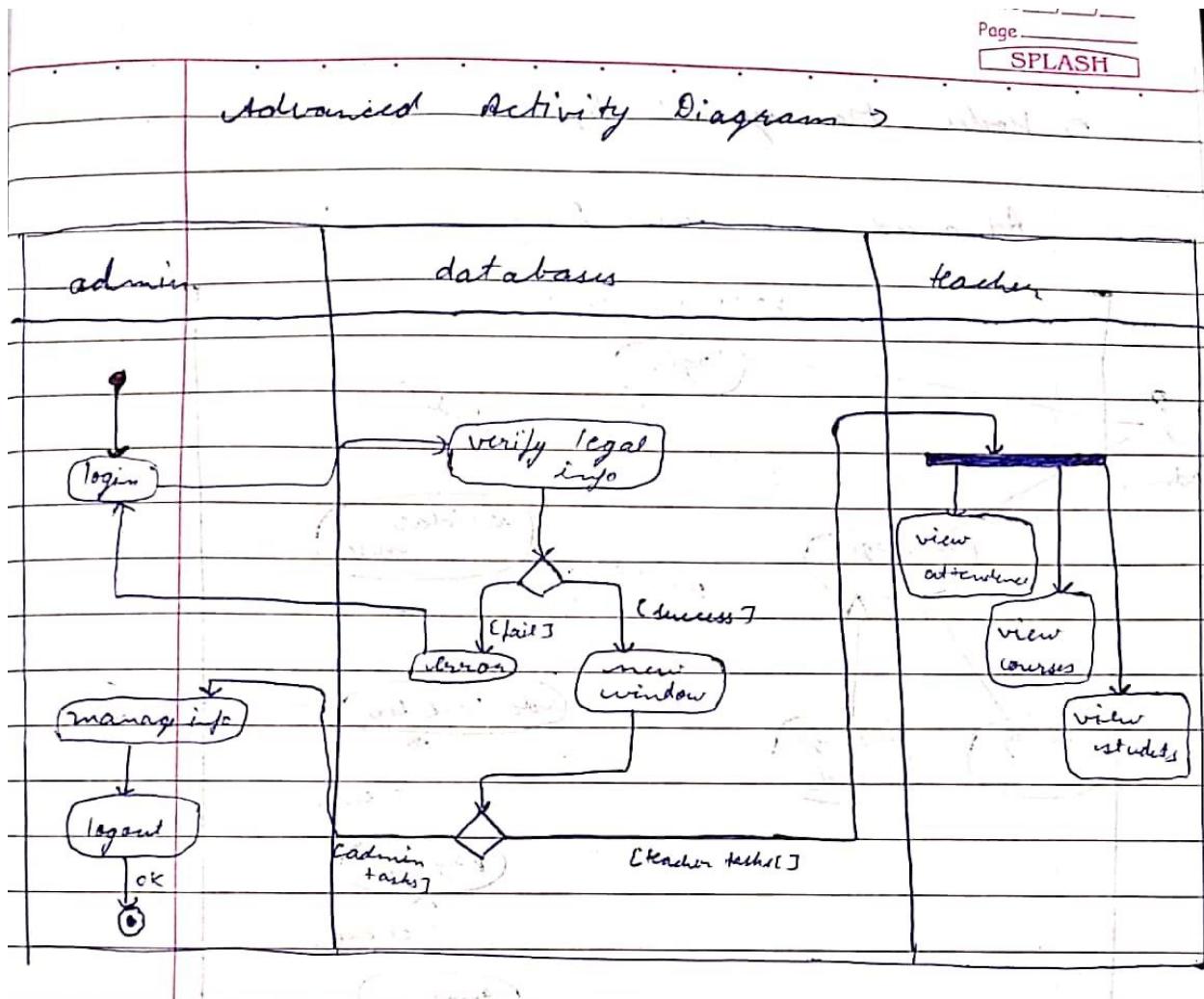


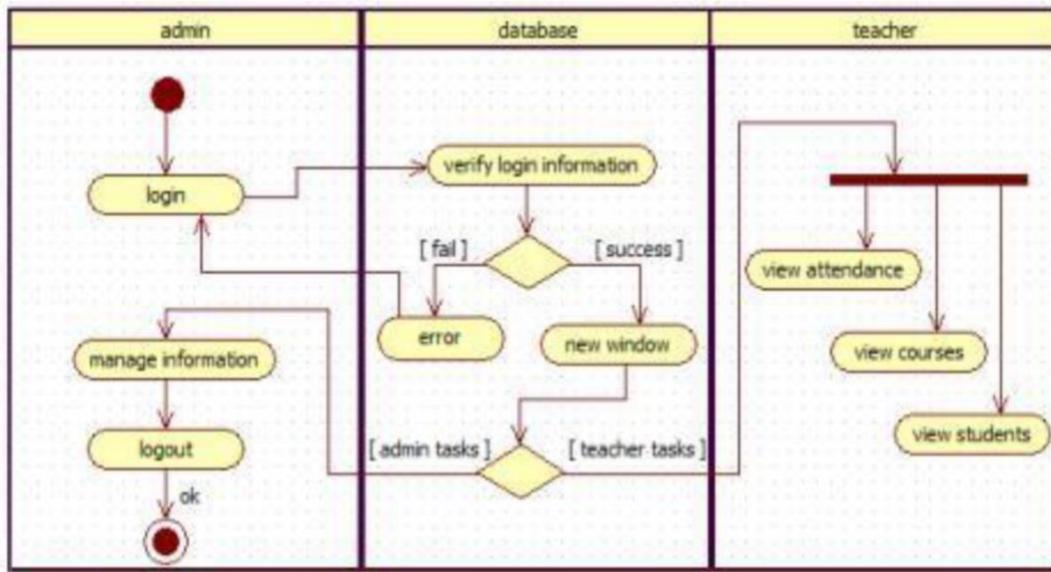
## Give a description of the scenario considered for developing the model

The lifeline is the dotted line and the rectangles represent the period of time the object is executing and is hence called activation.

The recursive function of verify is shown by double activation rectangle of verify payment and successful message.

## 6. Draw the advanced activity diagram





## Give a description of the scenario considered for developing the model

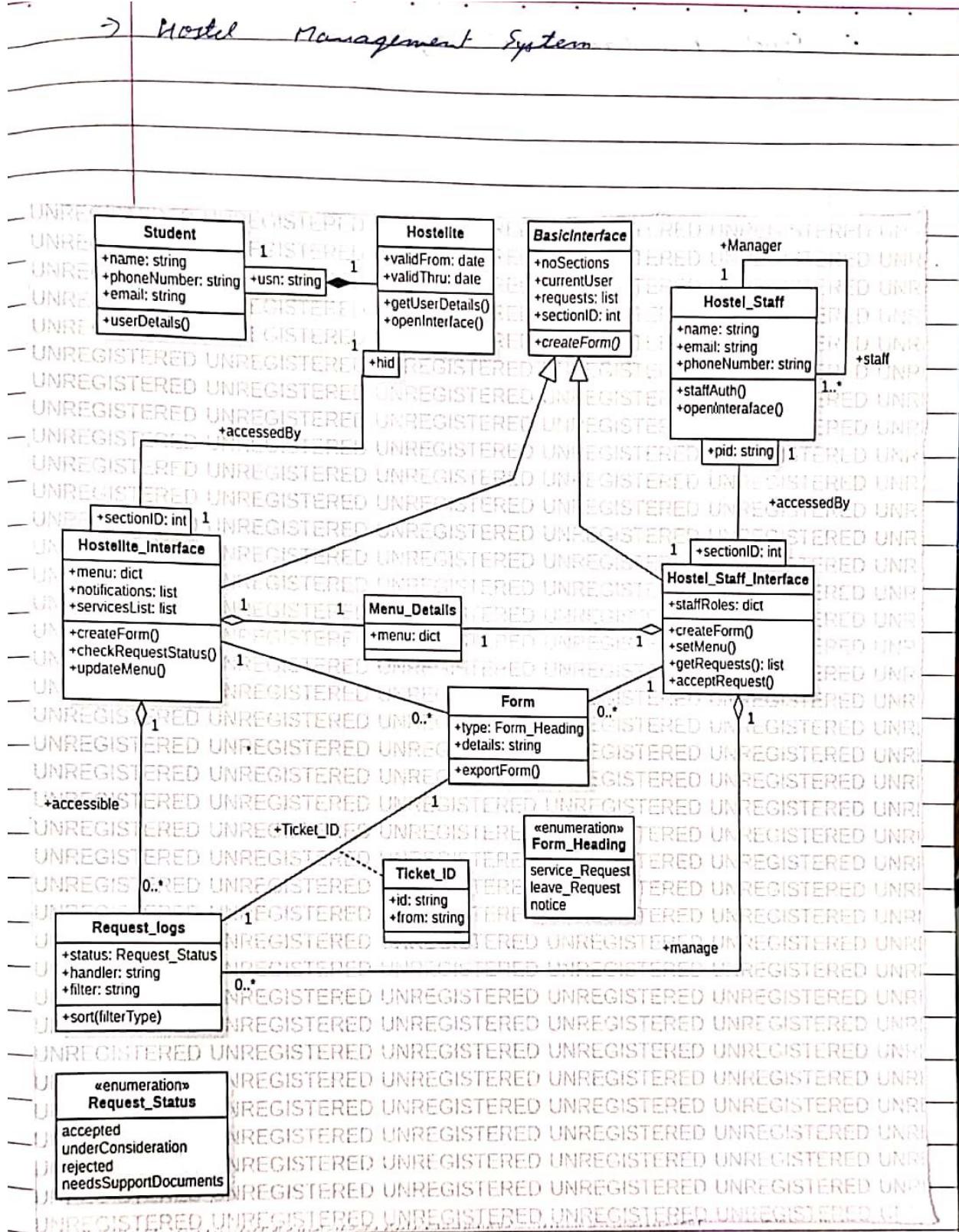
The advanced activity diagram starts from initiation and then user login activity where a signal is sent to the network for request validation and upon confirmation the control flows to profile and then fee payment activity. There are three swimlanes for Payment gateway, Database manager and accountant where validate payment, update database and generate receipt respectively. Then the control flows to the home page and then termination activities.

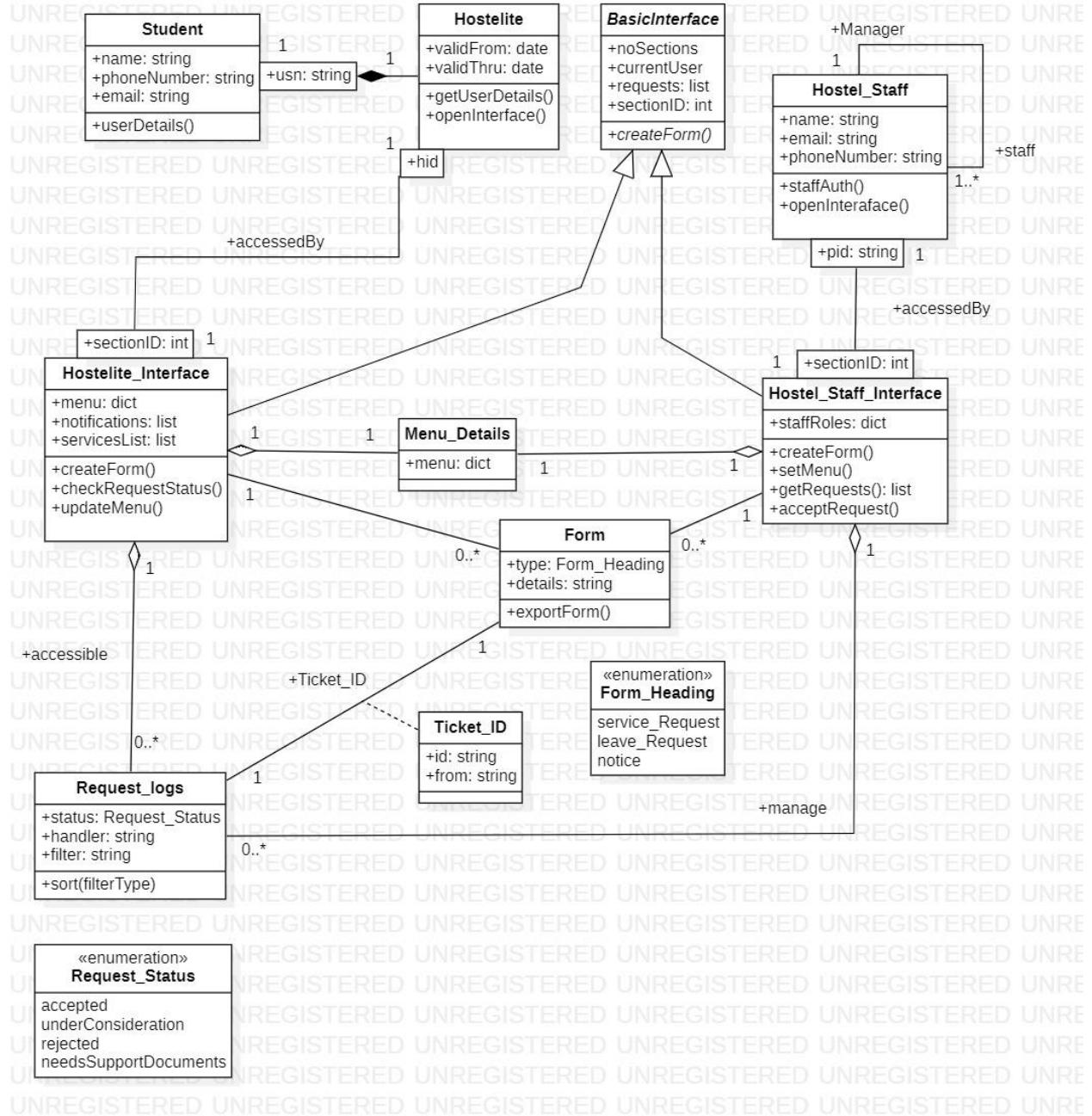
## Exercise 2: Hostel Management System

### 1. Write SRS

SRS	
→ Hostel Management system	System
SRs →	
→ The management should be able to edit, add and view hostel student details.	
→ The management should be able to manage the hostel, alloties and the payment methods.	
→ Admin can allocate rooms according to section or class. Admin will also keep track of payment made by student	
→ As the students course is over, they will vacate the rooms.	
→ Students make payment according to the bills generated having name, date.	
→ Management will allow renewing the students registration every year.	
→ Hostel should be categorised into boys or girls having diff staff & warden	

## 2. Draw the advanced class diagram





The below shown class diagram contains the following classes: Person, Student, Administrator, Warden, Hostel, Rooms\_allocation, Receipt\_generation, Rooms, Bed with multiplicities as shown.

Association: Warden manages Student, Student stays\_in Hostel, Student is allocated to Room\_allocation, Administrator decides\_room Room\_allocation, Administrator generates Receipt\_generation, .

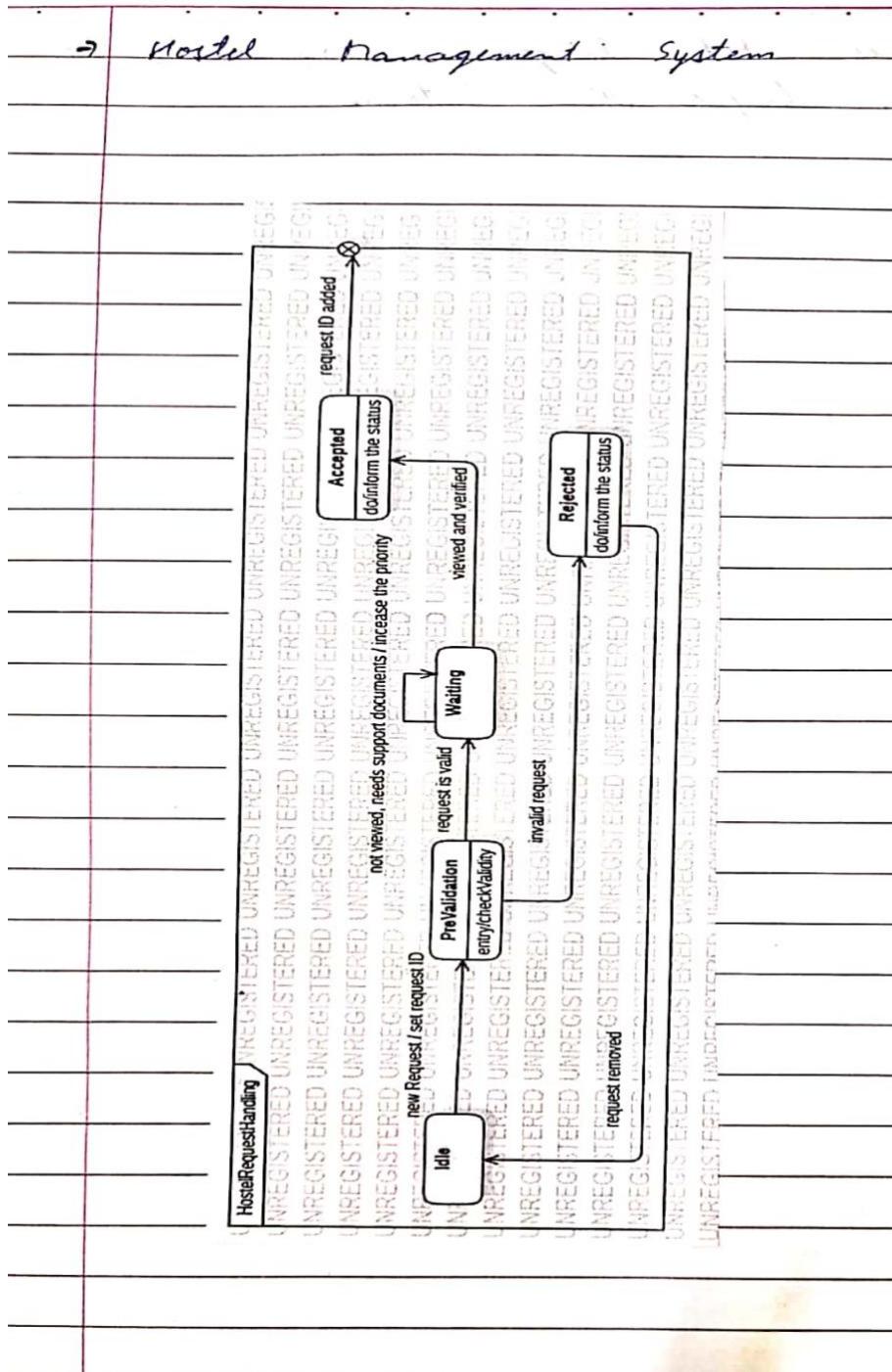
Generalization: Student, Administrator and Warden are generalized to Person class.

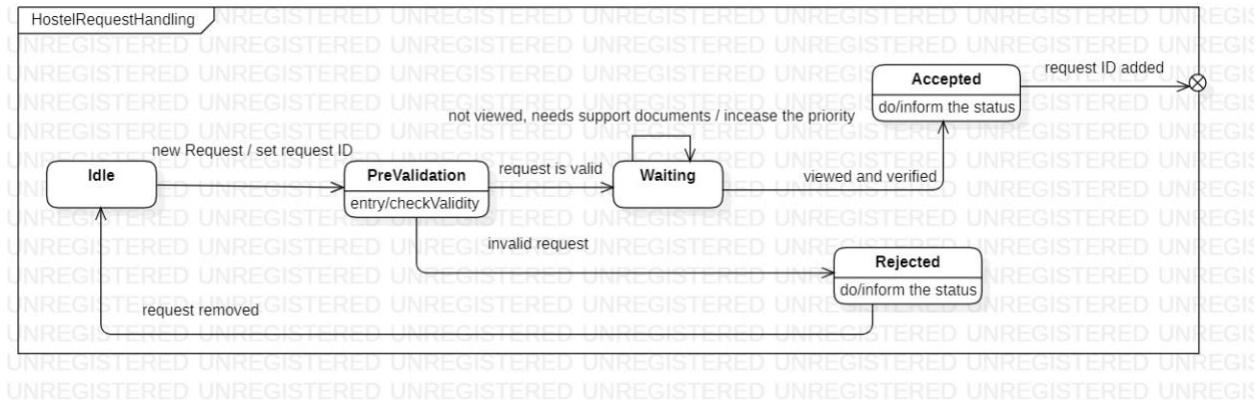
Aggregation: Rooms class (composed of) with Bed class.

Composition: Hostel has (or is composed of) Rooms.

Enumeration: RoomType.

### **3. Draw the advanced state diagram**





## Give a description of the scenario considered for developing the model

The below shown class diagram contains the following classes: Person, Student, Administrator, Warden, Hostel, Rooms\_allocation, Receipt\_generation, Rooms, Bed with multiplicities as shown.

Association: Warden manages Student, Student stays\_in Hostel, Student is allocated to Room\_allocation, Administrator decides\_room Room\_allocation, Administrator generates Receipt\_generation, .

Generalization: Student, Administrator and Warden are generalized to Person class.

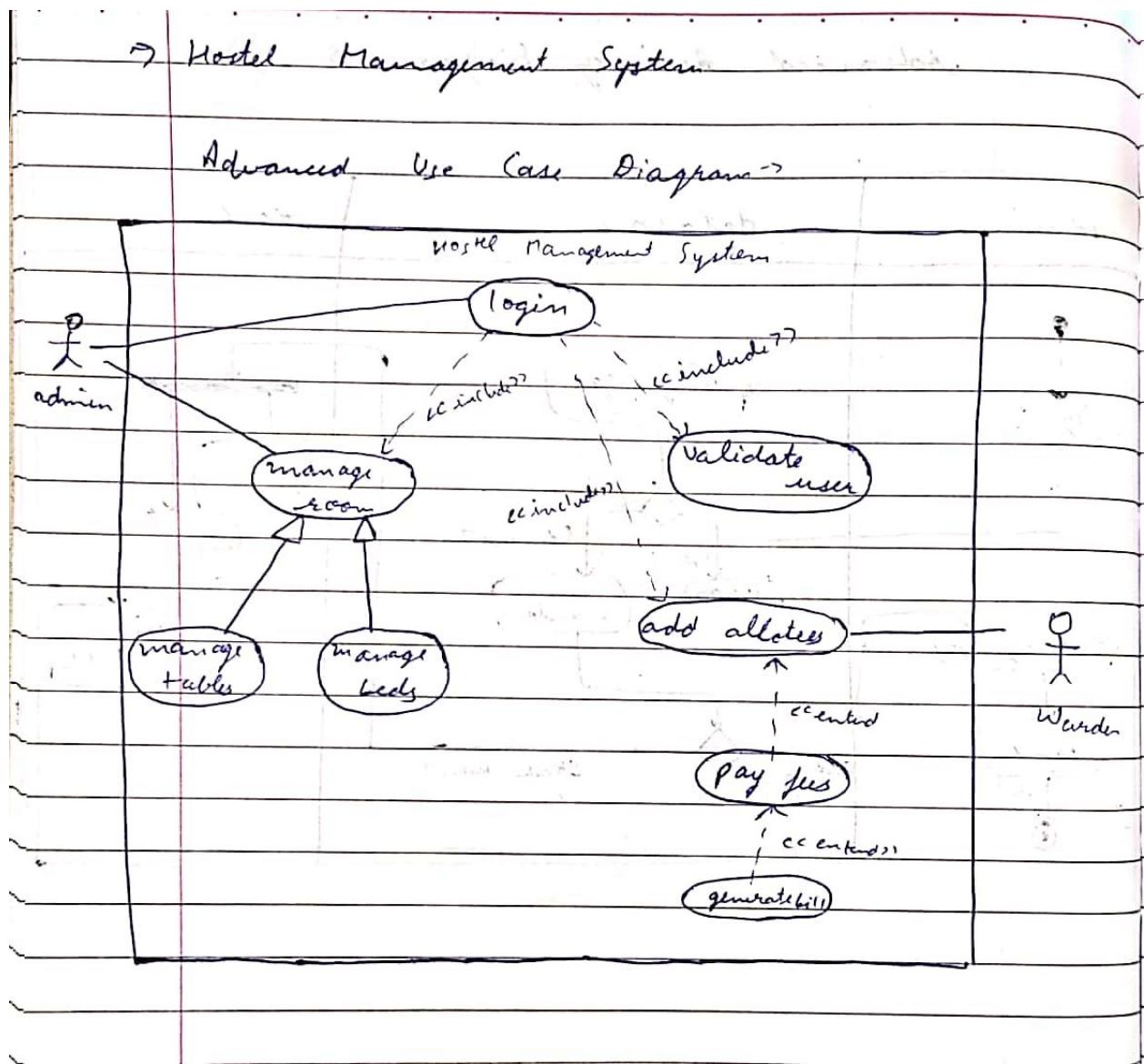
Aggregation: Rooms class (composed of) with Bed class.

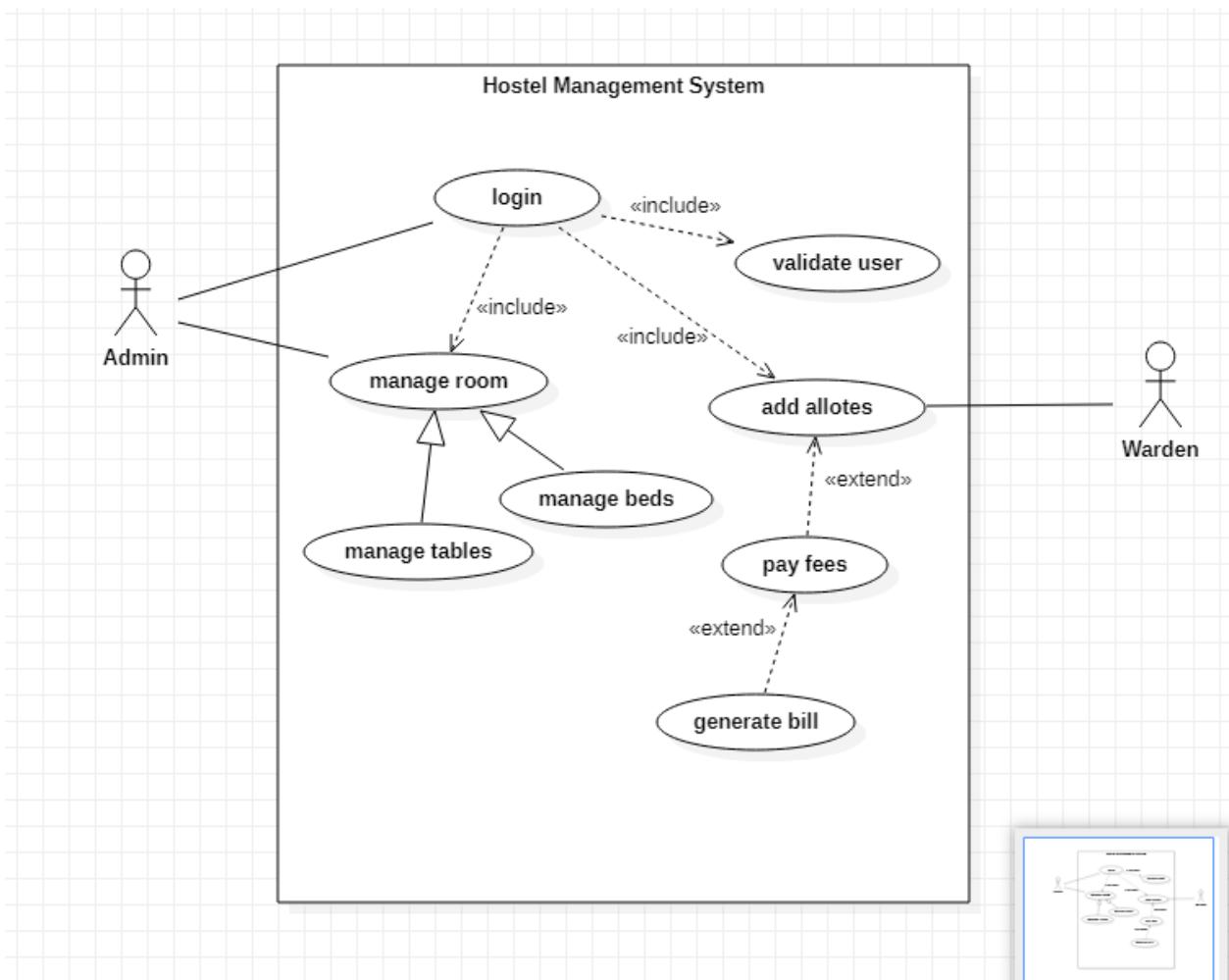
Composition: Hostel has (or is composed of)

Rooms.

Enumeration: RoomType.

#### 4. Draw the advanced use case diagram

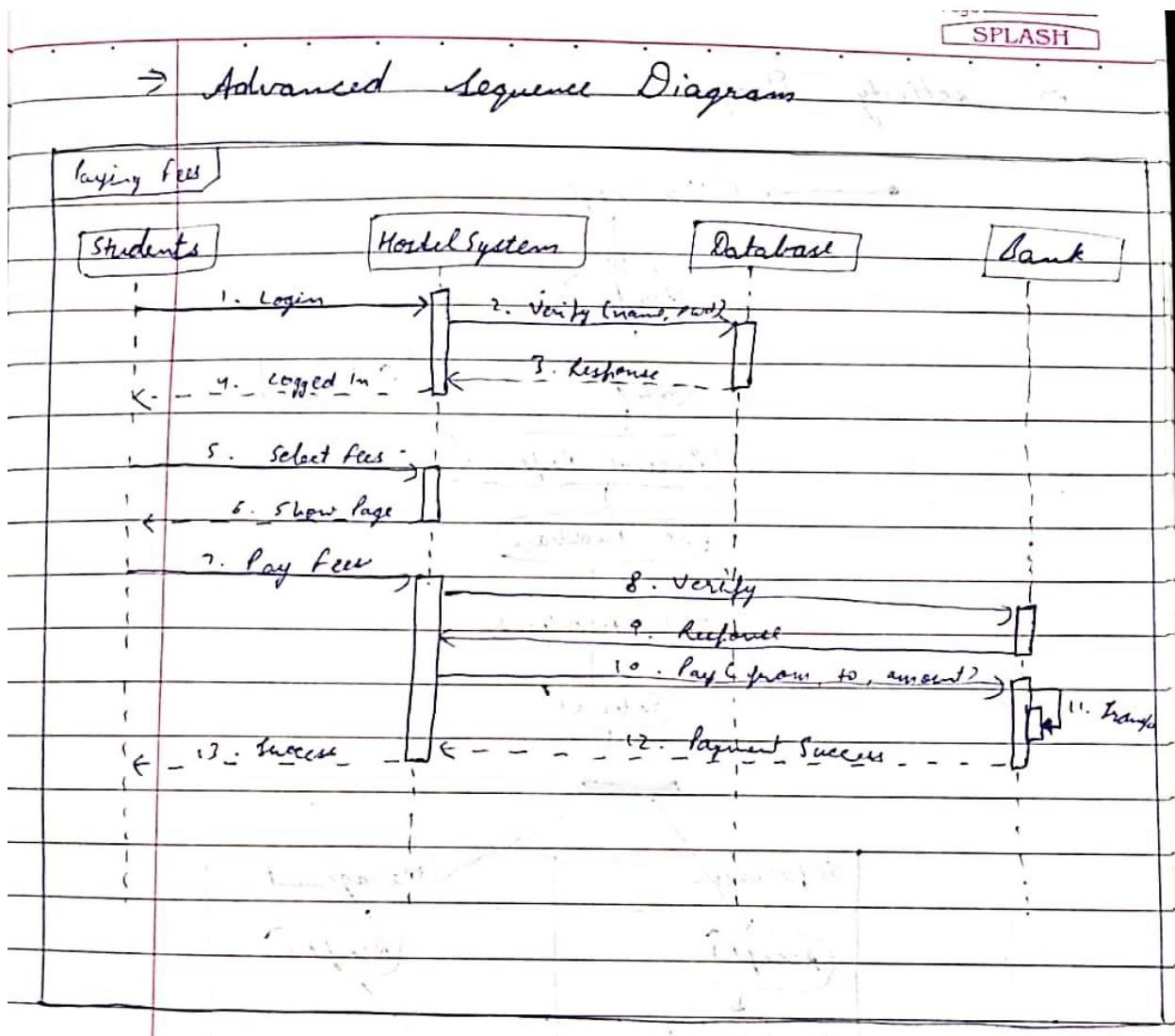


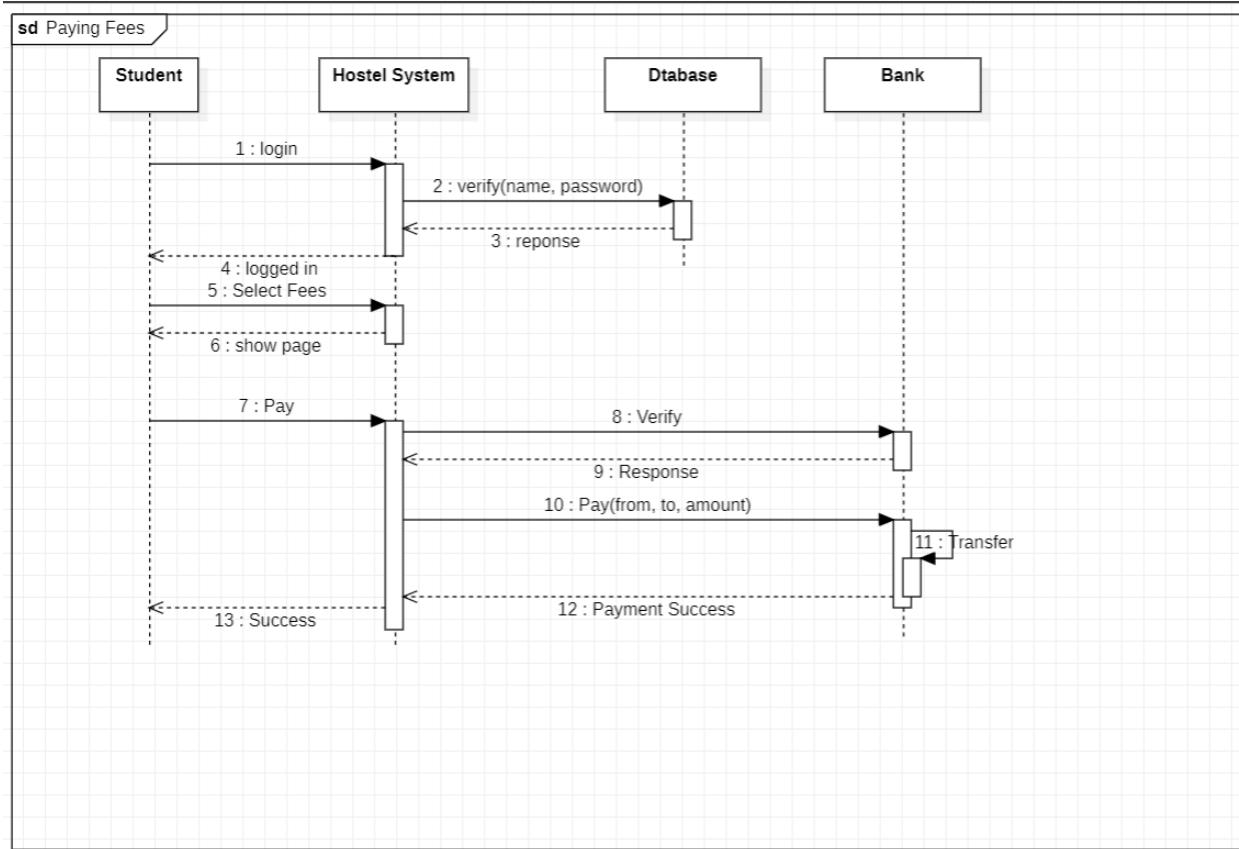


## Give a description of the scenario considered for developing the model

The advanced use case diagram has extra functionalities which includes extends, includes and generalization. The edit hostel info use case extends add room use case, collect fee use case includes verify student, add room use case includes delete room use case.

## 5. Draw the advanced sequence diagram





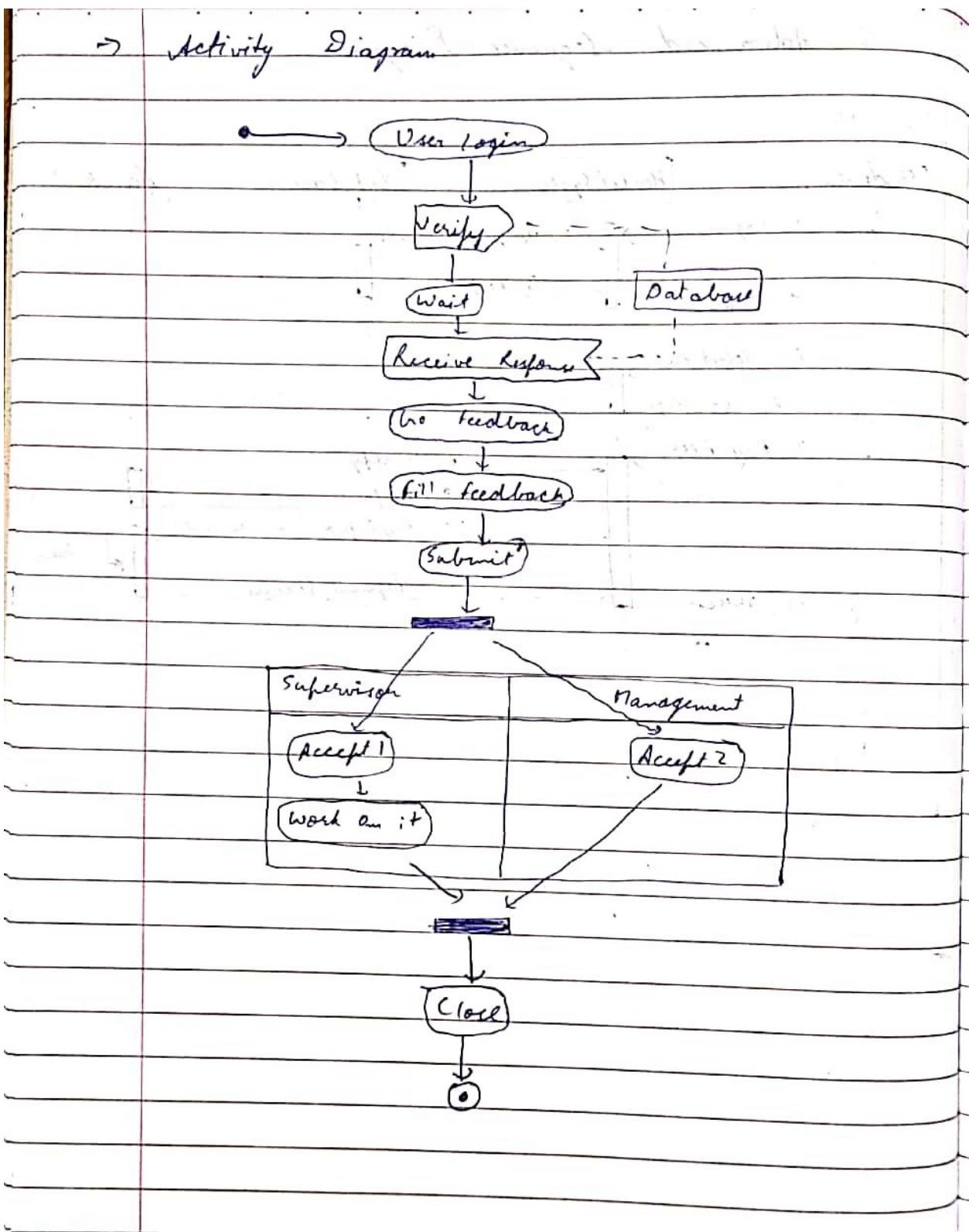
## Give a description of the scenario considered for developing the model

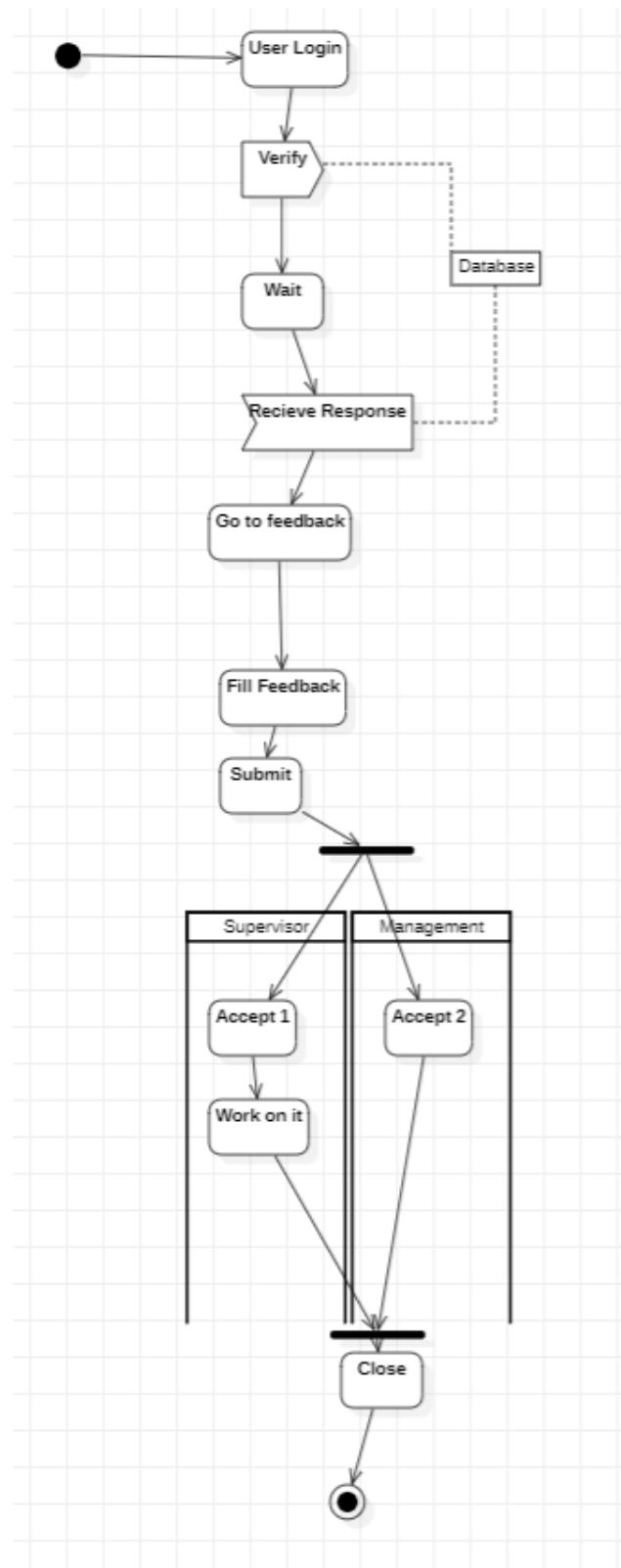
The lifeline is the dotted line and the rectangles represent the period of time the object is executing and is hence called activation.

The Login actor has self-message to check with the registration of the student.

Async and sync signal replies (dotted line) are used to reply back with specificity to the object.

## 6. Draw the advanced activity diagram





## **Give a description of the scenario considered for developing the model**

The advanced activity diagram starts from initiation and then in the student swimlane, student login activity where a signal is sent to the network for request validation and upon confirmation the control flows to profile and then book room activity. There are three swimlanes namely student, database, payment where validate student, update database and confirm payment respectively. Then the control flows to the home page and then termination activities.

### Exercise 3: Stock Maintenance System

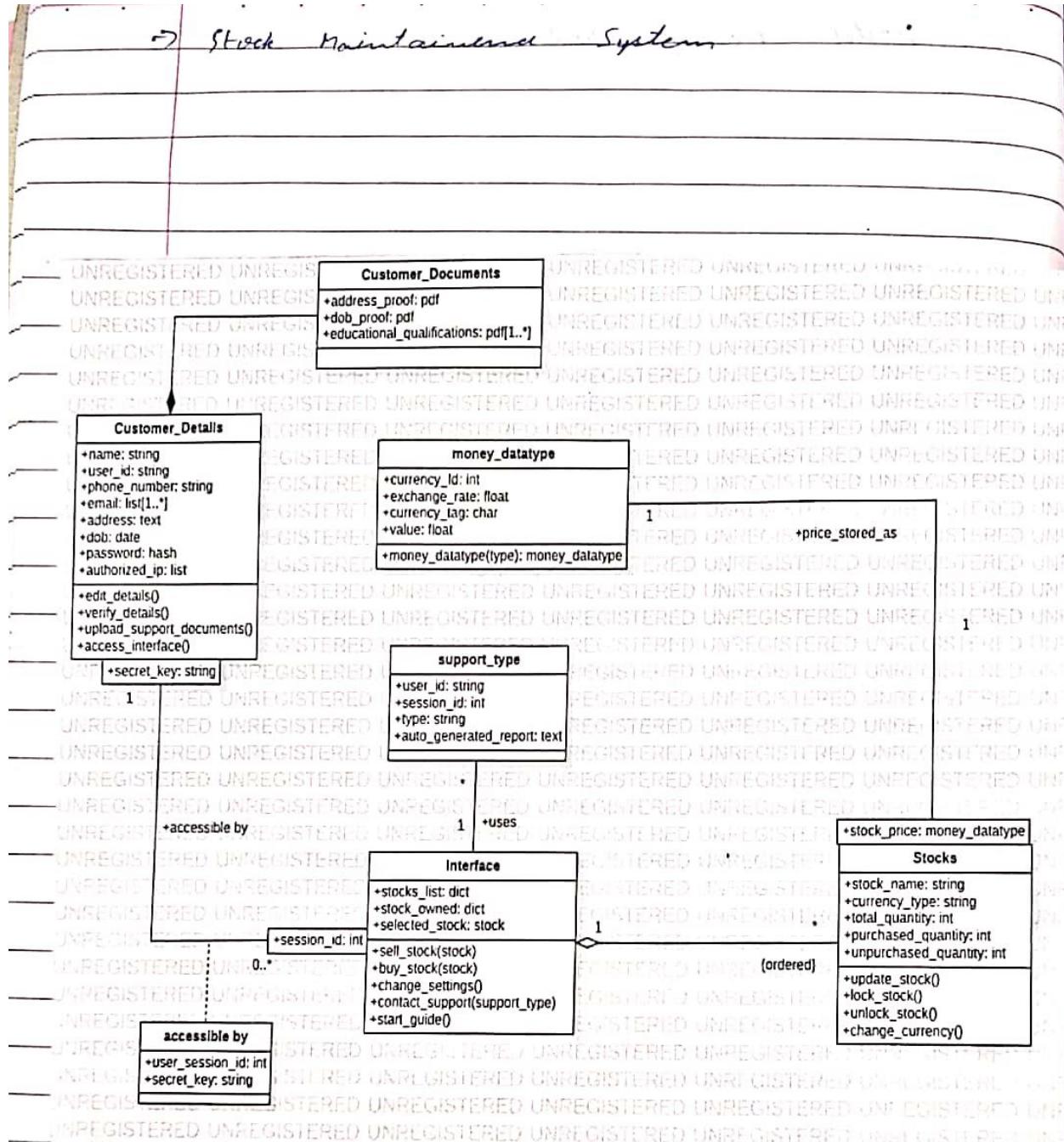
#### 1. Write SRS

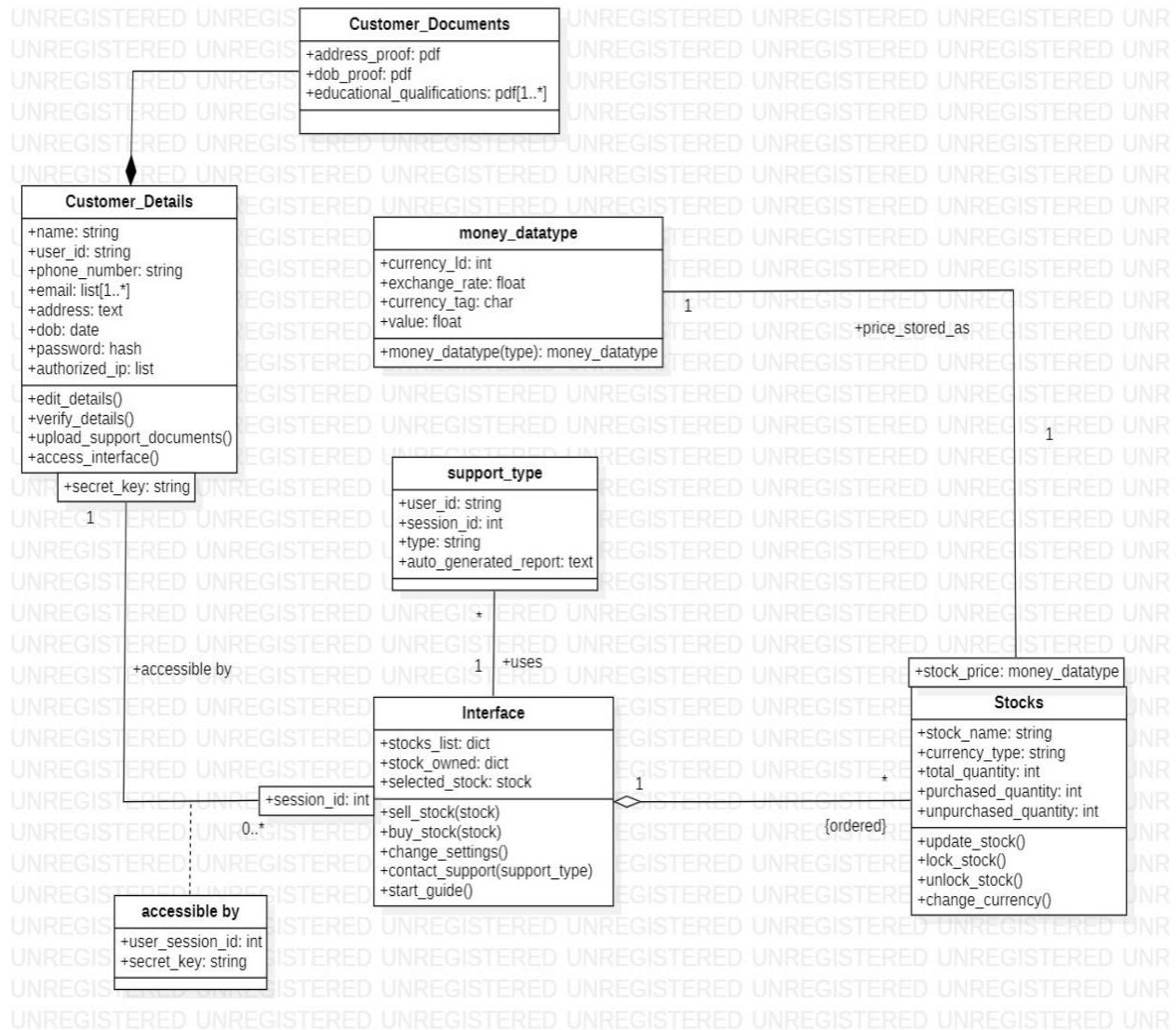
→ Stock Maintenance System

SRS →

- Customer can purchase one or more product on any day having code, price & quantity.
- Customer needs to pay the bill for stocks purchased.
- Stock deals with information about the details of the product is maintained.
- It contains details such as name of product, id, quantity.
- Vendor deals with information about the details of suppliers giving product to organization.
- Vendor details are stored & retrieved when a purchase is done.
- Information regarding store such as id, name, address & type are used to locate many product.
- Stores can be of many type such as departmental stores etc.

## 2. Draw the advanced class diagram





The below shown class diagram contains the following classes: Role, Permissssion, Store, User, Stock, Product, Customer and Payment with multiplicities as shown.

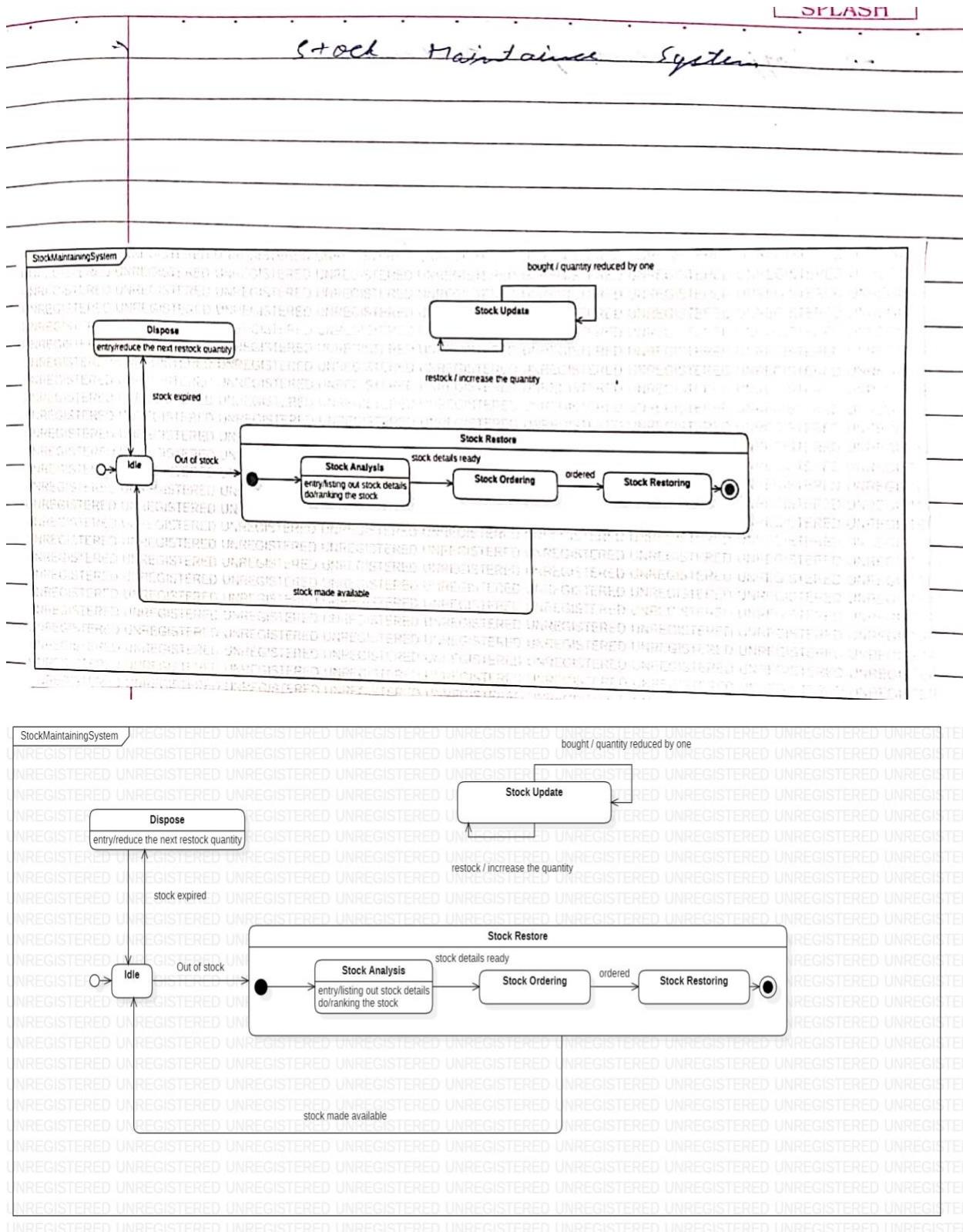
Association: Customer buys Product, Customer buys Stocks, Customer pays Payment.

Generalization: User is generalized to Permission class and User is Generalized to Role.

Aggregation: Stock class, Product class, Store class, Customer class are (composed of) withPermission class.

Composition: Payment needs (or is composed of) Permission and Stock (or is composed of) hasProduct.

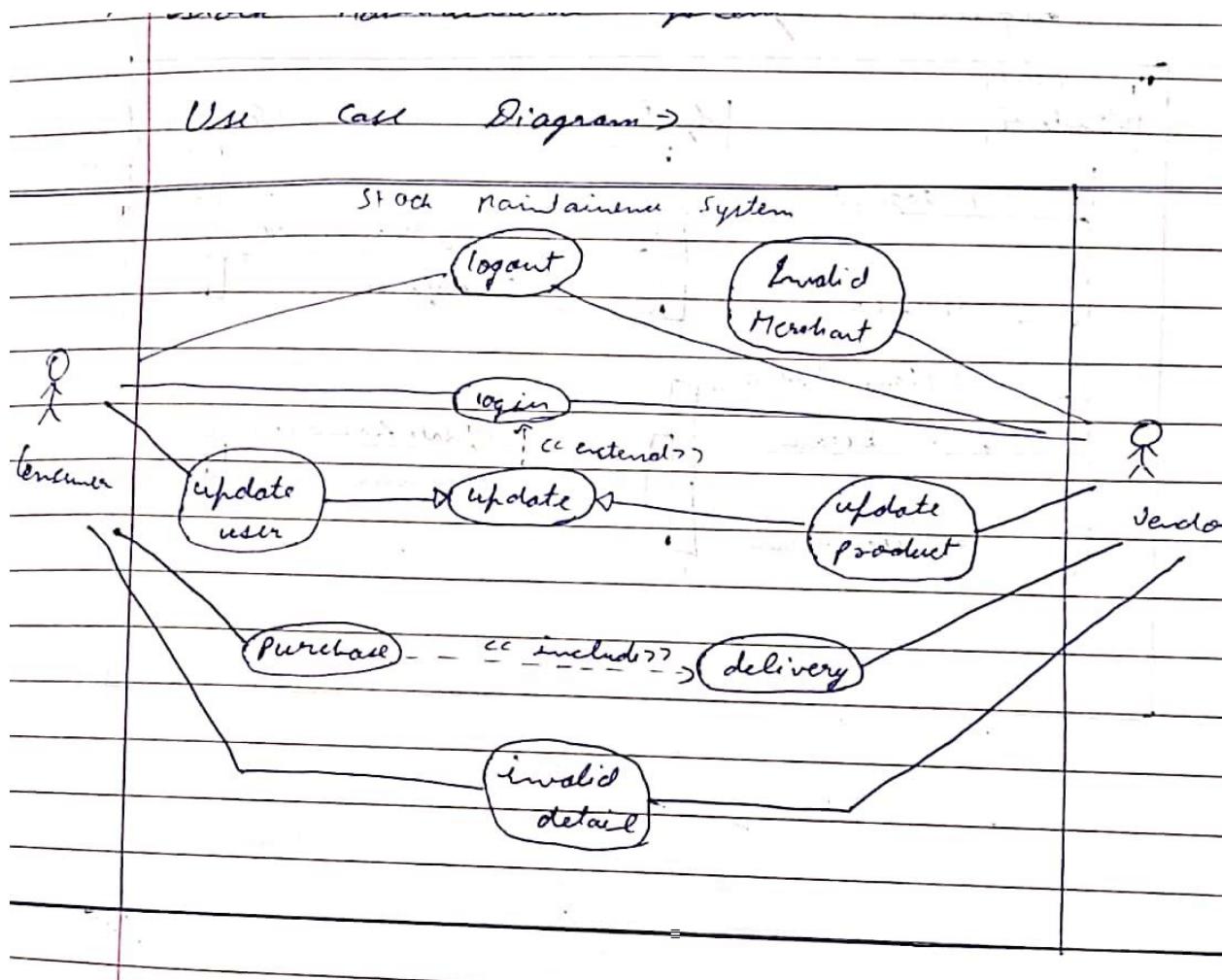
### 3. Draw the advanced state diagram

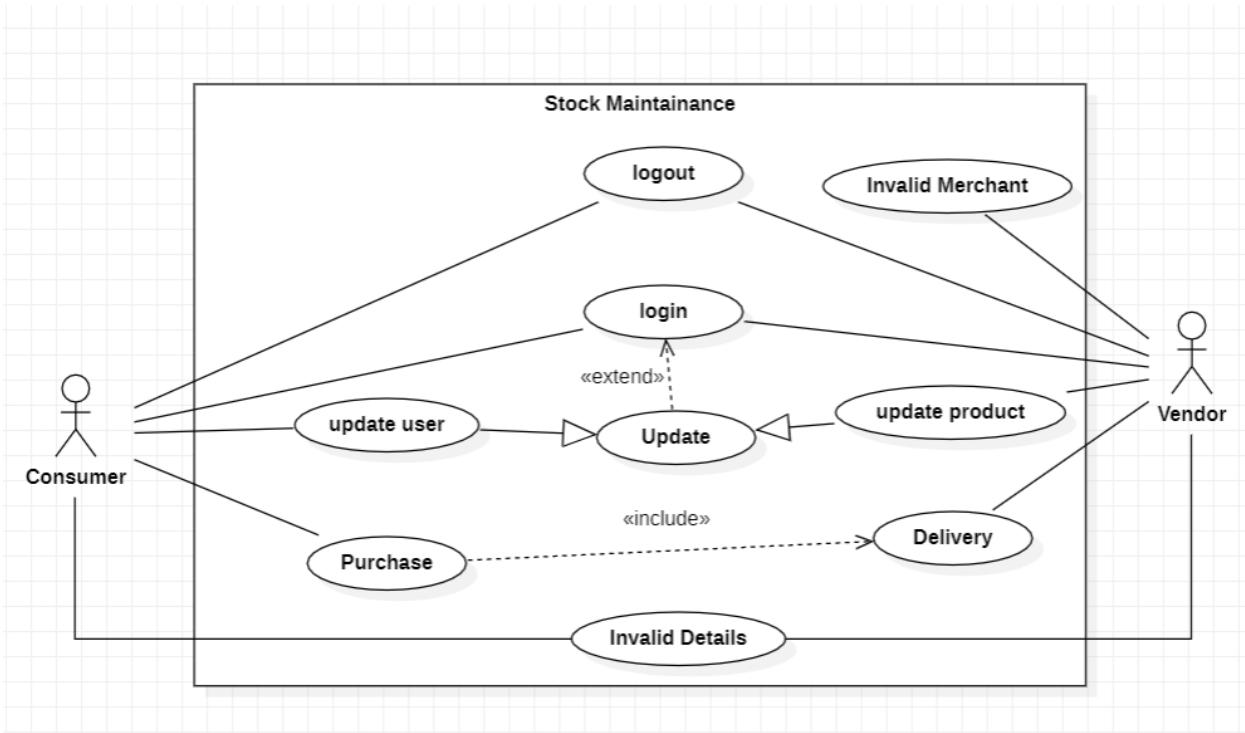


## **Give a description of the scenario considered for developing the model**

The advanced state diagram depicted below contains one nested state and one submachine, which on successful login shows the StockStatus details and StockPurchase procedure. It contains initial state and termination state with Maintaining as a nested state including the required simple states. It also has a submachine state named StockPurchase with initial, termination state along with simple states; Inventory check, Sell, Payment, Validation.

#### 4. Draw the advanced use case diagram

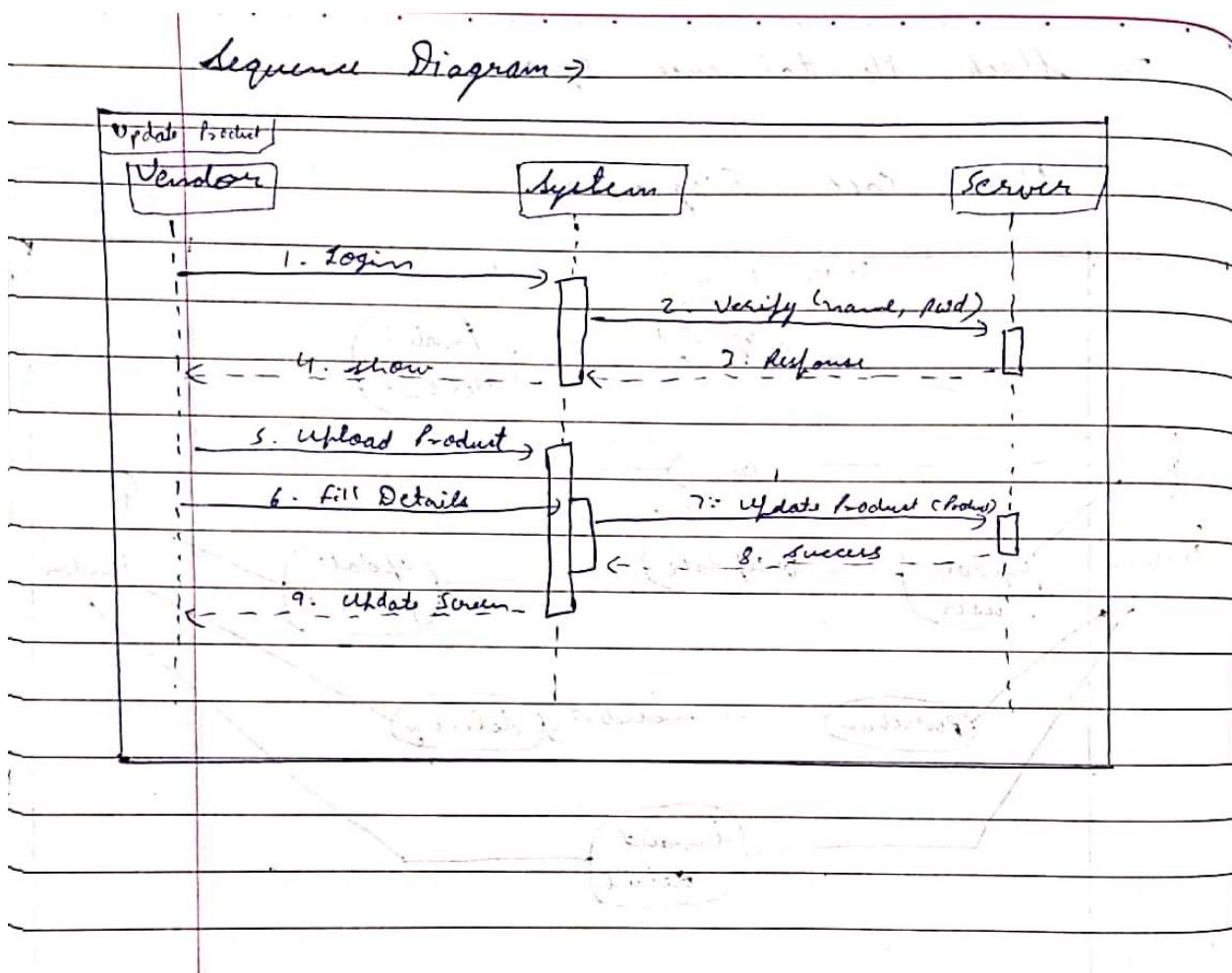


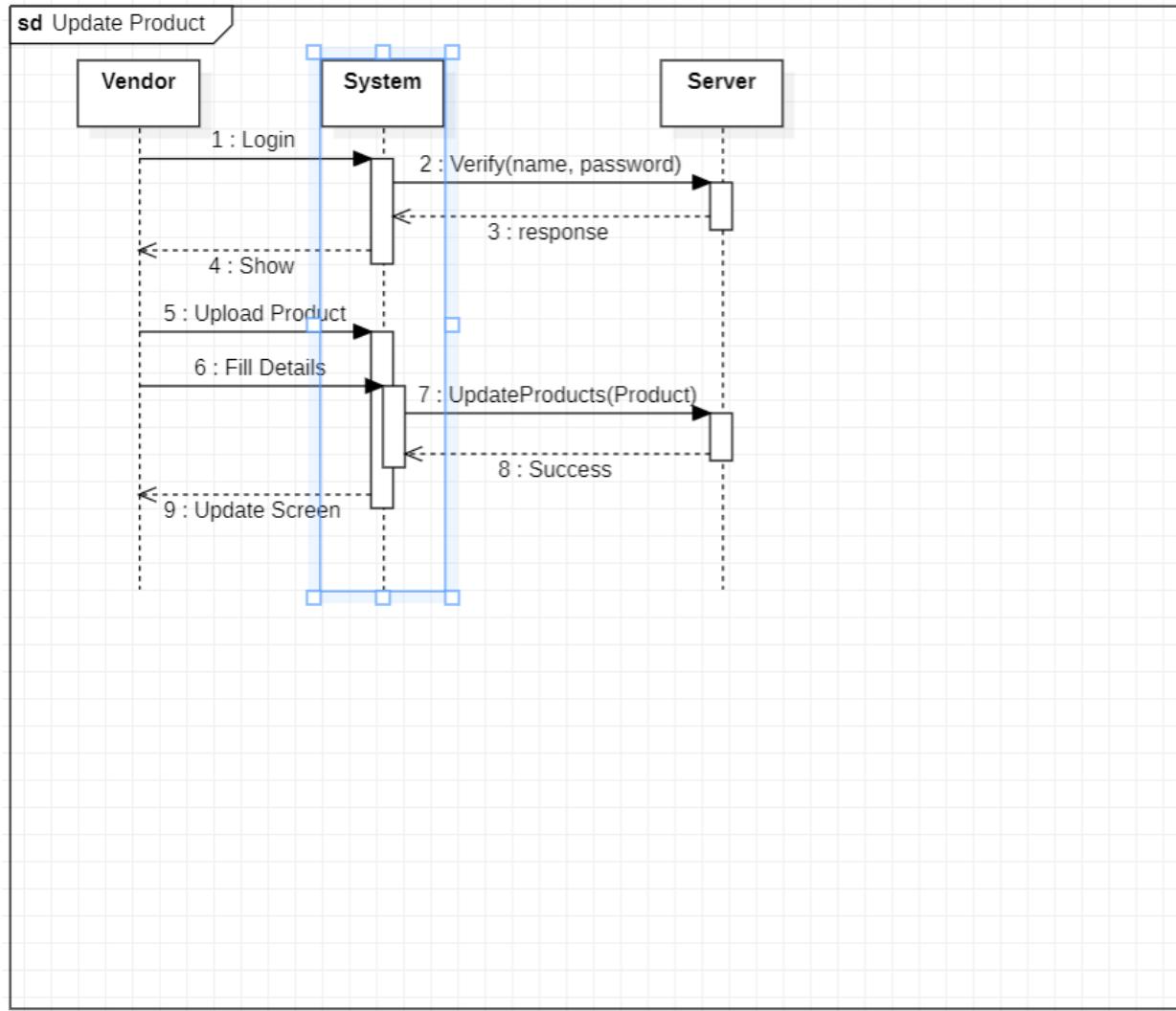


## Give a description of the scenario considered for developing the model

The advanced use case diagram has extra functionalities which includes extends, includes and generalization. The stock level use case extends place order use case, detective shipment use case extends check quality criteria use case , shipment error use case extends receive shipment with bill use case, pay bill use case includes track order use case.

## 5. Draw the advanced sequence diagram



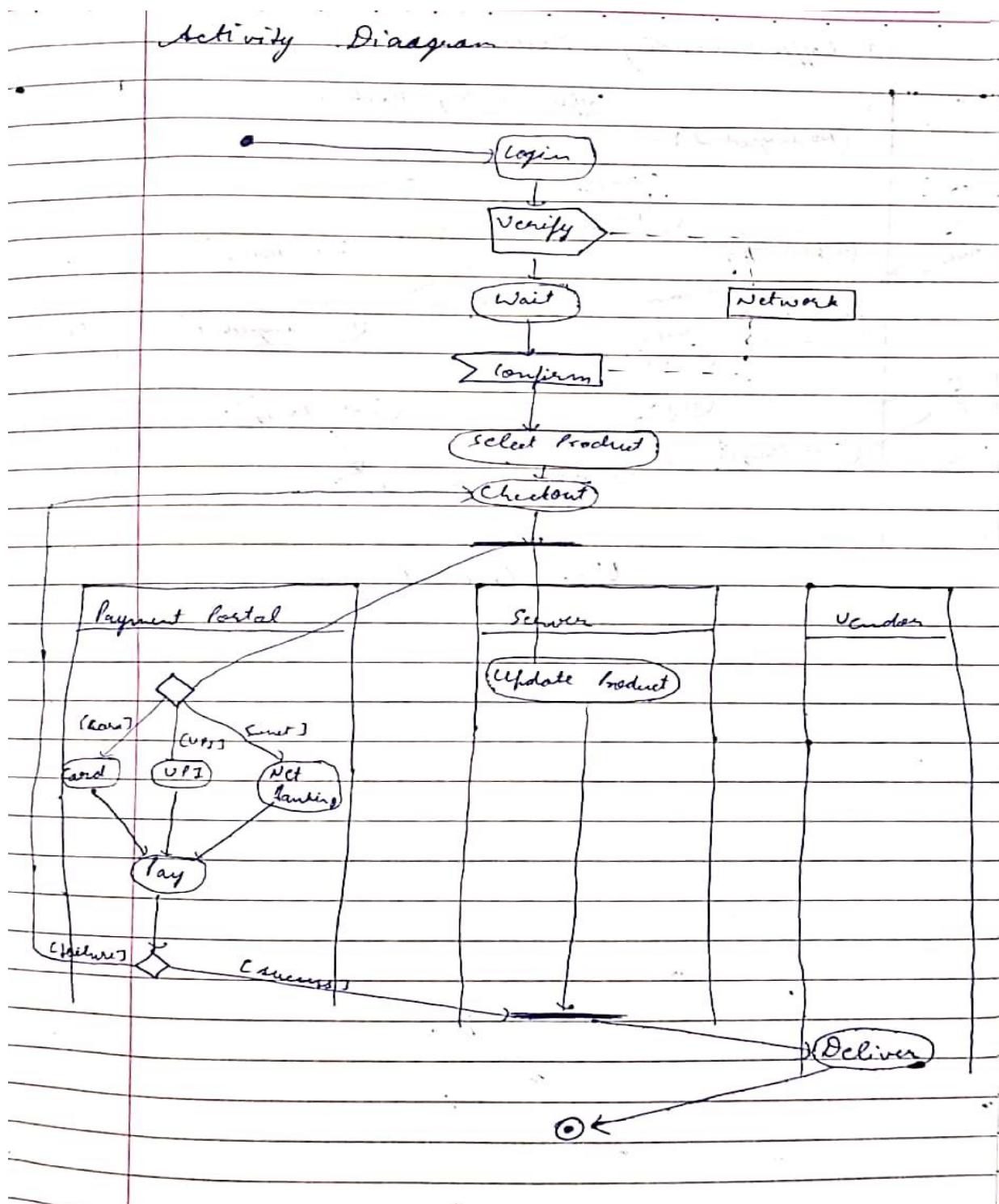


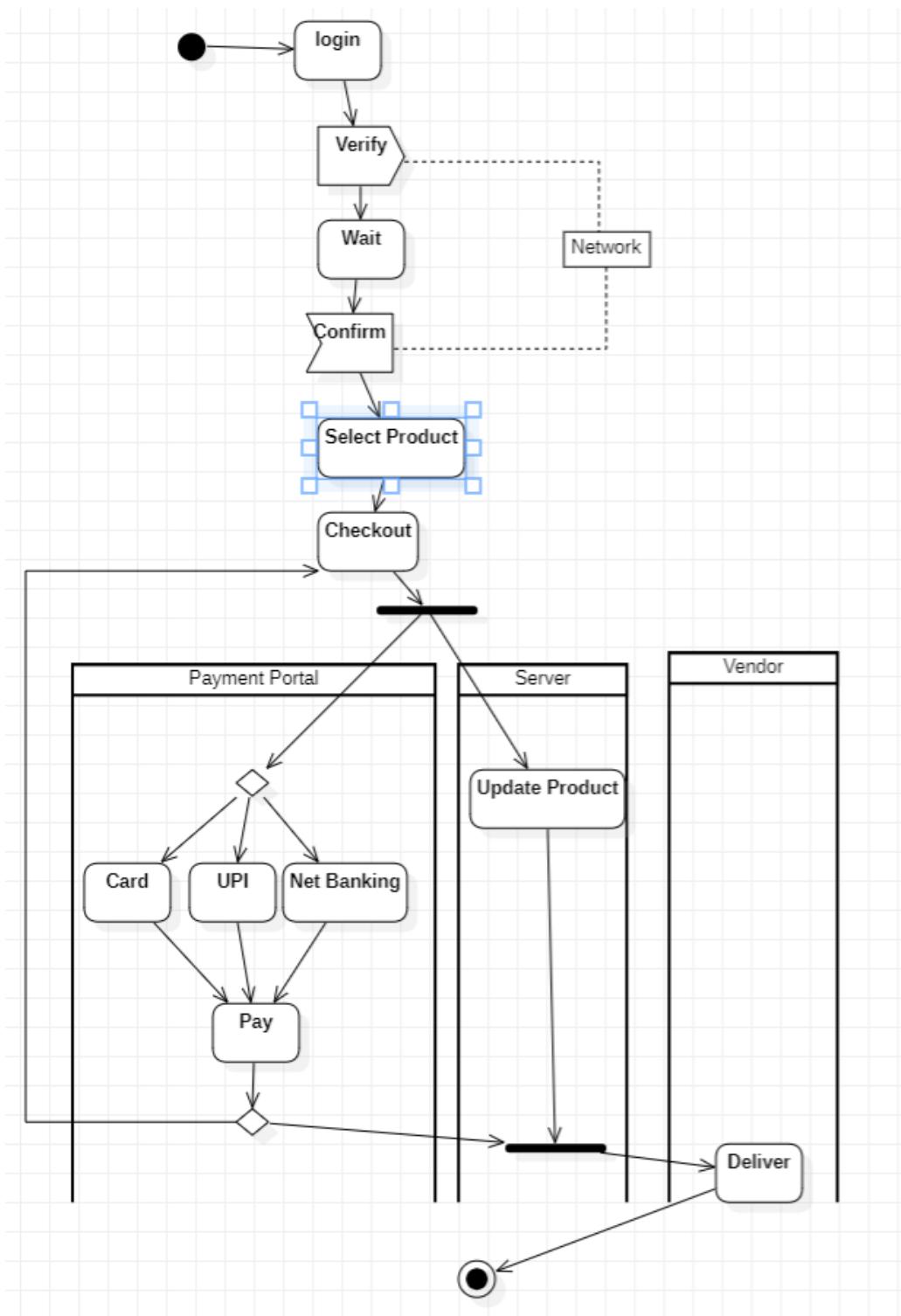
## Give a description of the scenario considered for developing the model

The lifeline is the dotted line and the rectangles represent the period of time the object is executing and is hence called activation.

Create message signal is used to indicate the display of failure in any failure situation.

## 6. Draw the advanced activity diagram





## **Give a description of the scenario considered for developing the model**

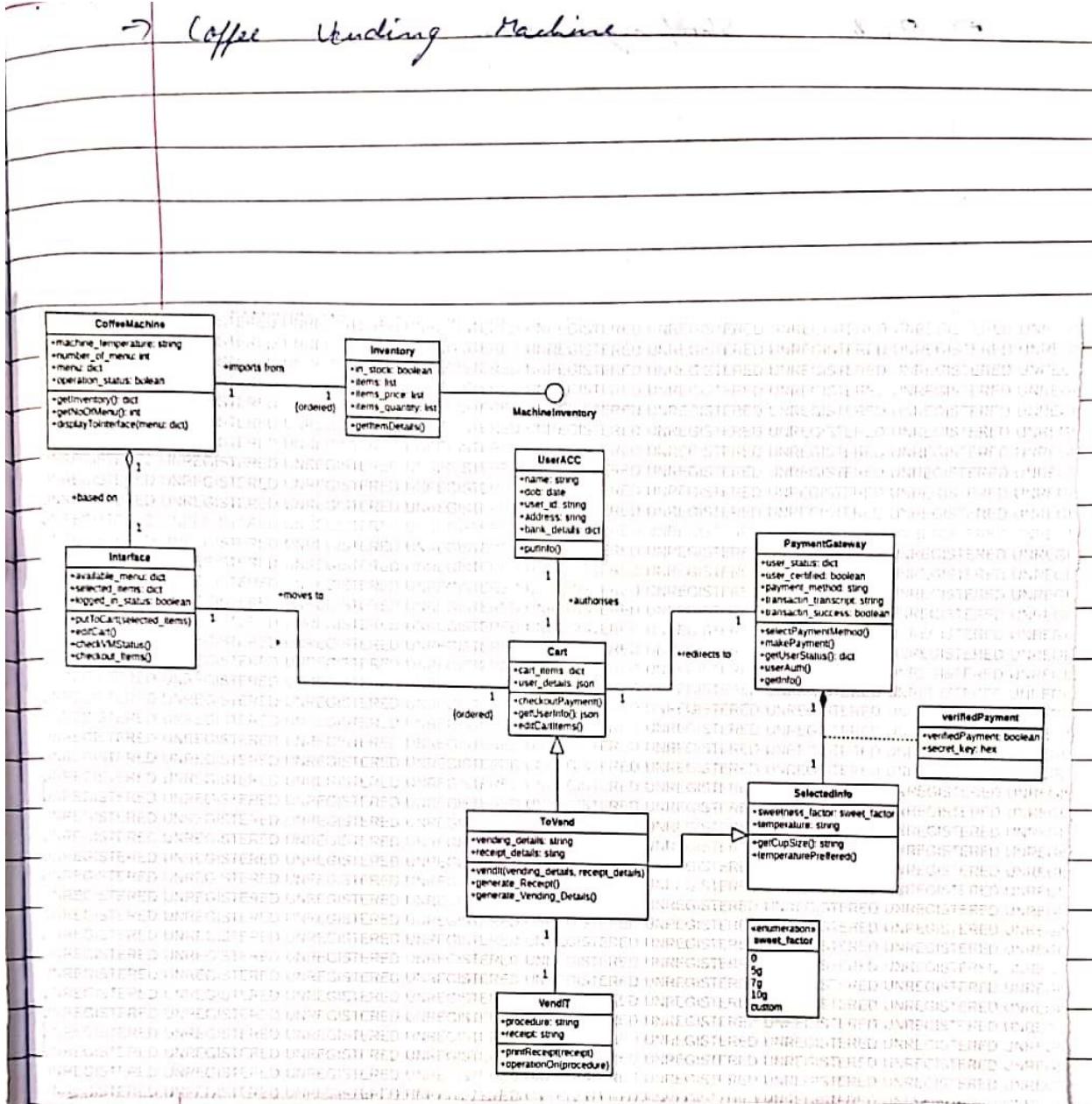
The advanced activity diagram starts from initiation and then user login activity where a signal is sent to the network for request validation and upon confirmation the control flows to order received and then check inventory activity. There are three swimlanes namely inventory manager, accountant and sale agent where update inventory, update payment and generate bill respectively. Then the control flows to the home page and then termination activities.

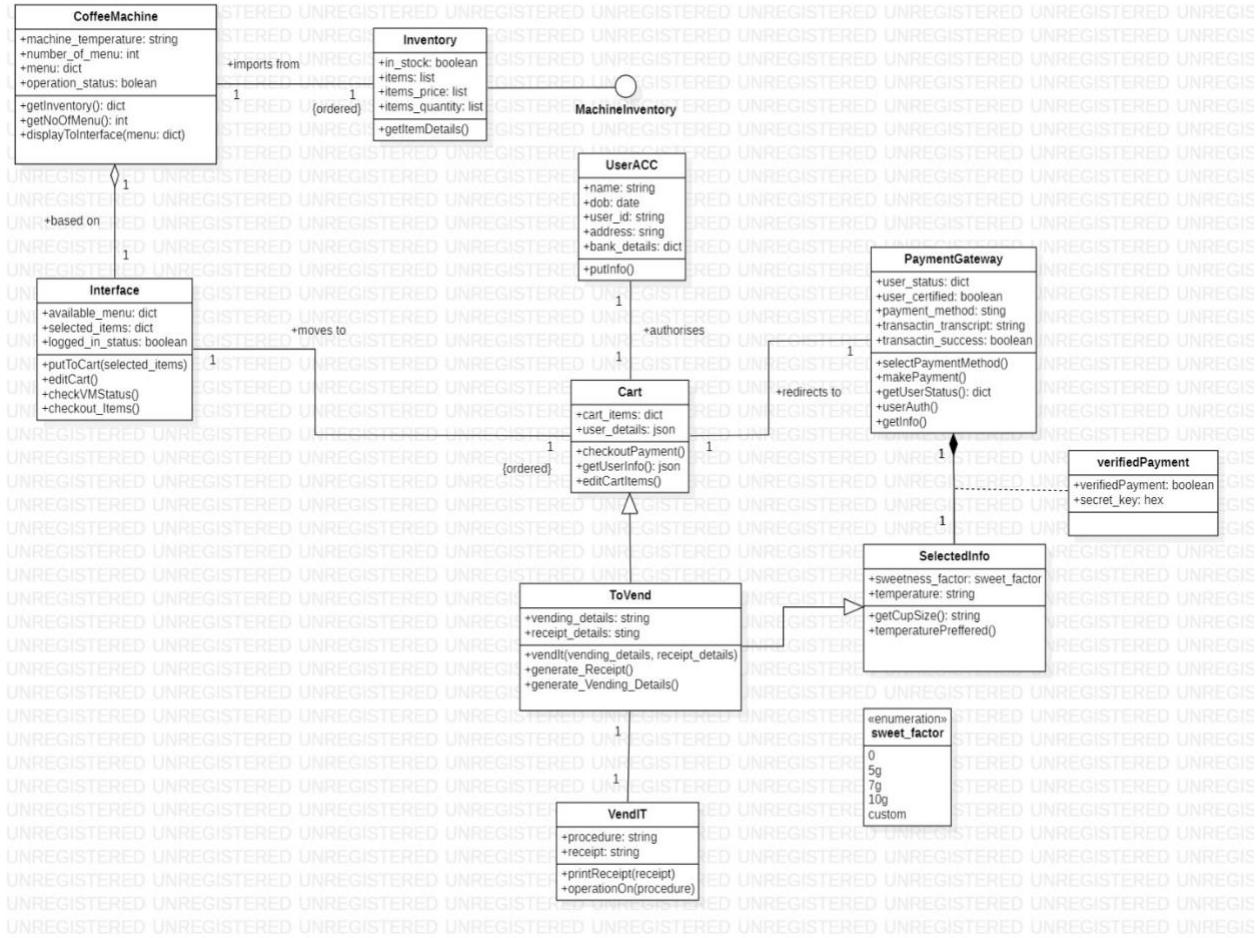
## Exercise 4: Coffee Vending Machine

### 1. Write SRS

1) Coffee Vending Machine	
SRS →	
→ Vending machine must keep track of inventory.	
→ A person should be able to insert cash into the machine and choose an item.	
→ The machine should confirm the inserted cash with the price of selected item.	
→ The machine must display an error in case of insufficient cash or if an item is unavailable.	
→ Finally if all above steps succeed then the user gets the item.	
→ The user should be able to select the type of flavours & their amounts like sugar quantity etc.	

## 2. Draw the advanced class diagram





The below shown class diagram contains the following classes: Coffee Machine, Cash Box, Selector, Dispenser Register, Dispenser, Ingredient, Recipe, Product, Product Register. with multiplicities as shown.

Association: Customer buys Product, Customer buys Stocks, Customer pays Payment.

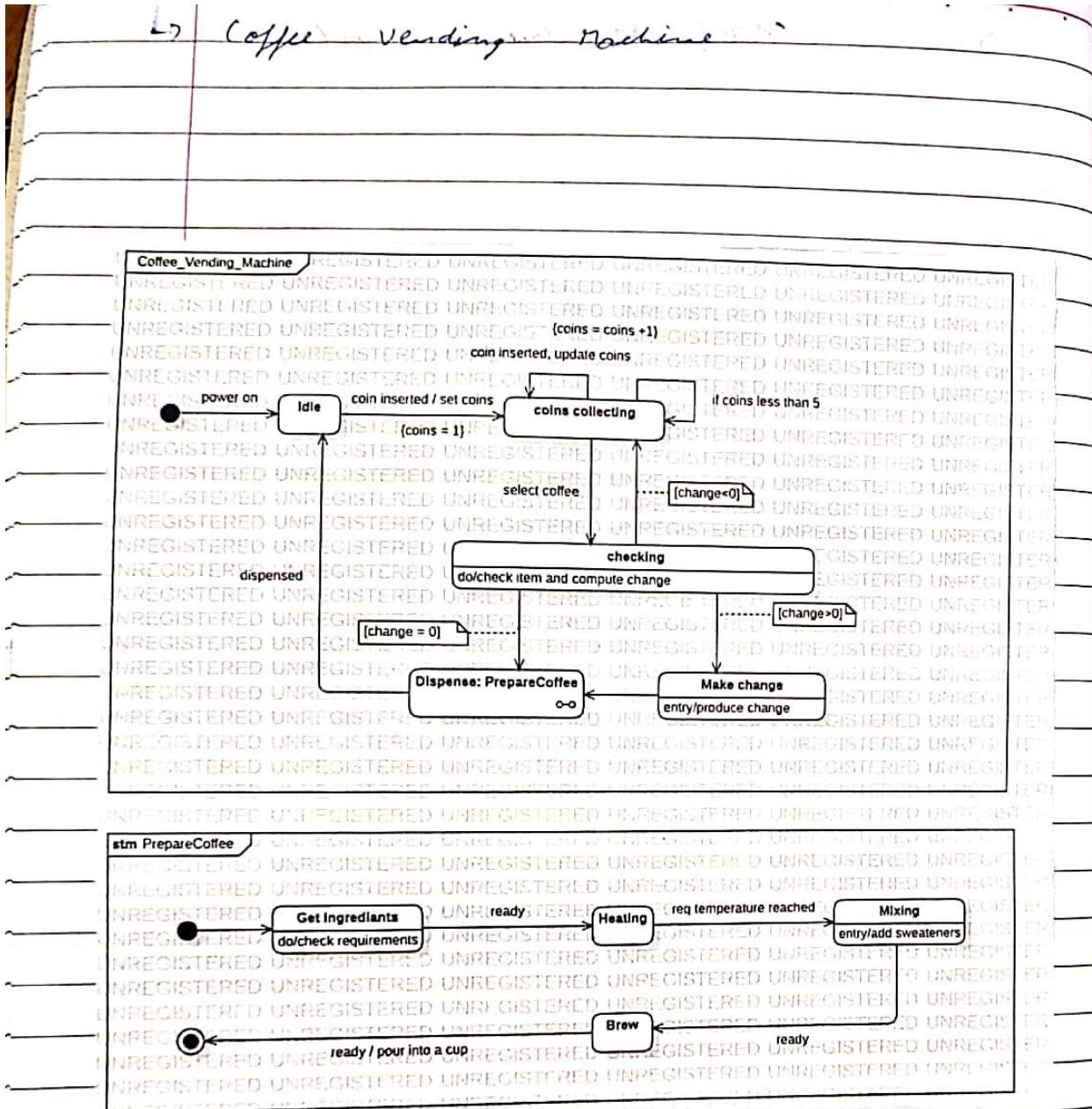
Generalization: User is generalized to Permission class and User is Generalized to Role.

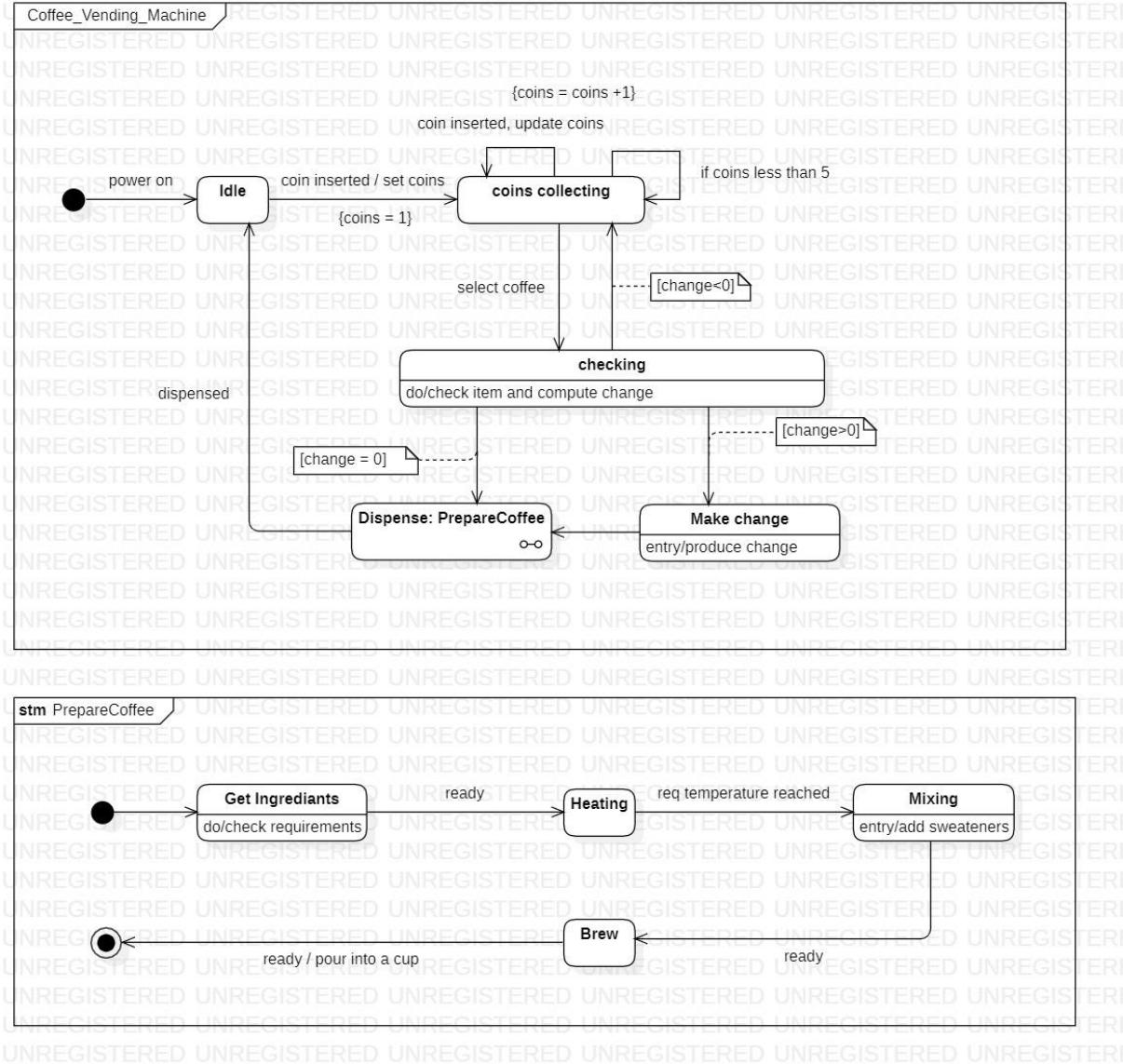
Aggregation: Coffee Machine contains Cash Box, Selectors, Dispense Register has Dispenser, Dispenser is composed of Ingredients.

Composition: Recipe is made up of

Ingredients Enumerations: TypeOfCoffee

### 3. Draw the advanced state diagram

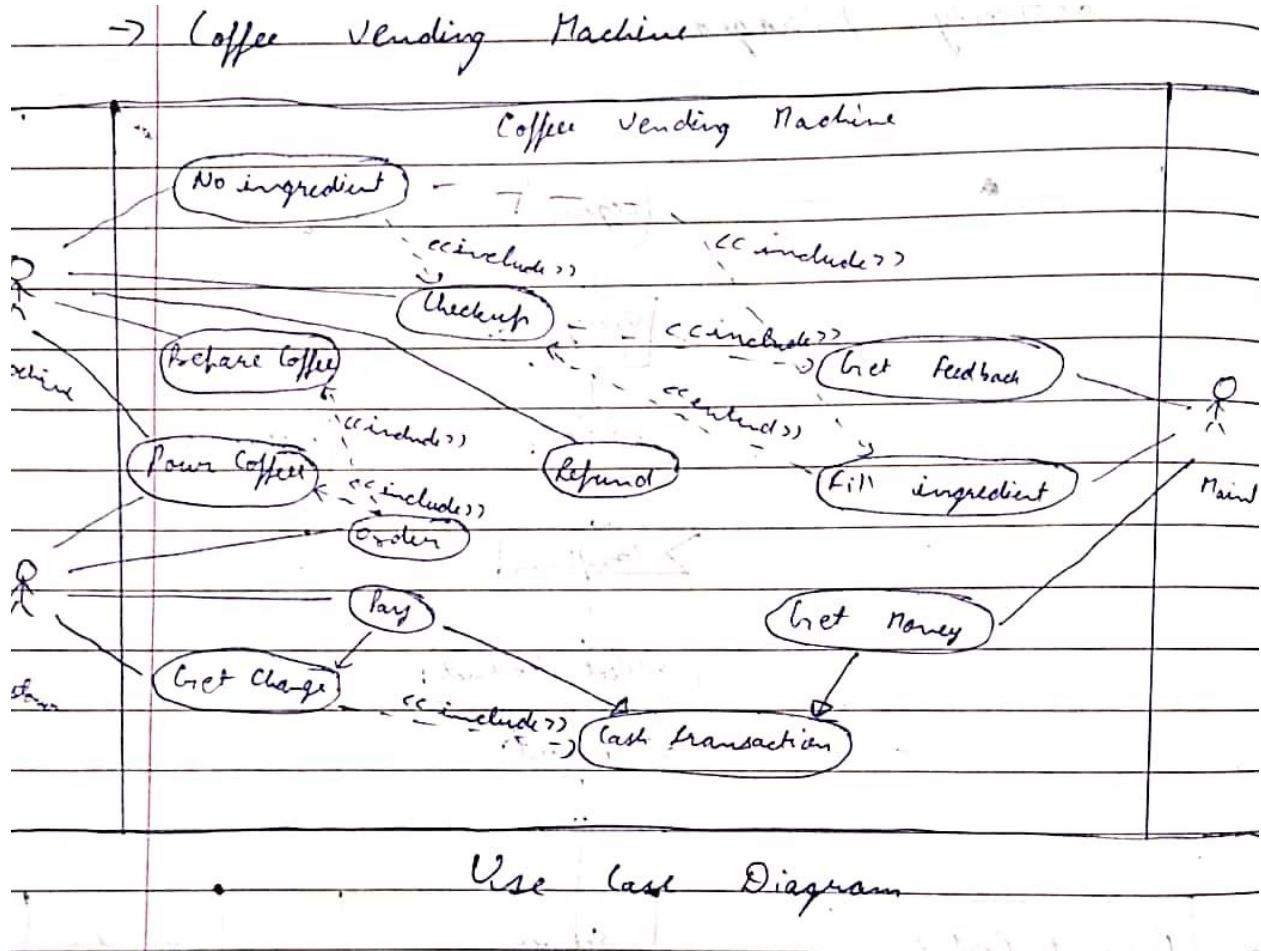


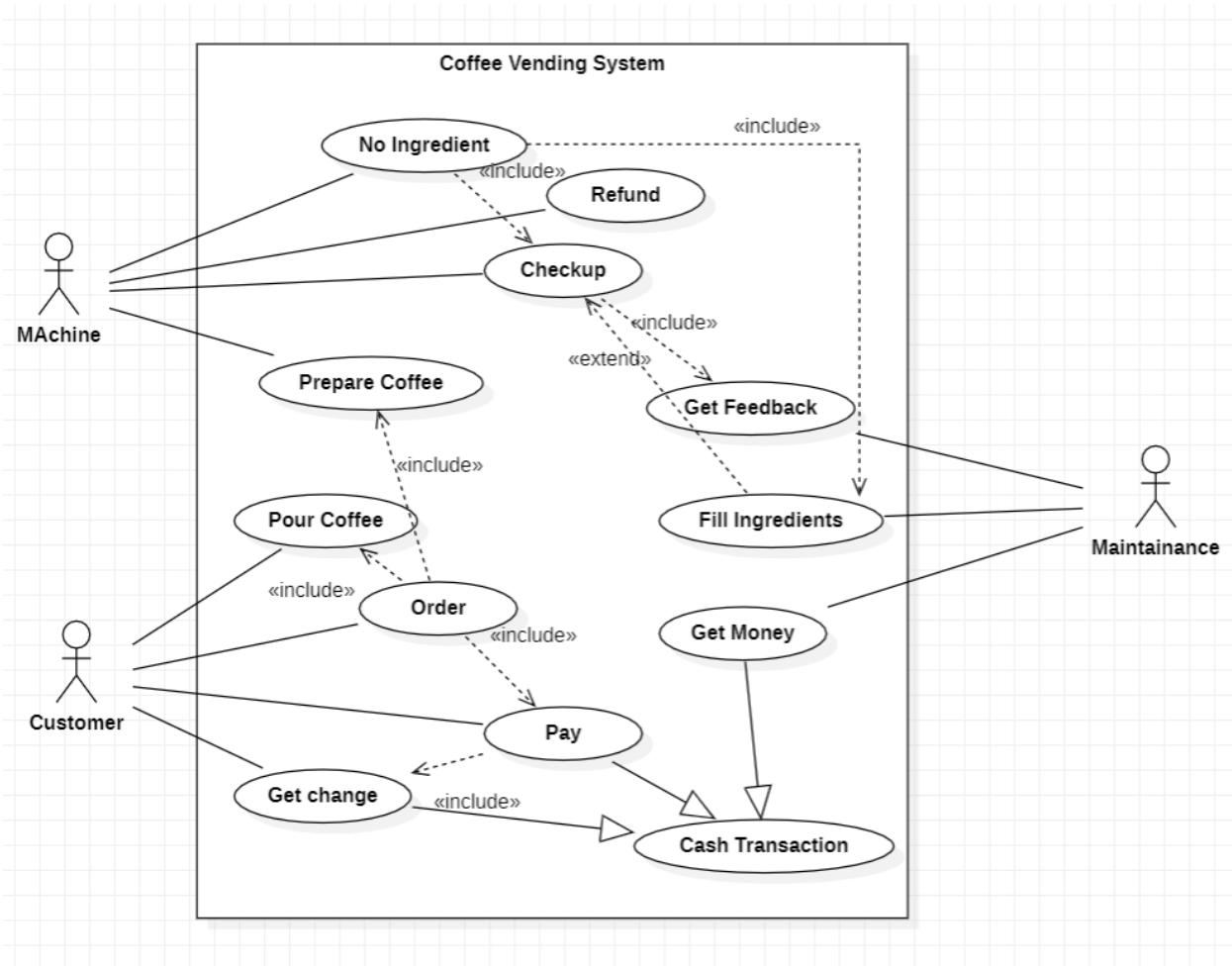


## Give a description of the scenario considered for developing the model

The advanced state diagram depicted below contains one nested state and one submachine, which on successful login shows the CollectingMoney procedure and DispenseItem procedure. It contains initial state and termination state with CollectingMoney as a nested state including the required simple states. It also has a submachine state named DispenseItem with initial, termination state along with simple states; SettingRow, SettingColumn, Pouring.

#### 4. Draw the advanced use case diagram

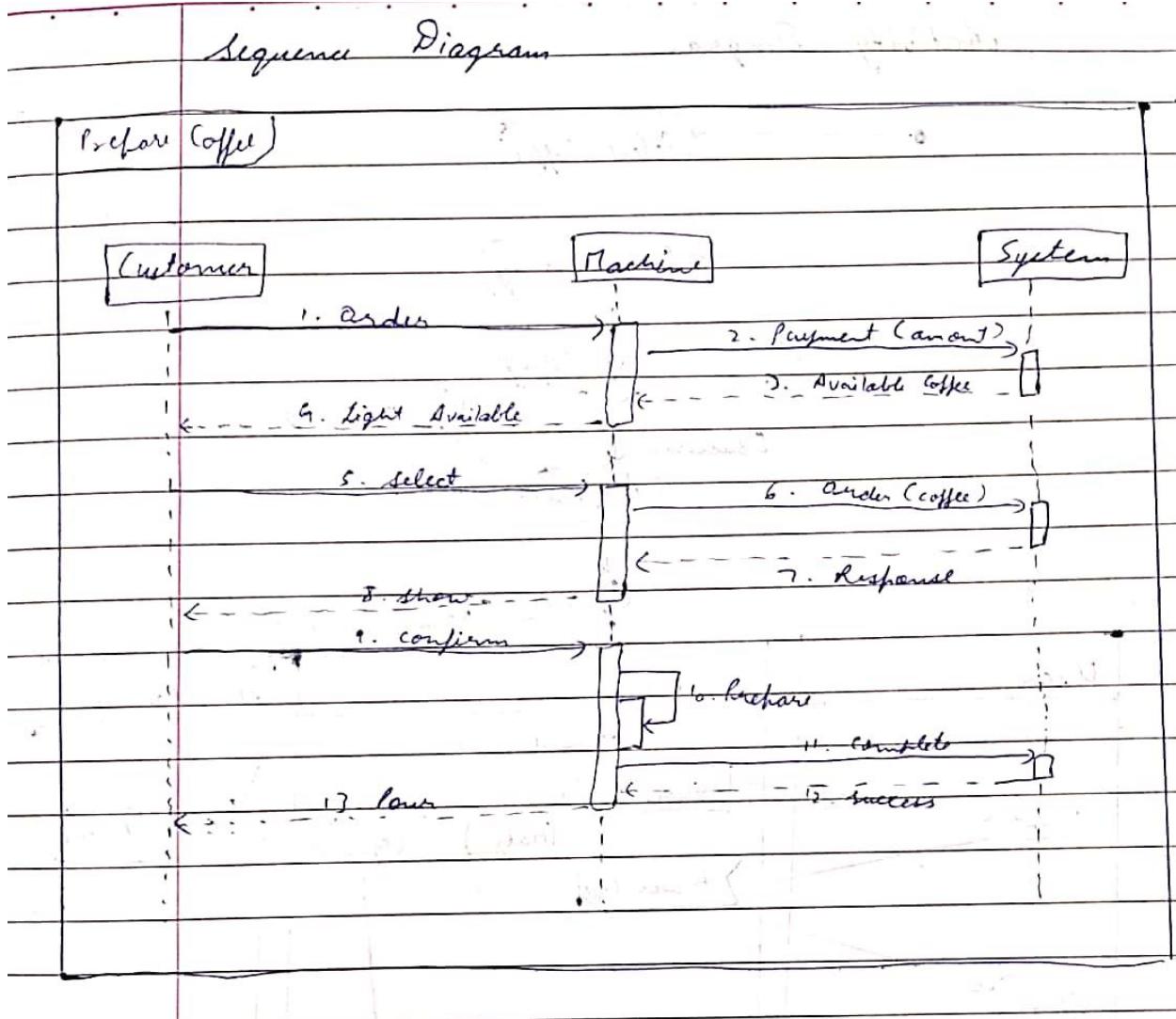


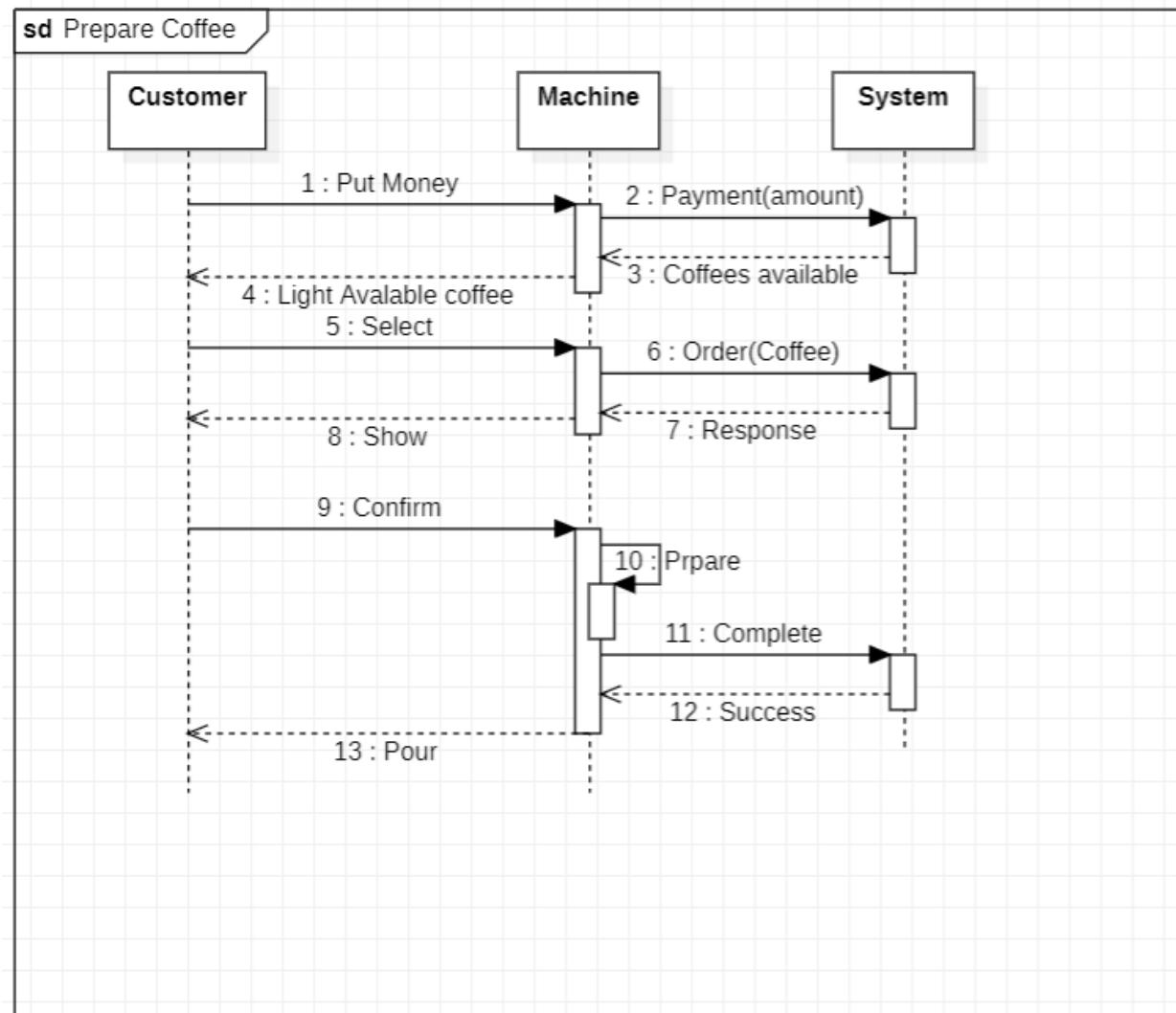


## Give a description of the scenario considered for developing the model

The advanced use case diagram has extra functionalities which includes extends, includes and generalization. The dispense change use case extends payment use case, payment use case extends buy item use case, buy item use case includes choose item and take item use case. Capuccino dispense and American dispense is generalized to super class dispense coffee.

## 5. Draw the advanced sequence diagram





## Give a description of the scenario considered for developing the model

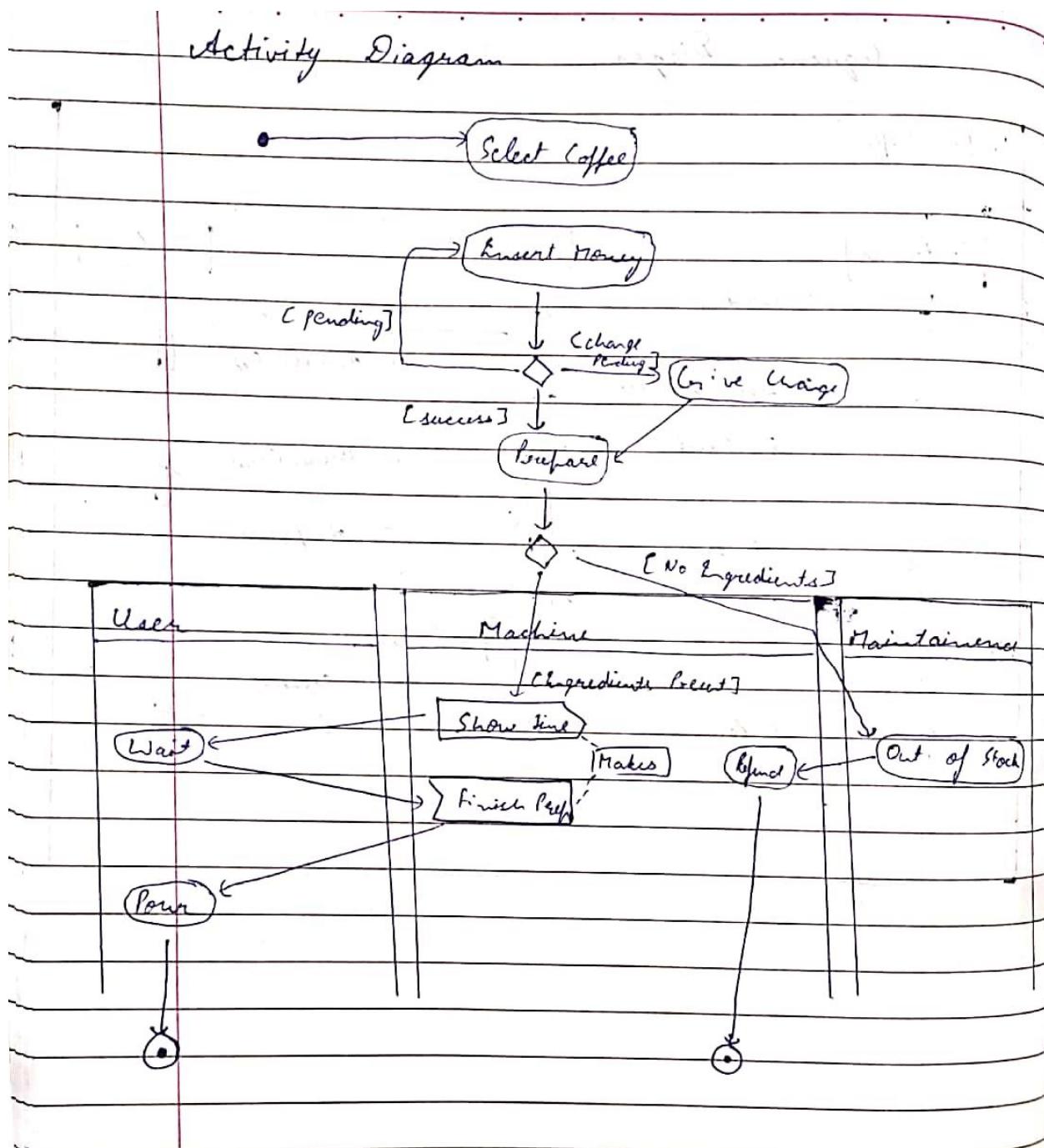
The lifeline is the dotted line and the rectangles represent the period of time the object is executing and is hence called activation.

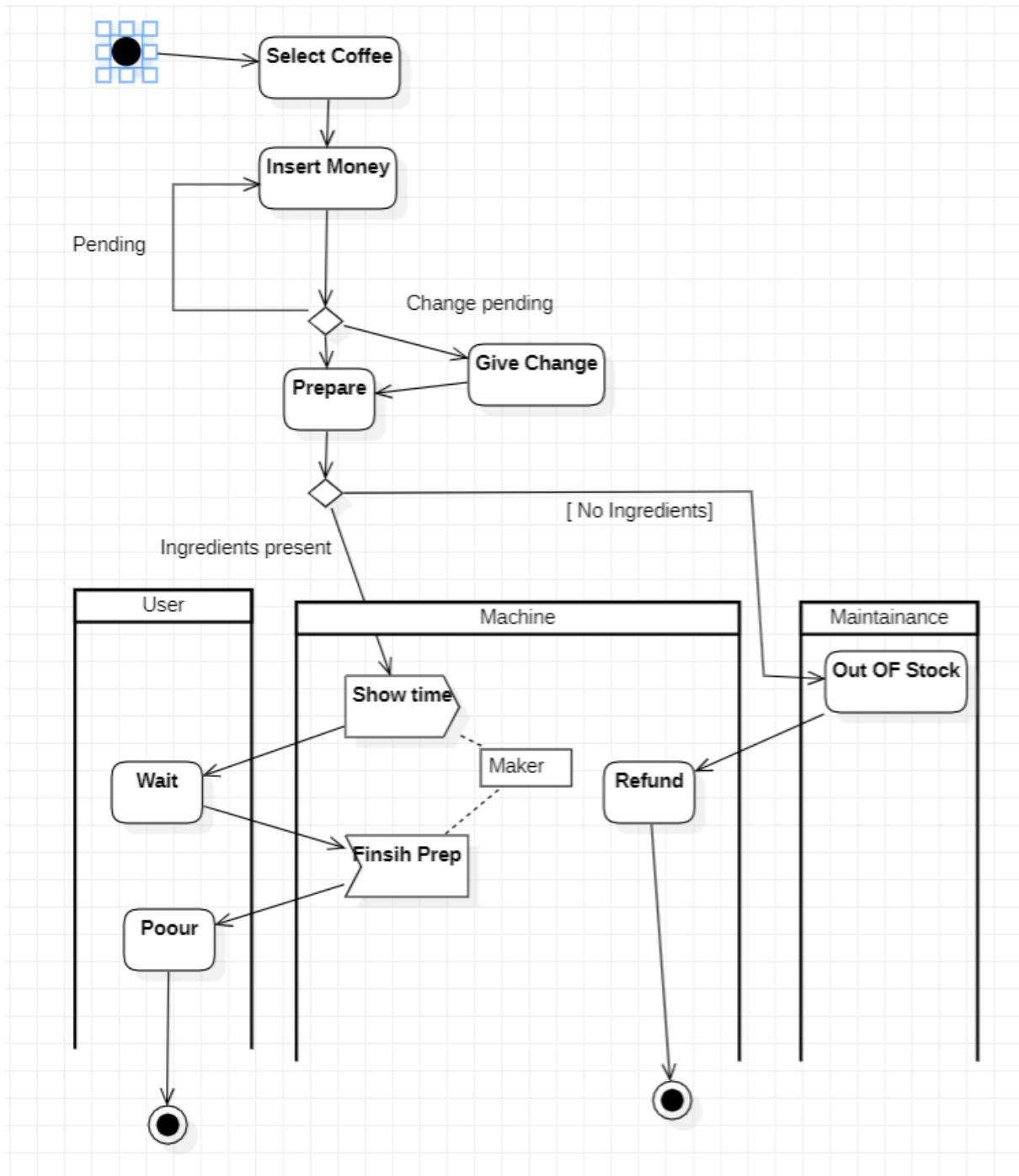
The recursive function of customise is shown by double activation rectangle of customise and verify coins.

The passive object Printer is created when the customer asks for printing and is destroyed (turned off) after sending the receipt.

A time constraint of 1 to 10 seconds is given for depositing coins by the customer in the vending machine.

## 6. Draw the advanced activity diagram





## Give a description of the scenario considered for developing the model

The advanced activity diagram starts from initiation and in the customer swimlane, customer login activity where a signal is sent to the network for request validation and upon confirmation the control flows to order received and then check inventory activity. There are three swimlanes

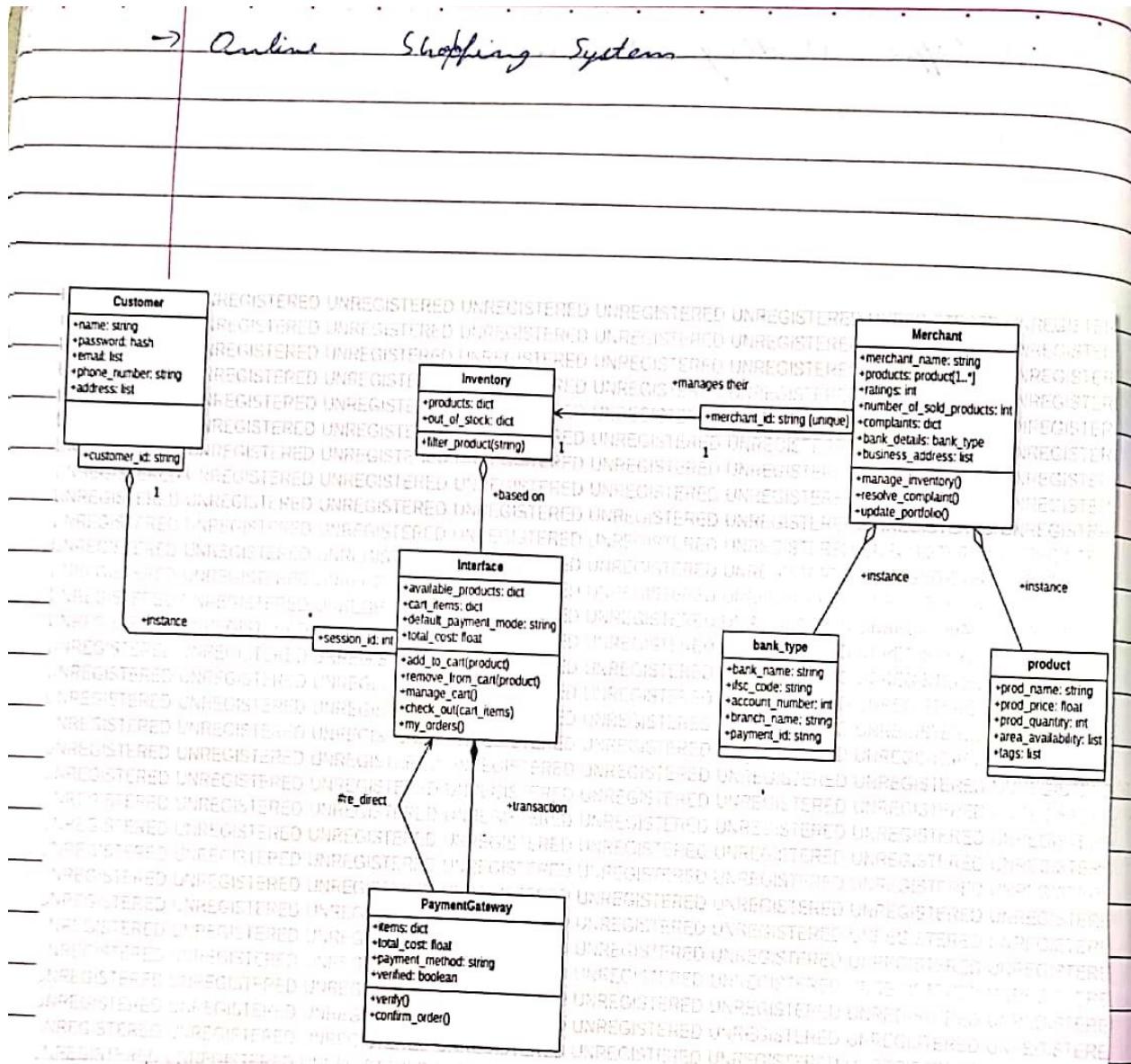
namely customer, coffee dispenser and payment where customer perform operations like order coffee, dispenses coffee and collect coins respectively. Then the control flows to the home page and then termination activities.

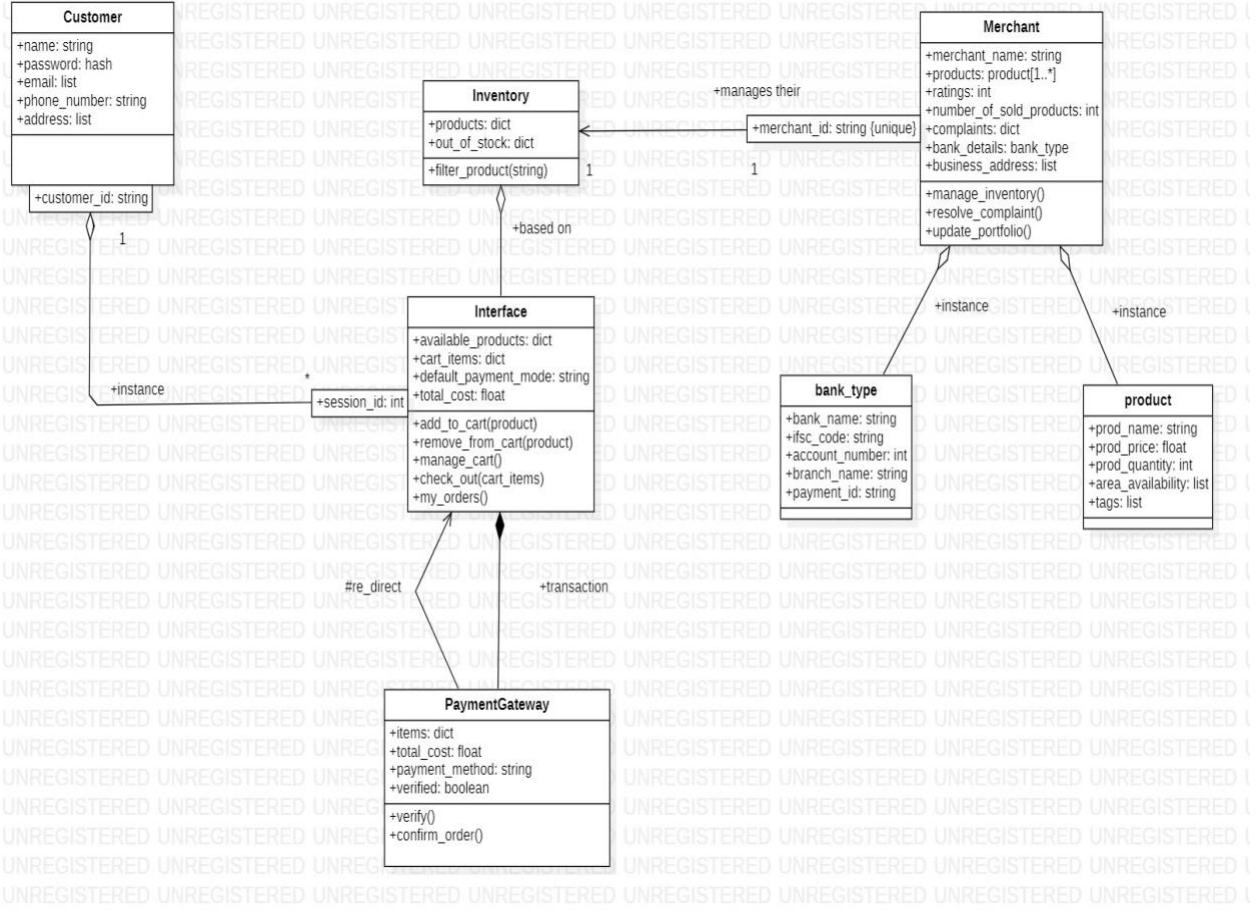
## Exercise 5: Online Shopping System

### 1. Write SRS

→ Online Shopping System
SRS →
→ Customers must have an account in the online website to purchase the products.
→ To buy any product, the customer should be registered, unregistered customer can't go to the cart.
→ Customer login to the system by entering valid user id & password
→ Customers after login can make order or cancel it from shopping cart
→ Customers can order from various categories like men, women & home products
→ Customer can view, compare and make choices from available products.
→ Bill payment can be done by different methods such as debit or credit card or COD.
→ Customer can log out any time he / she want.

## 2. Draw the advanced class diagram





The below shown class diagram contains the following classes: WebUser, Customer, ShoppingCart, Account, Product, Order, Payment, Netbanking, COD with multiplicities as shown.

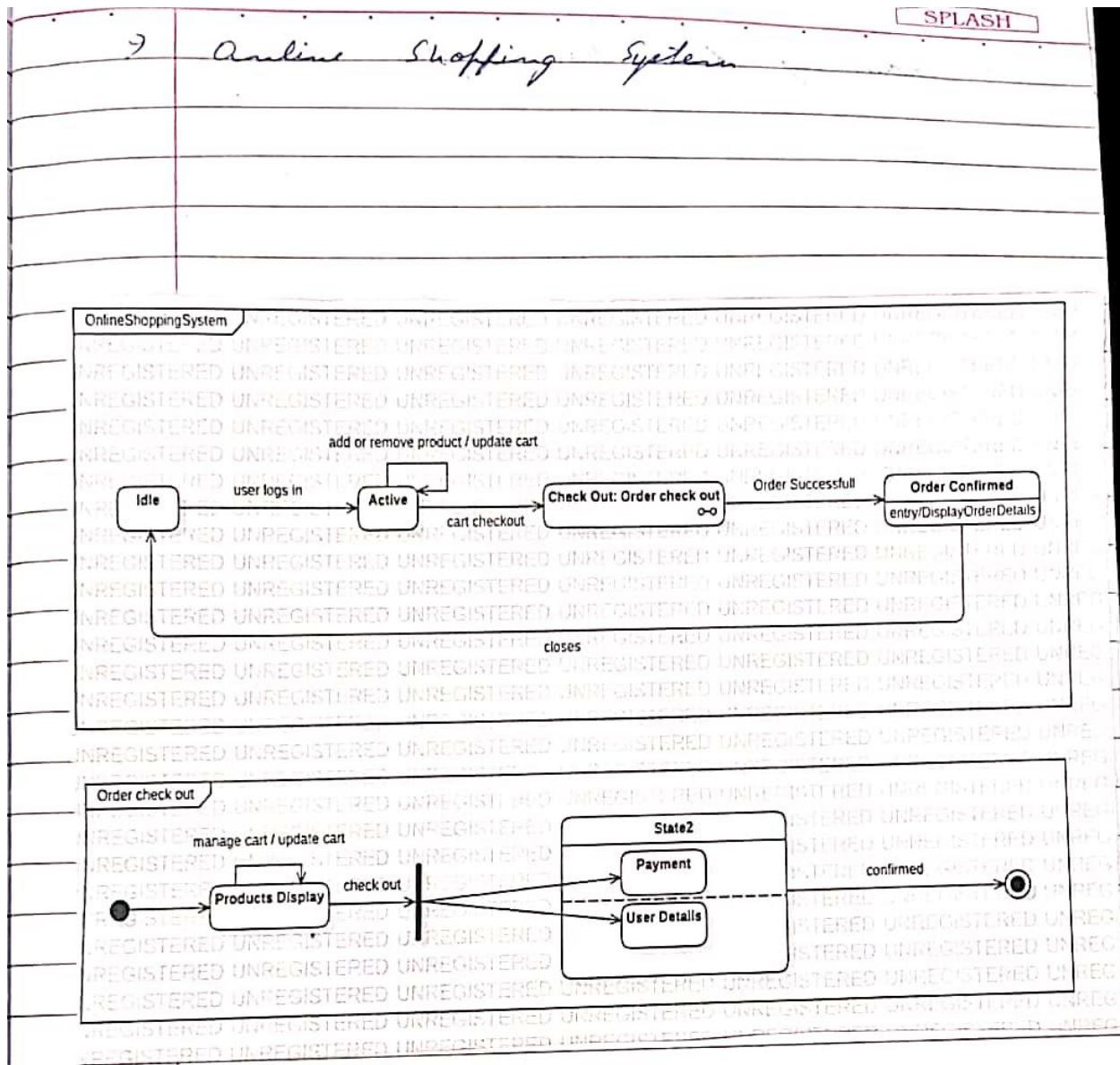
Association: WebUser owns ShoppingCart, ShoppingCart has Product, Order consists of Product, Payment completes Order.

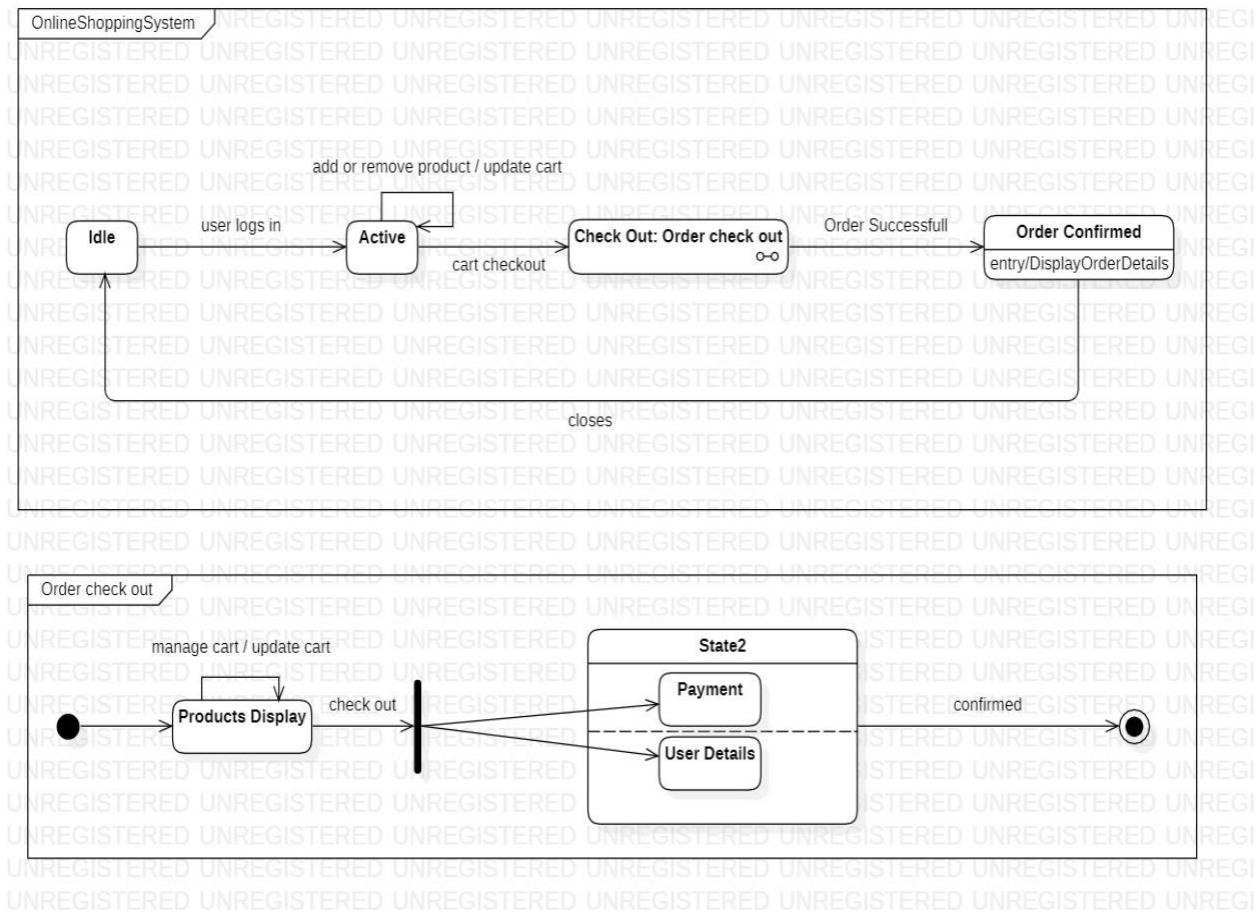
Generalization: Netbanking and COD are generalized to Payment

class. Association class: LineItem with ShoppingCart and Product

Composition: Account is composed of ShoppingCart, Customer, and Order. Enumerations: UserState, OrderStatus

### 3. Draw the advanced state diagram

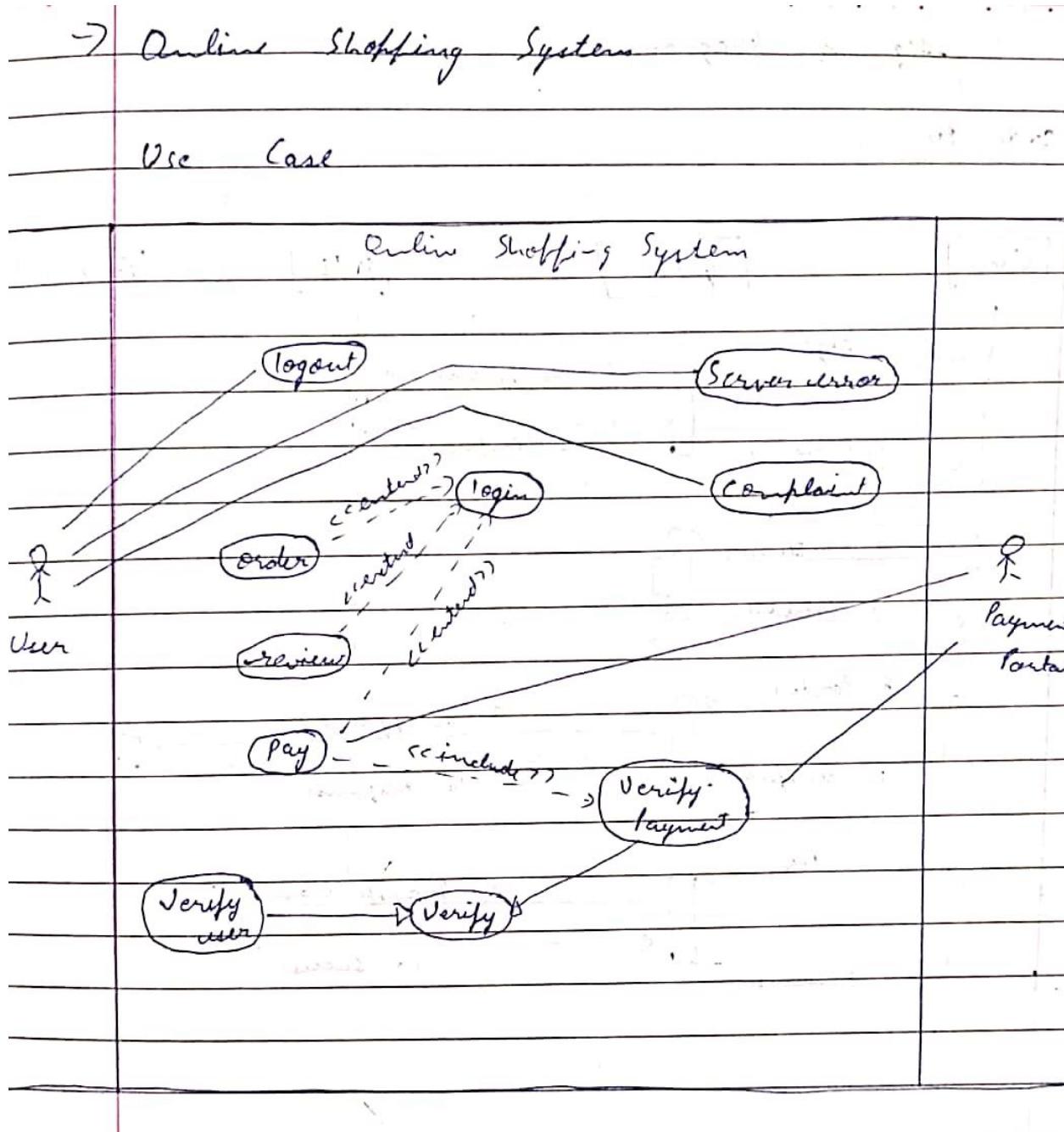


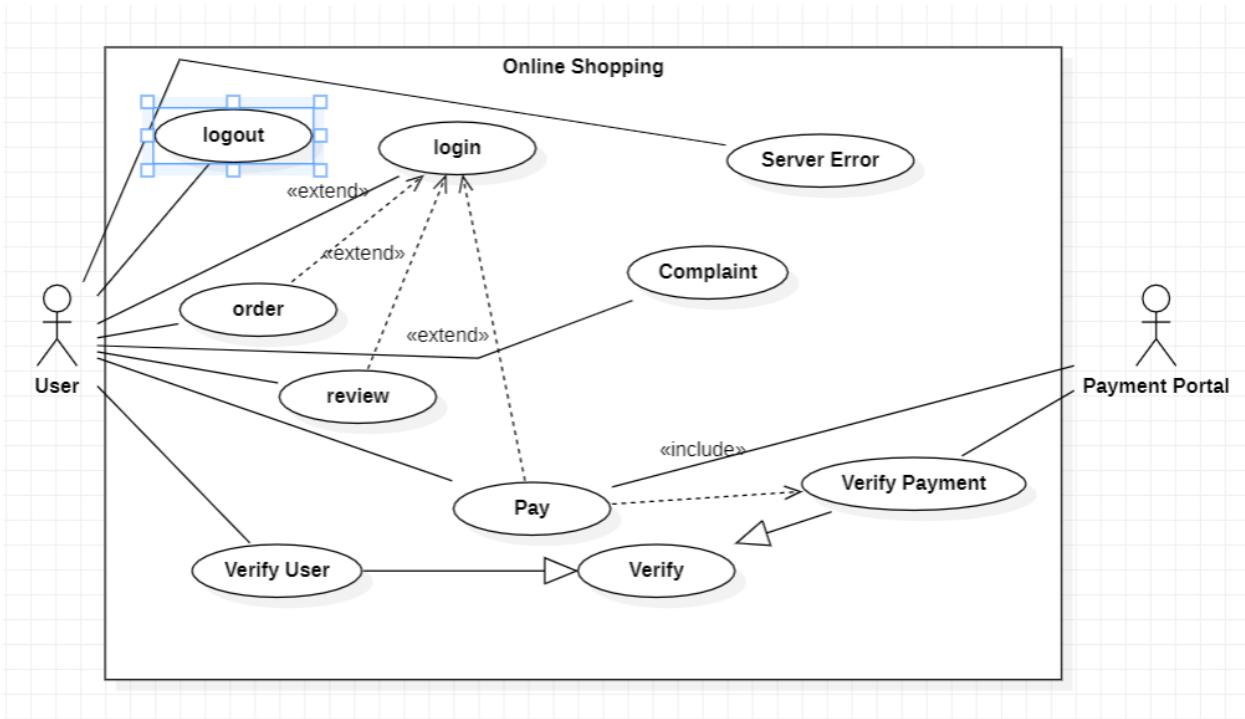


## Give a description of the scenario considered for developing the model

The advanced state diagram depicted below contains one nested state and one submachine, which on successful login shows the AddToCart procedure and PaymentSystem procedure. It contains initial state and termination state with AddToCart as a nested state including the required simple states. It also has a submachine state named PaymentSystem with initial, termination state along with simple states; Method, Card, Validation, Processing.

#### 4. Draw the advanced use case diagram

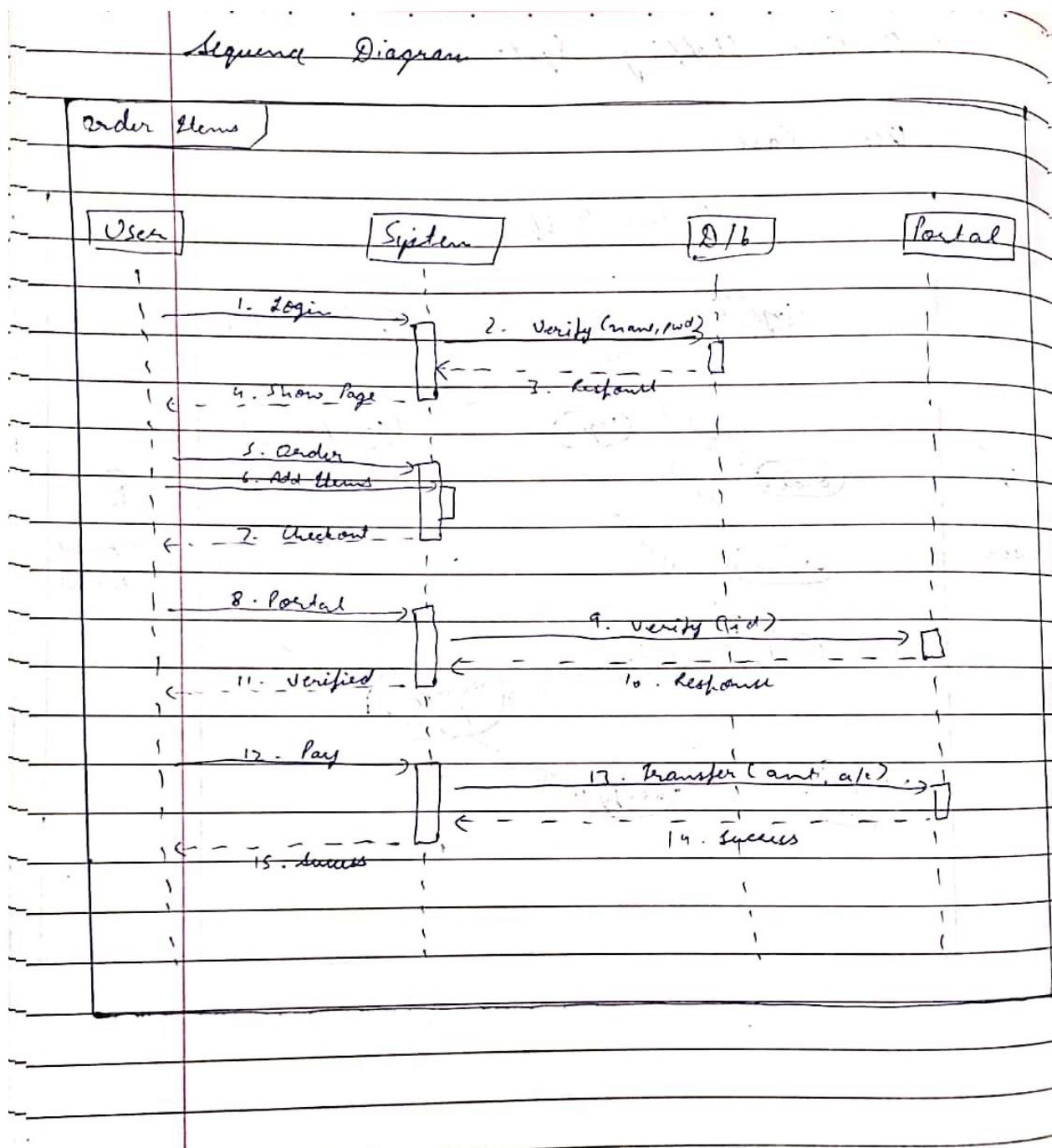


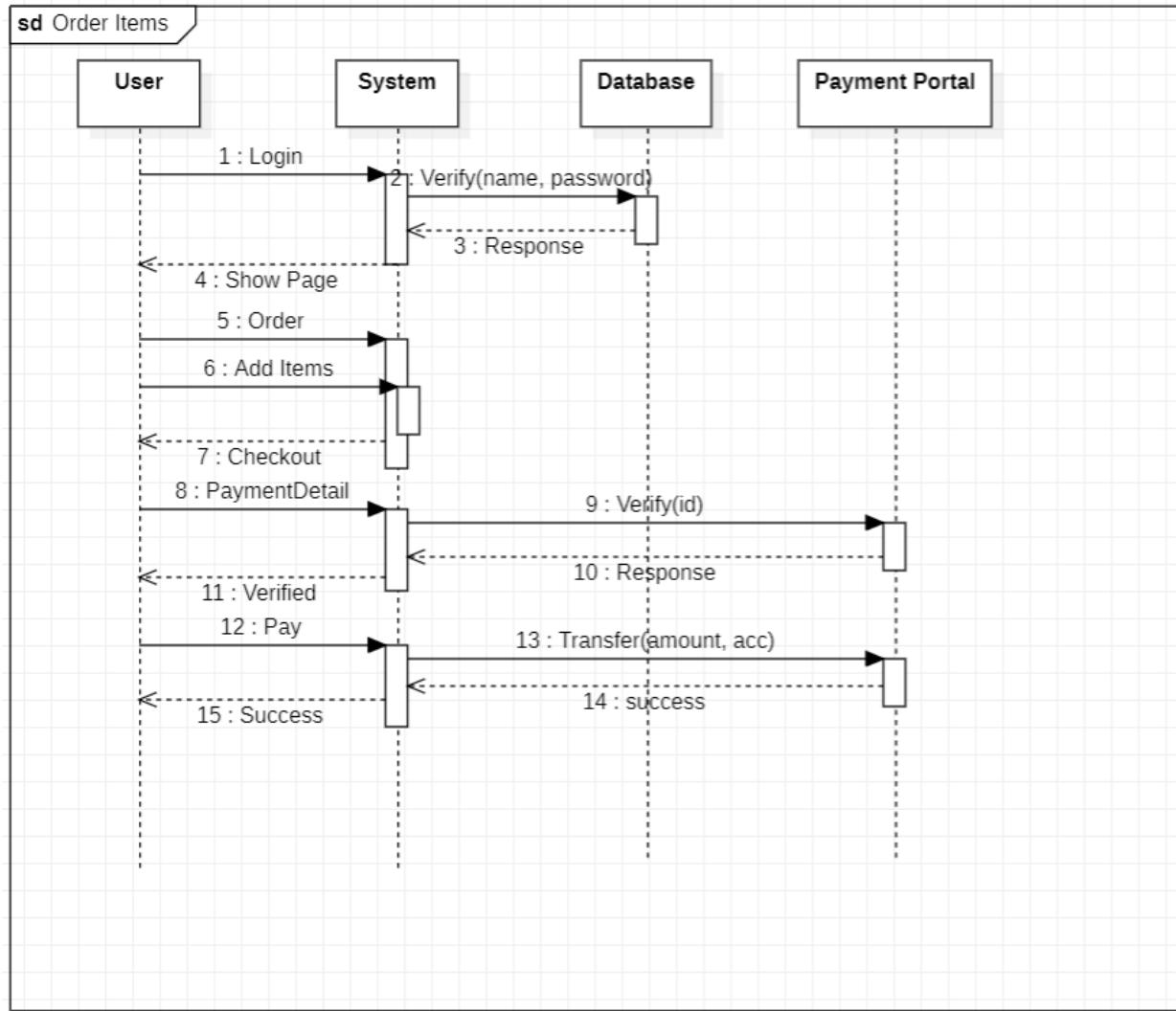


## Give a description of the scenario considered for developing the model

The advanced use case diagram has extra functionalities which includes extends, includes and generalization. The delete from cart use case extends add item to cart use case, place order use case includes make payment use case, check authentication use case includes make finalized payment and add tax use case. Add item, remove item and update quantity is generalized to superclass maintain stock.

## 5. Draw the advanced sequence diagram



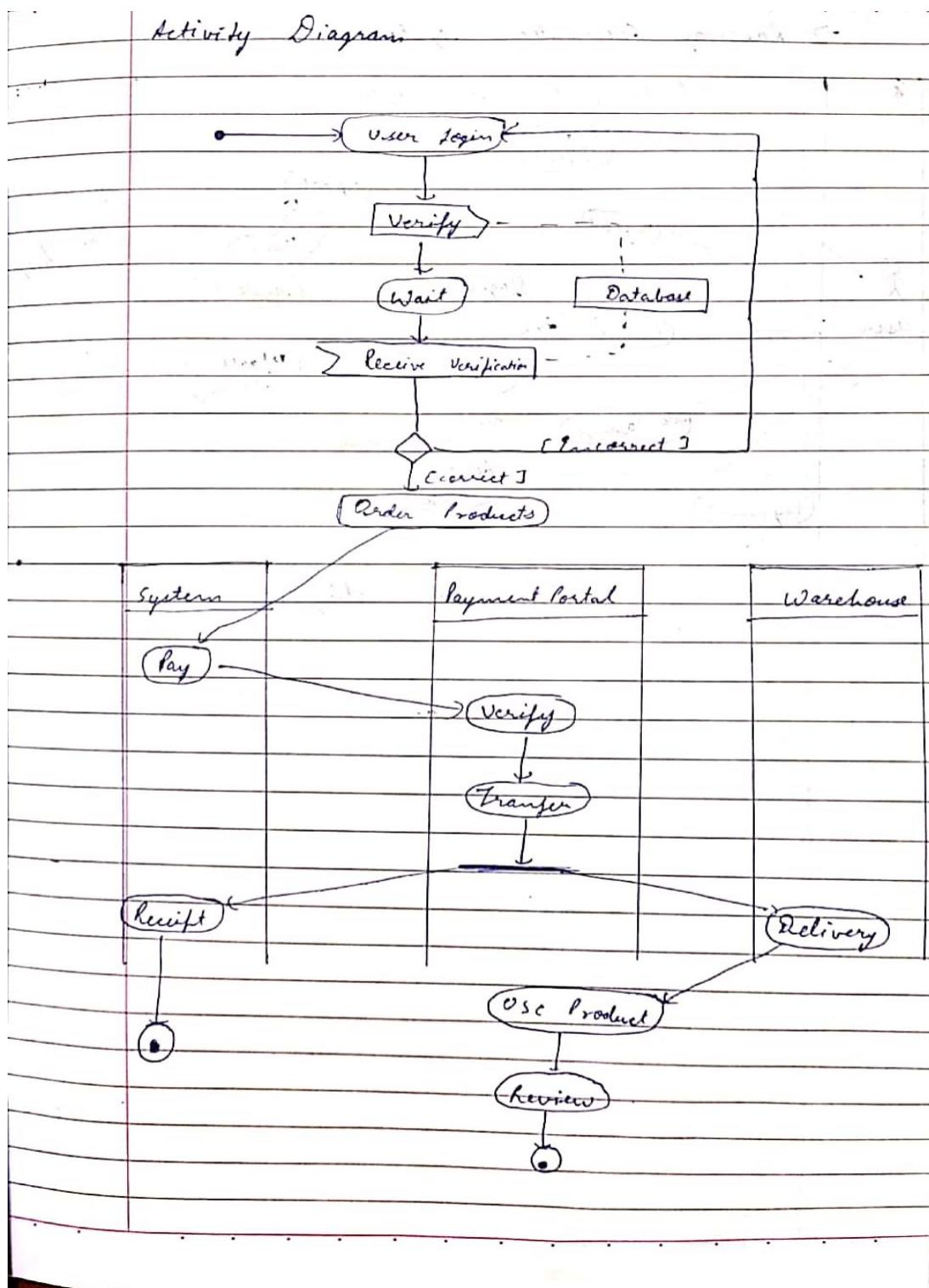


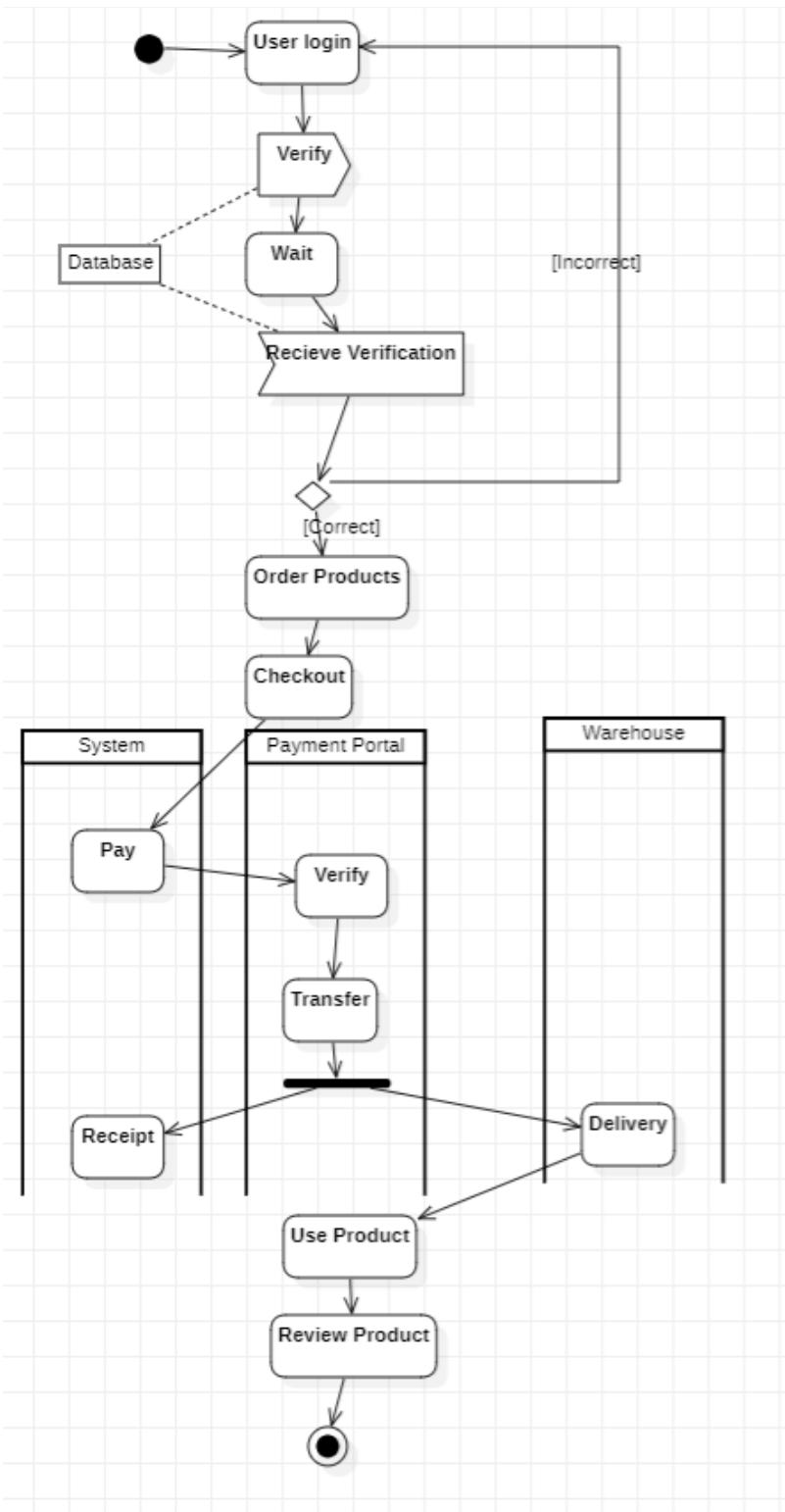
## Give a description of the scenario considered for developing the model

The lifeline is the dotted line and the rectangles represent the period of time the object is executing and is hence called activation.

Reply message is used to return back to lifelines with the required message.

## 6. Draw the advanced activity diagram





## **Give a description of the scenario considered for developing the model**

The advanced activity diagram starts from initiation and in the customer swimlane, the customer login activity where a signal is sent to the network for request validation and upon confirmation the control flows to add product and checkout activity. There are two swimlanes namely customer and online shop where it confirms the order and delivery, payment process respectively. Then the control flows to the home page and then termination activities

## Exercise 6: Railway Reservation System

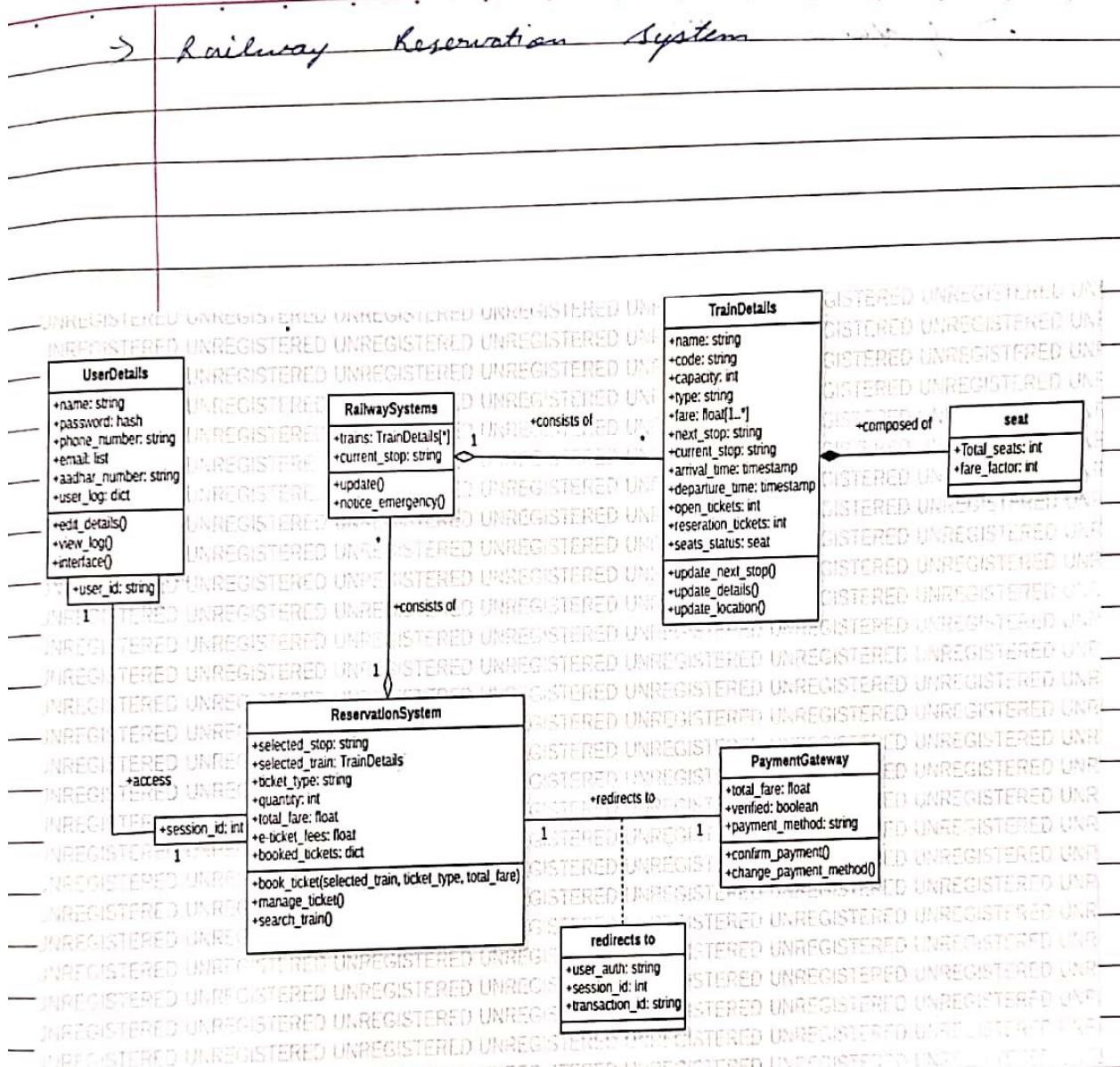
### 1. Write SRS

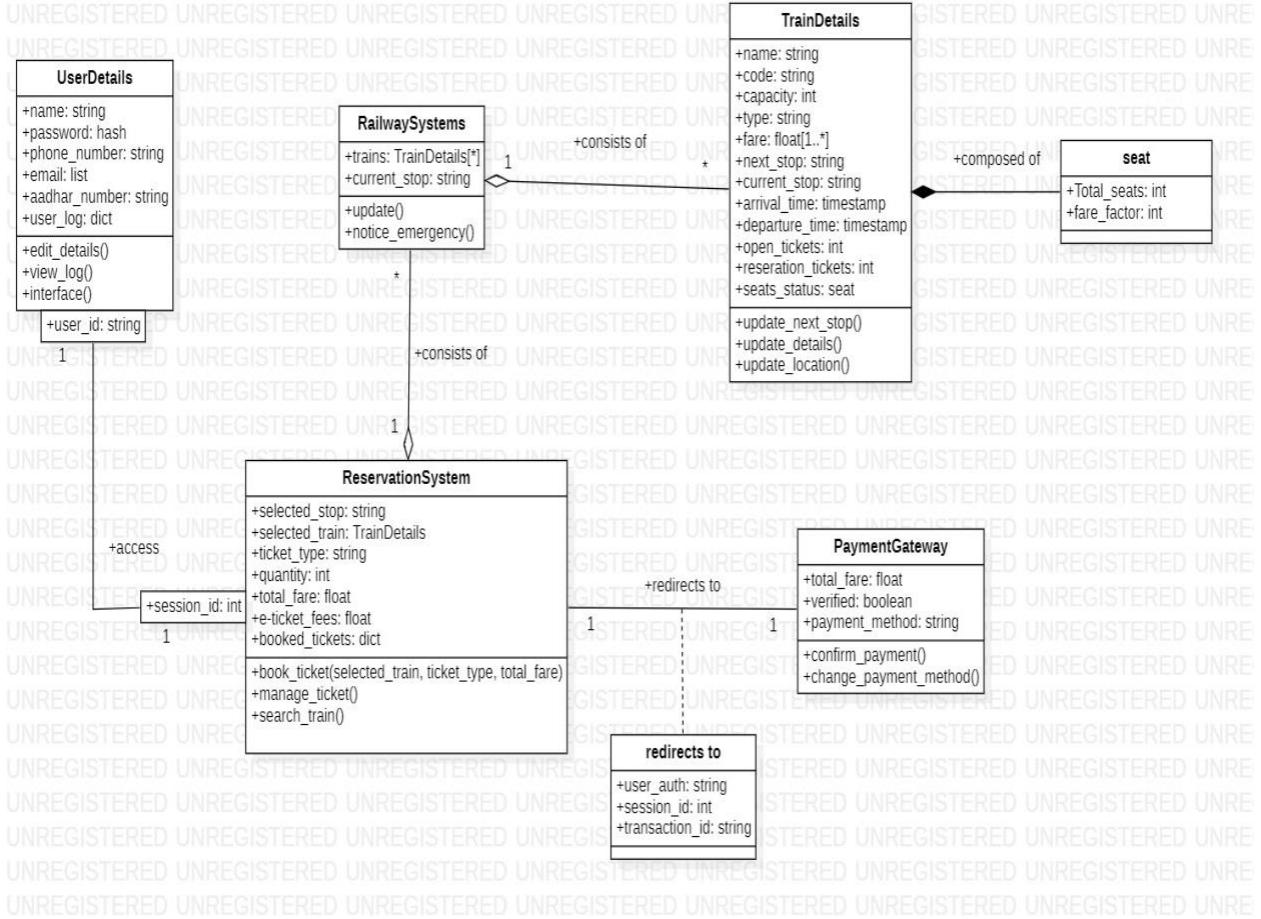
→ Railway Reservation System

SRS →

- Each user should have user id & password.
- Record of user should be kept in a log file.
- Customers should be able to view schedule of trains, their cost and the availability.
- Tickets can be booked by providing details such as name, age & seat.
- Tickets can be booked in two ways →
  1. ticket & e-ticket
  2. In e-ticket booking, tickets can be booked online and tickets are sent by courier on the address.
- In e-ticket booking, tickets can be booked online as well as cancelled online, customer can printout the ticket.
- After booking, the customer has to check out by paying the fare amount.

## 2. Draw the advanced class diagram





The below shown class diagram contains the following classes: RailwayStation, Train, Admin, Passenger, TicketBooking, Payment, Ticket, General and Tatkal with multiplicities as shown.

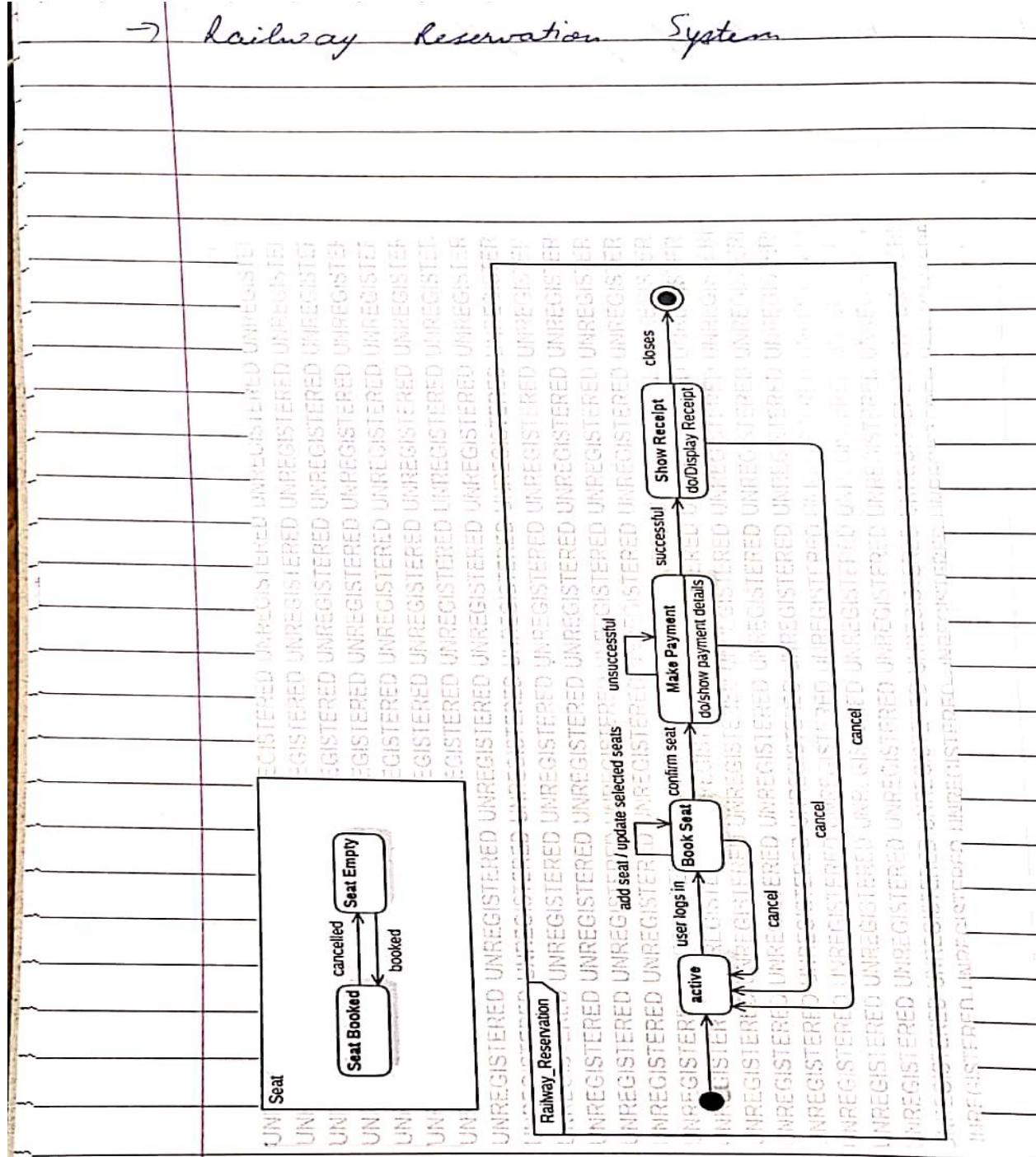
Association: Passengers takes Train, Admin supervises TicketBooking, TicketBooking pays Payment.

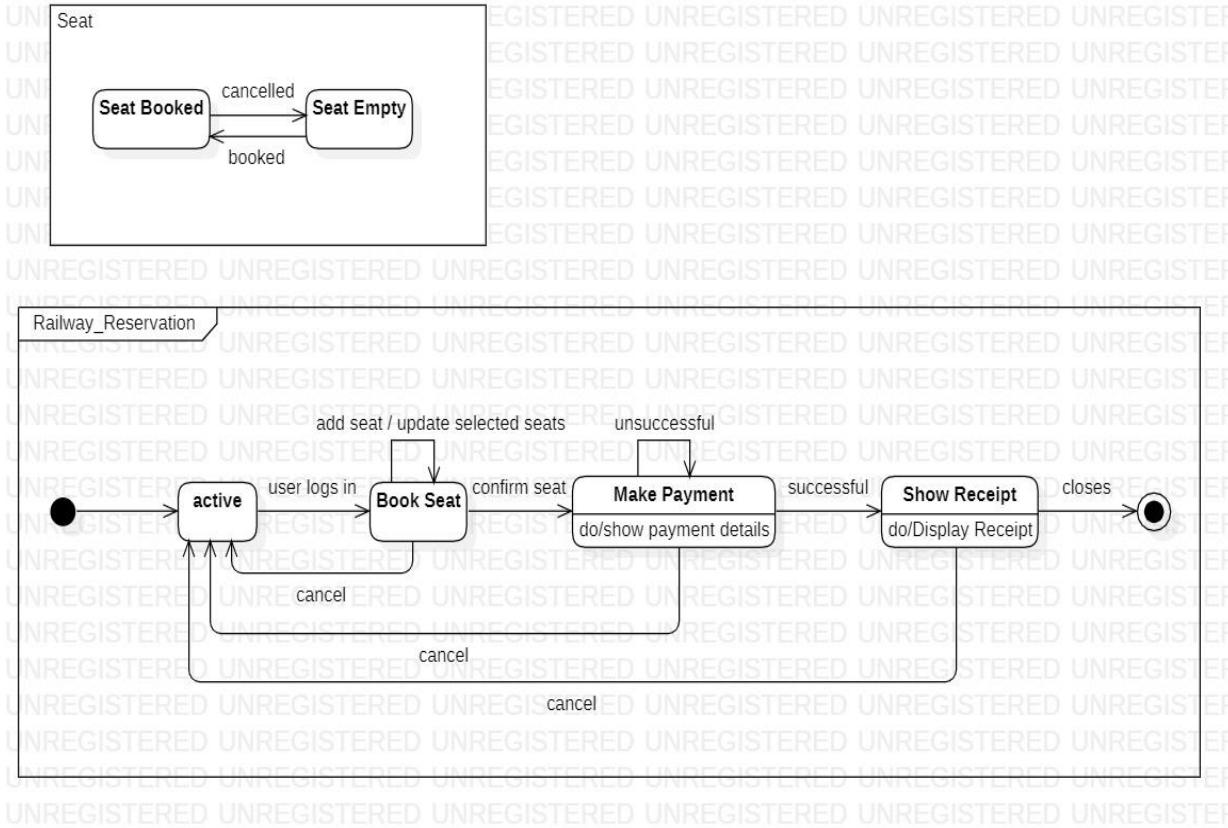
Generalization: General and Tatkal are generalized to Ticket class.

Association class: Bank with TicketBooking and Payment

Composition: RailwayStation contains train, Passenger books TicketBooking, TicketBooking hasTicket.

### **3. Draw the advanced state diagram**

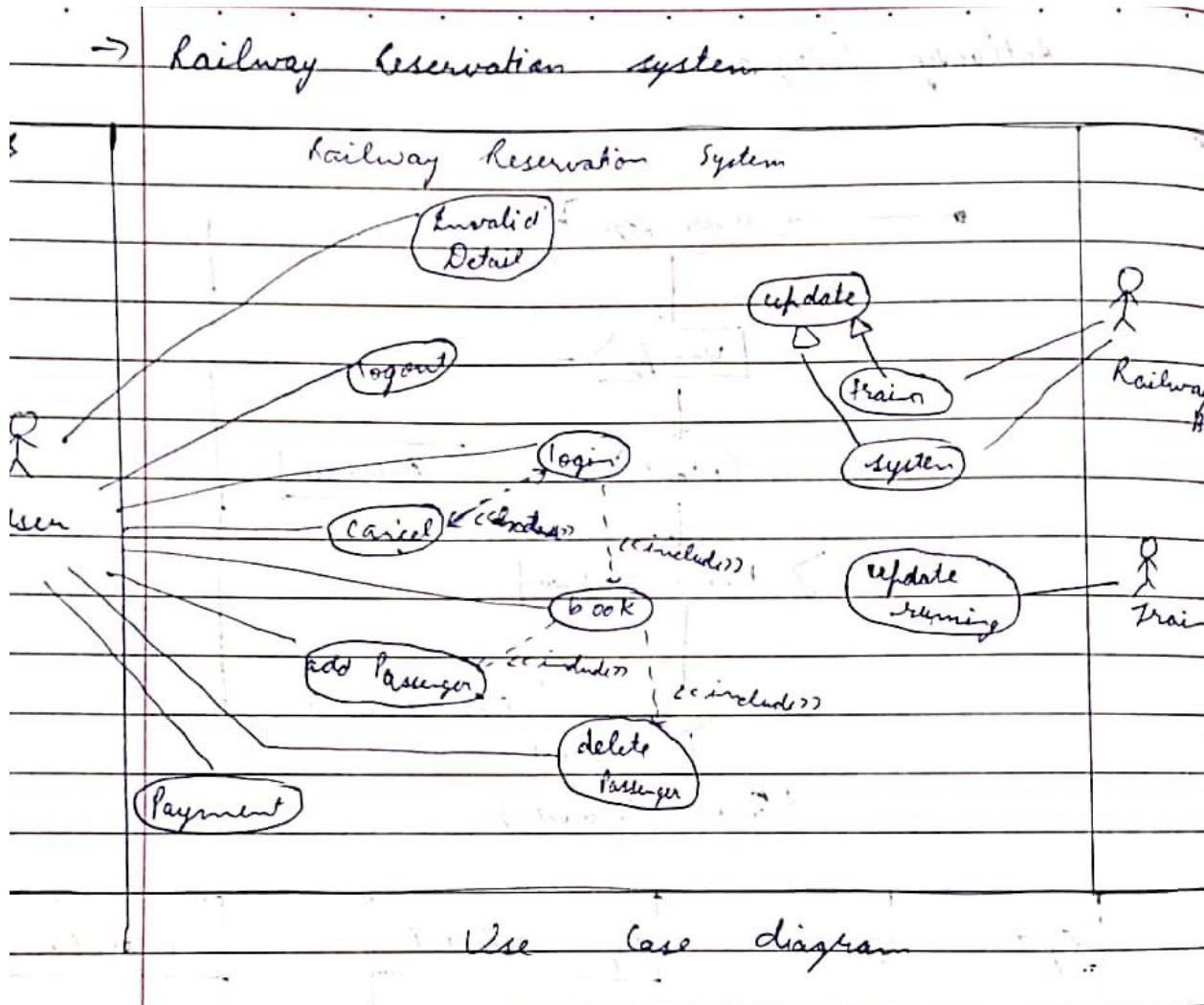


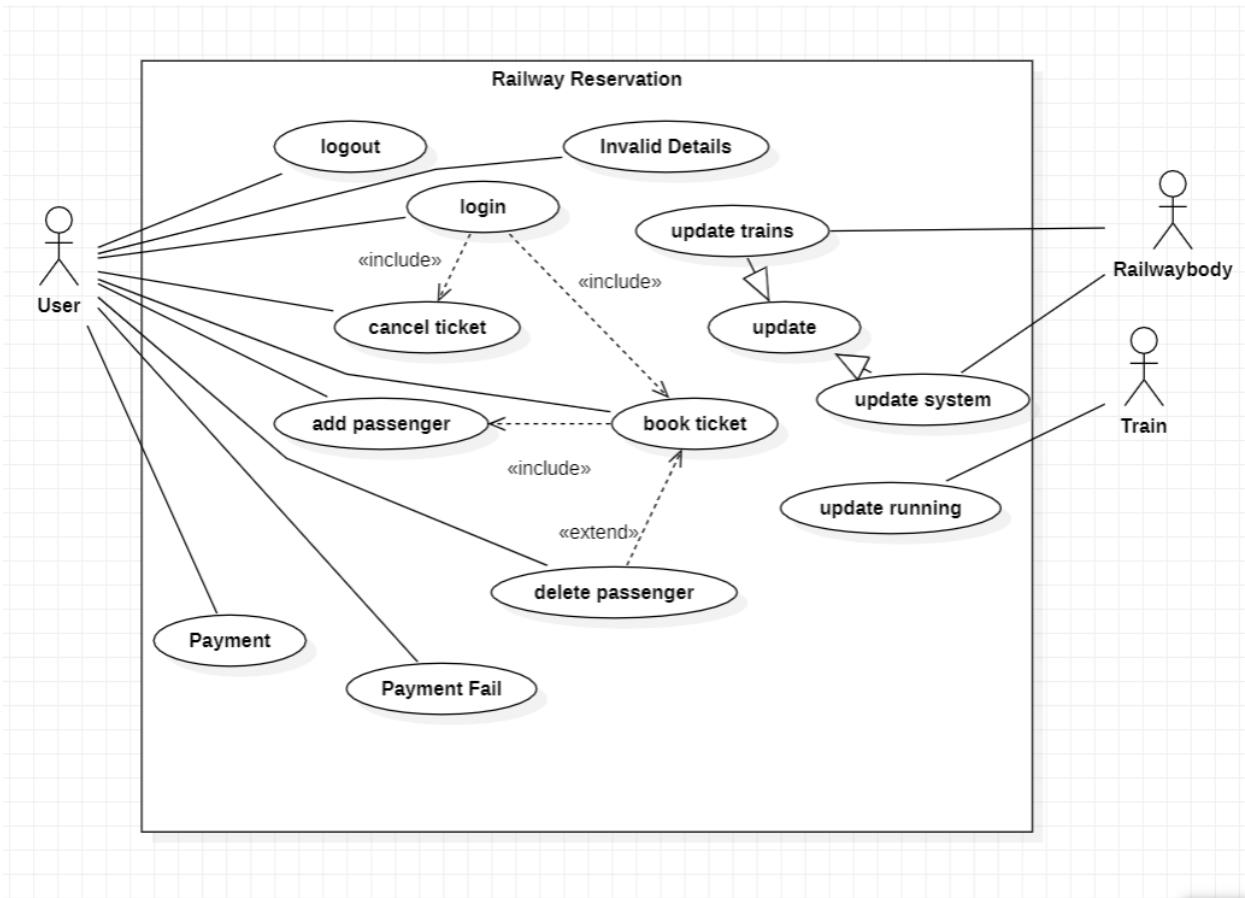


## Give a description of the scenario considered for developing the model

The advanced state diagram depicted below contains one nested state and one submachine, which on successful login shows the ChooseTrain details and PaymentSystem procedure. It contains initial state and termination state with ChooseTrain as a nested state including the required simple states. It also has a submachine state named PaymentSystem with initial, termination state along with simple states; Method, Card, Validation, Processing.

#### 4. Draw the advanced use case diagram

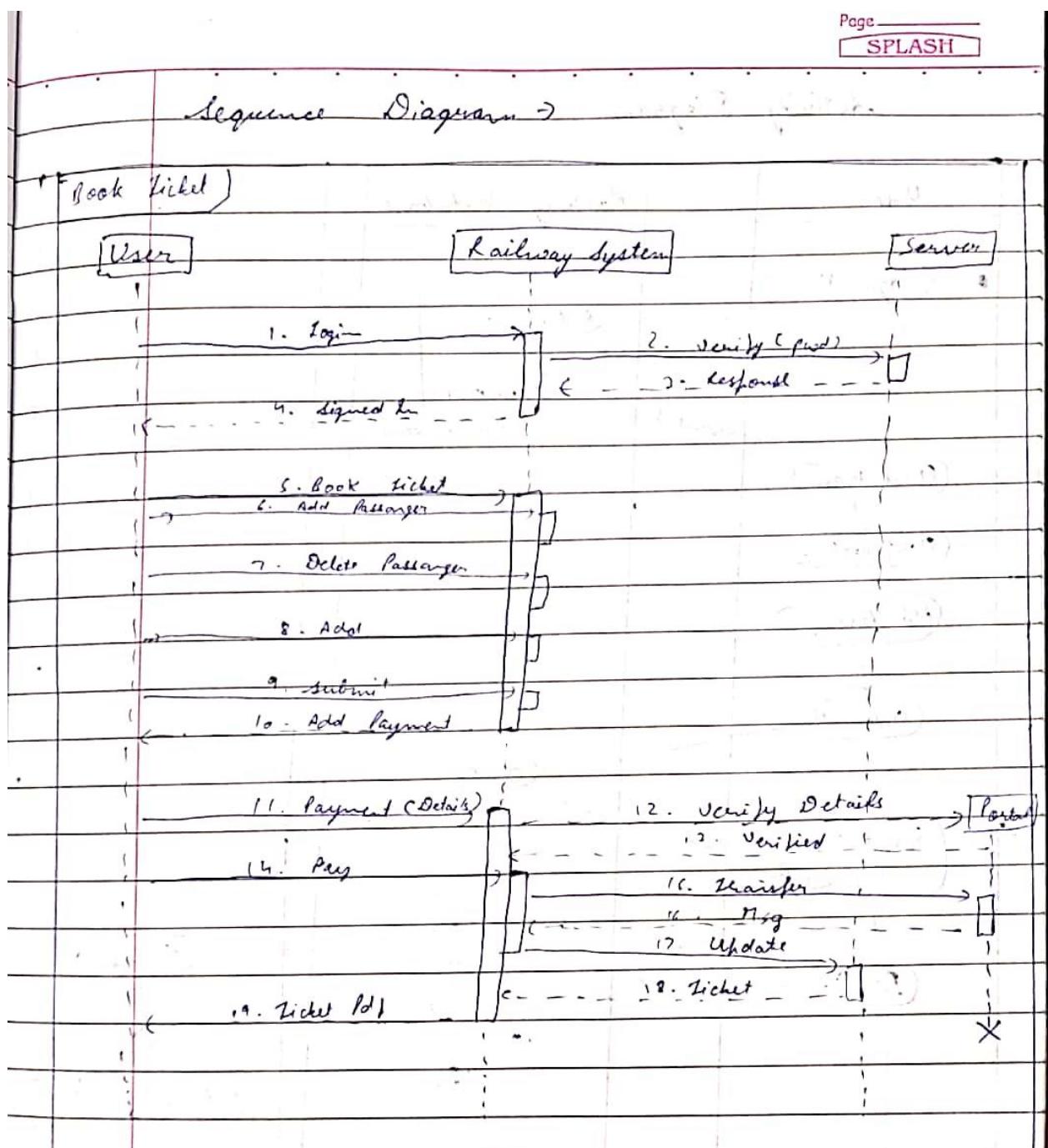


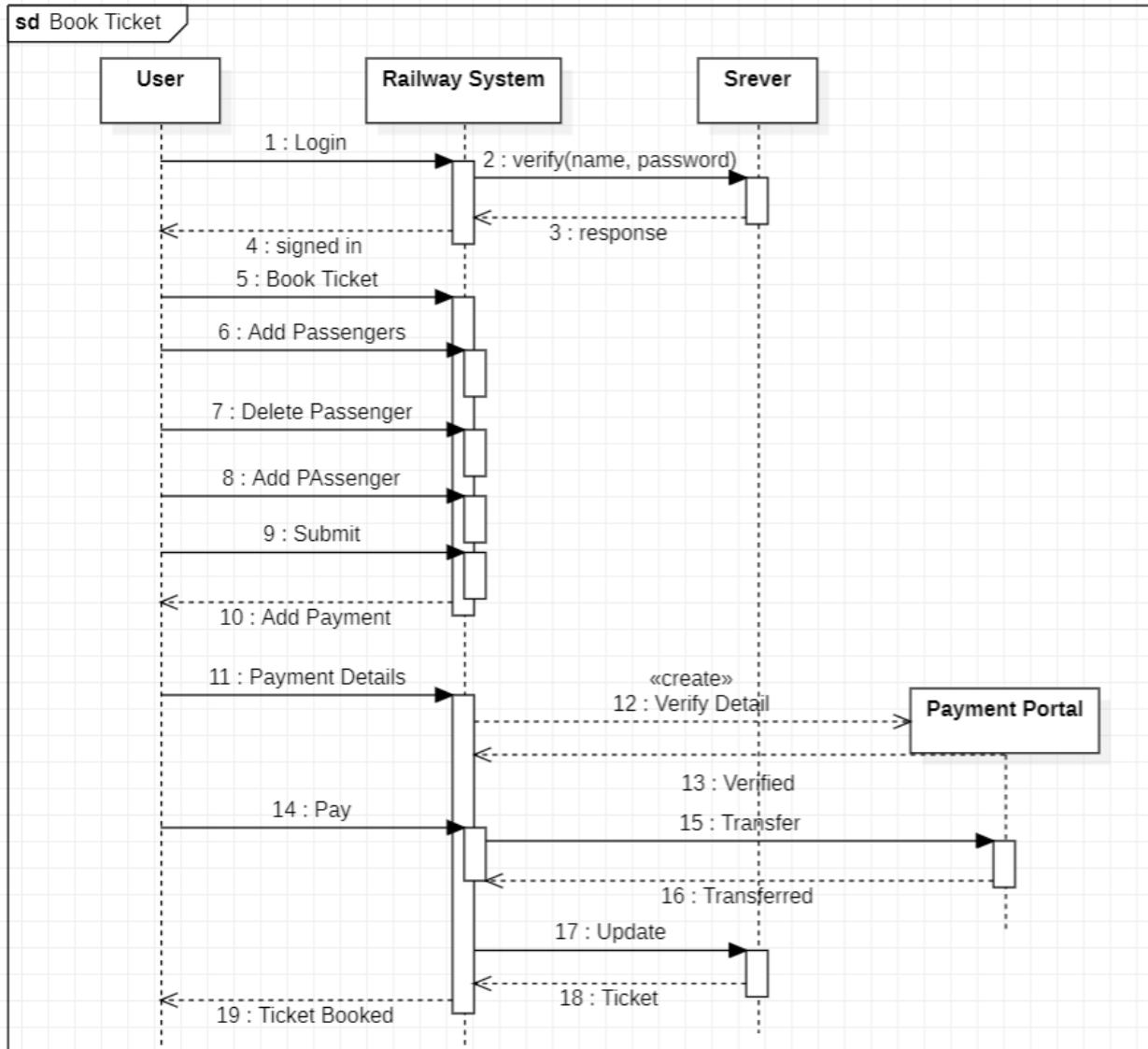


## Give a description of the scenario considered for developing the model

The advanced use case diagram has extra functionalities which includes extends, includes and generalization. The cancel ticket use case extends refund money use case, check availability use case extends book ticket use case, book ticket use case includes fill details use case, fill details use case includes make payment. Online and offline is generalized to super class make payment.

## 5. Draw the advanced sequence diagram



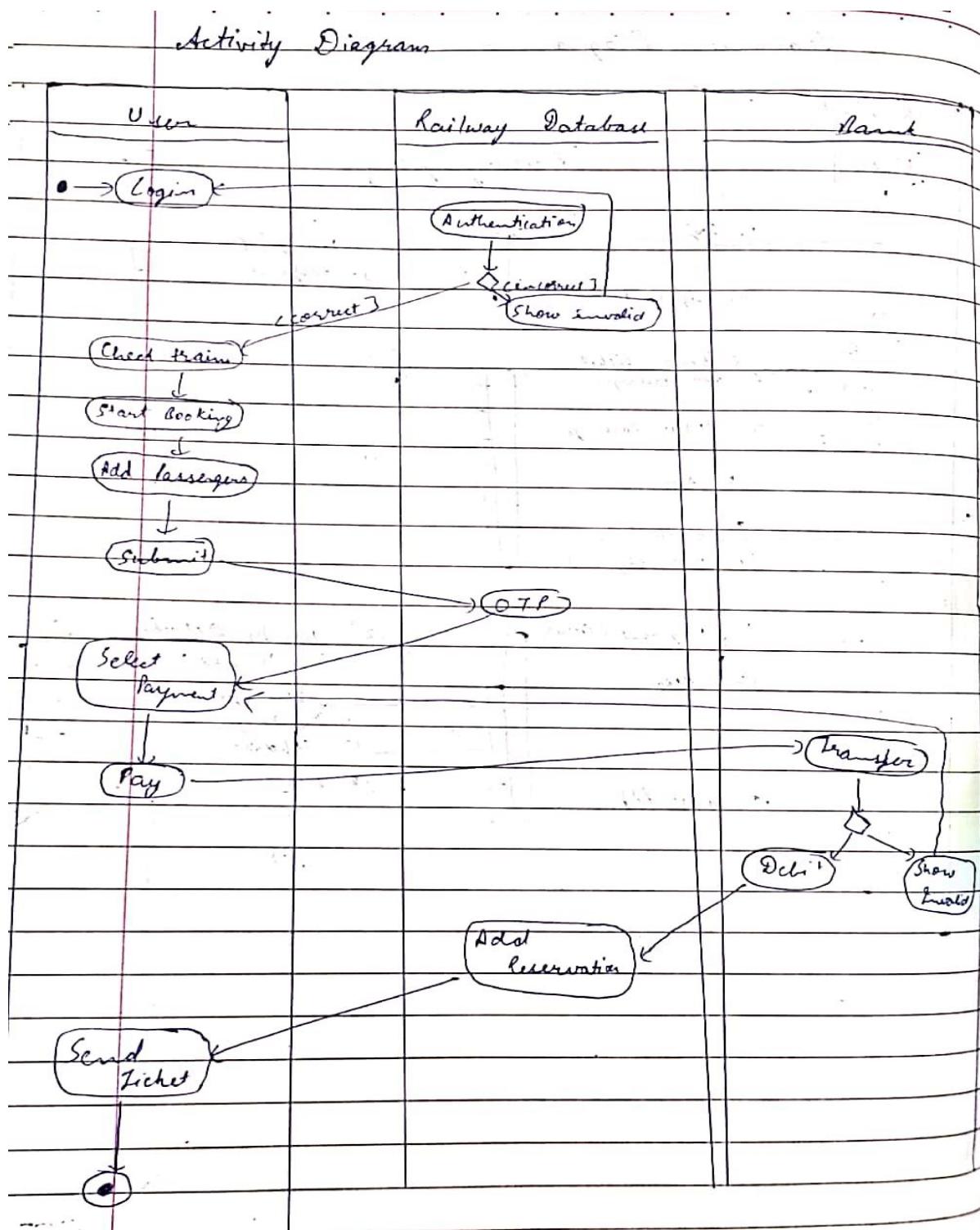


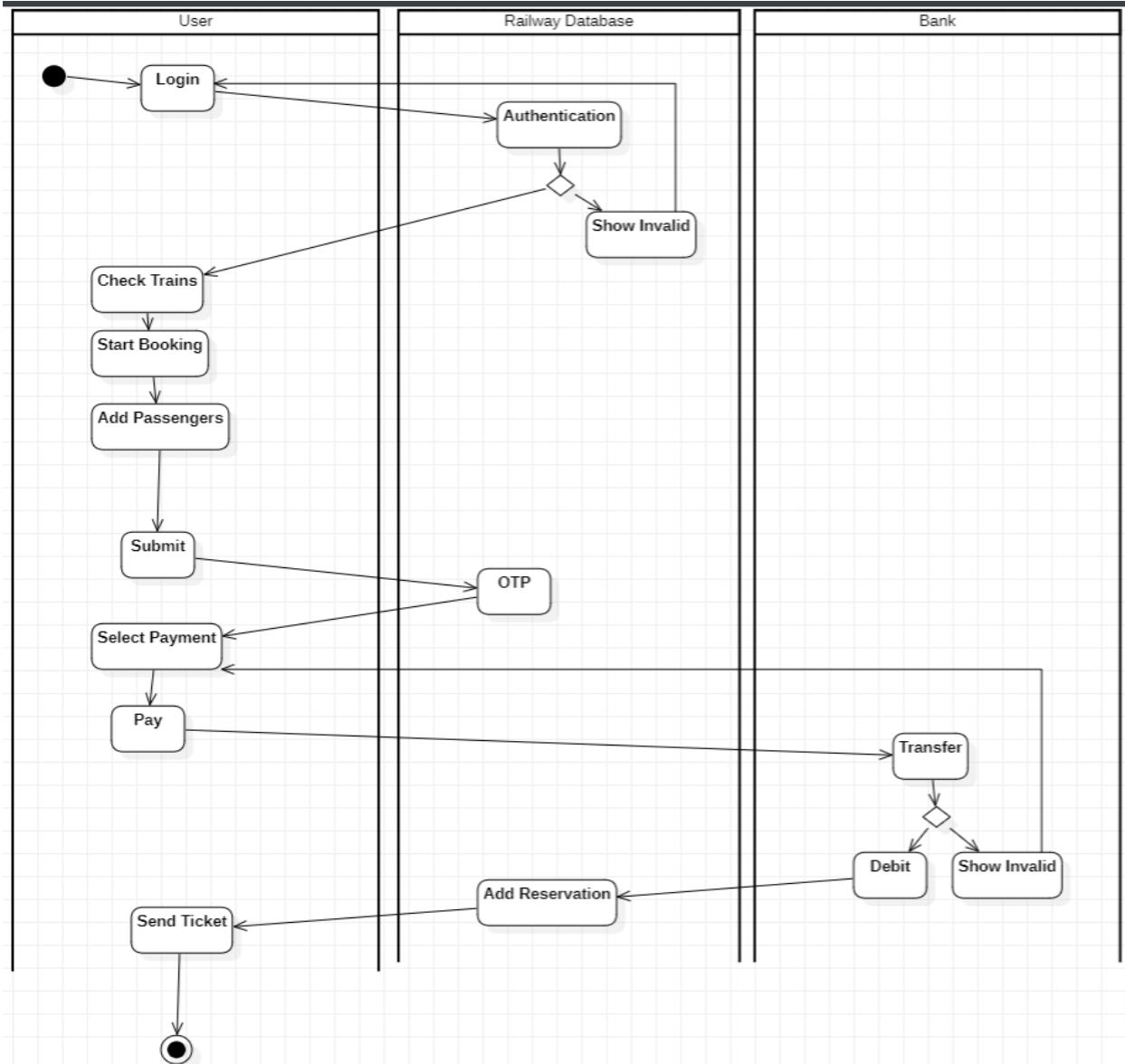
## Give a description of the scenario considered for developing the model

The lifeline is the dotted line and the rectangles represent the period of time the object is executing and is hence called activation.

The recursive function of validation is shown by double activation rectangle of validation with self-transition and verify user.Reply message is used to return back to lifelines with the required message.

## 7. Draw the advanced activity diagram





## Give a description of the scenario considered for developing the model

The advanced activity diagram starts from initiation and in the passenger swimlane, the passenger login activity where a signal is sent to the network for request validation and upon confirmation the control flows to check seat availability activity. There are four swimlanes namely passenger, railway database, railway authority and bank where each one indicates the passenger operations, check seat availability, check validation, confirm payment respectively. Then the control flows to the home page and then termination activities.

## Exercise 7: Graphics Editor

### 1. Write SRS

SPLASH

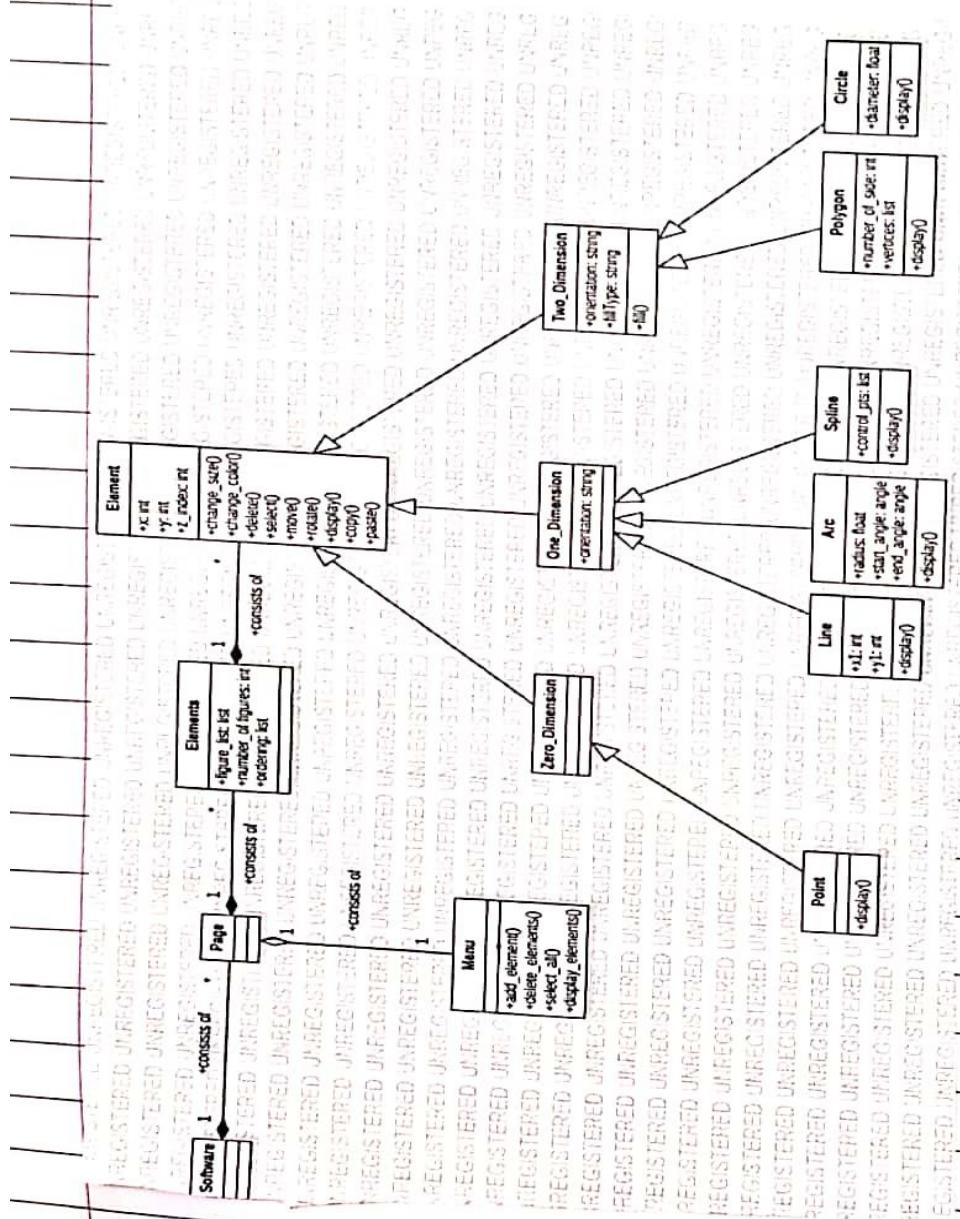
→ Graphics editor →

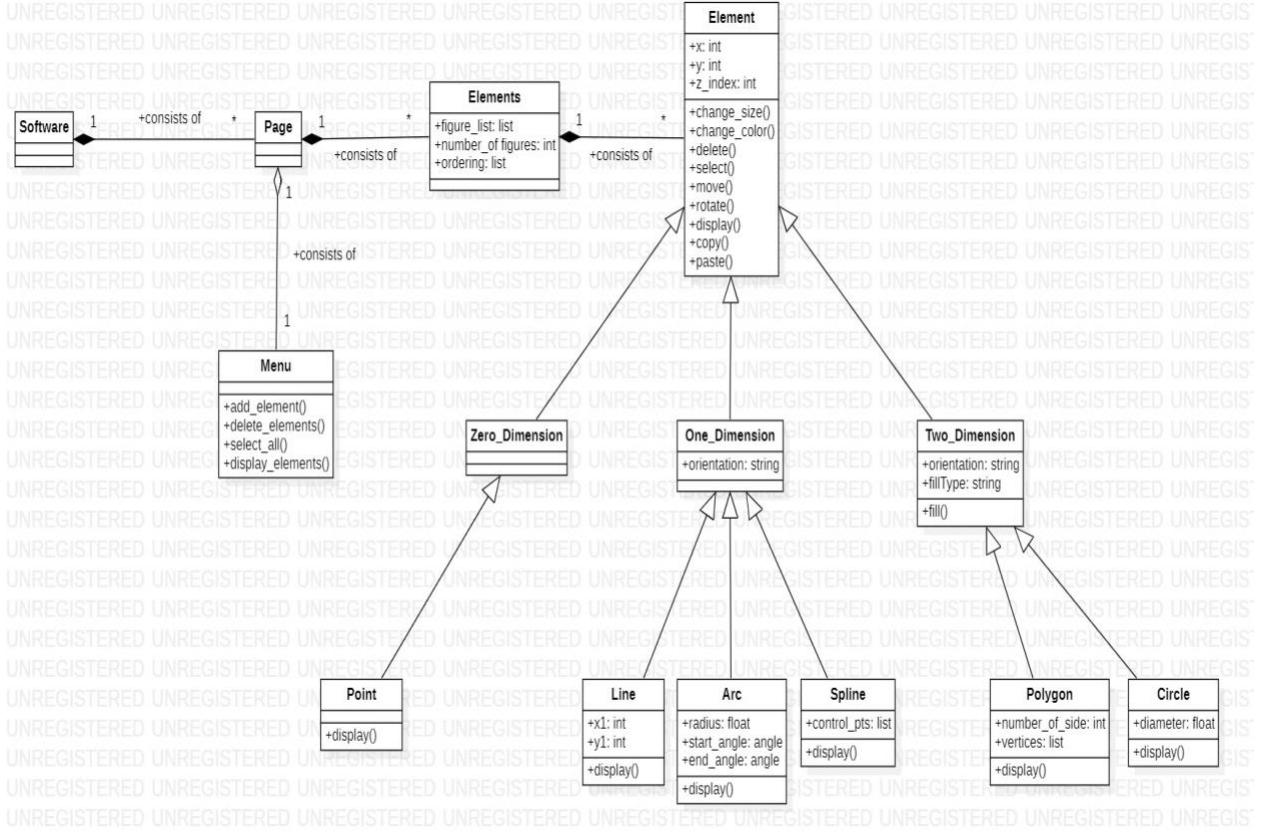
GRS →

- Graphics editor consists of graphical document editor and can be used to create, delete, update & view documents.
- Each document can be saved, opened, printed & new one creating.
- Document consists of many sheets having graphic included in them.
- Sheets have multiple drawing objects & can be created or grouped.
- Programmer must provide functions that draw objects and their connections as well as add & remove connection.
- Can draw multi-dimensional objects, such as 1-D, 2-D or 3-D, which can have multiple sub classes such as point, square, rectangle etc.
- Geometrical objects include circle, ellipse, rectangles which are identified by their respective constraints.

## 2. Draw the advanced class diagram

→ graphics Editor



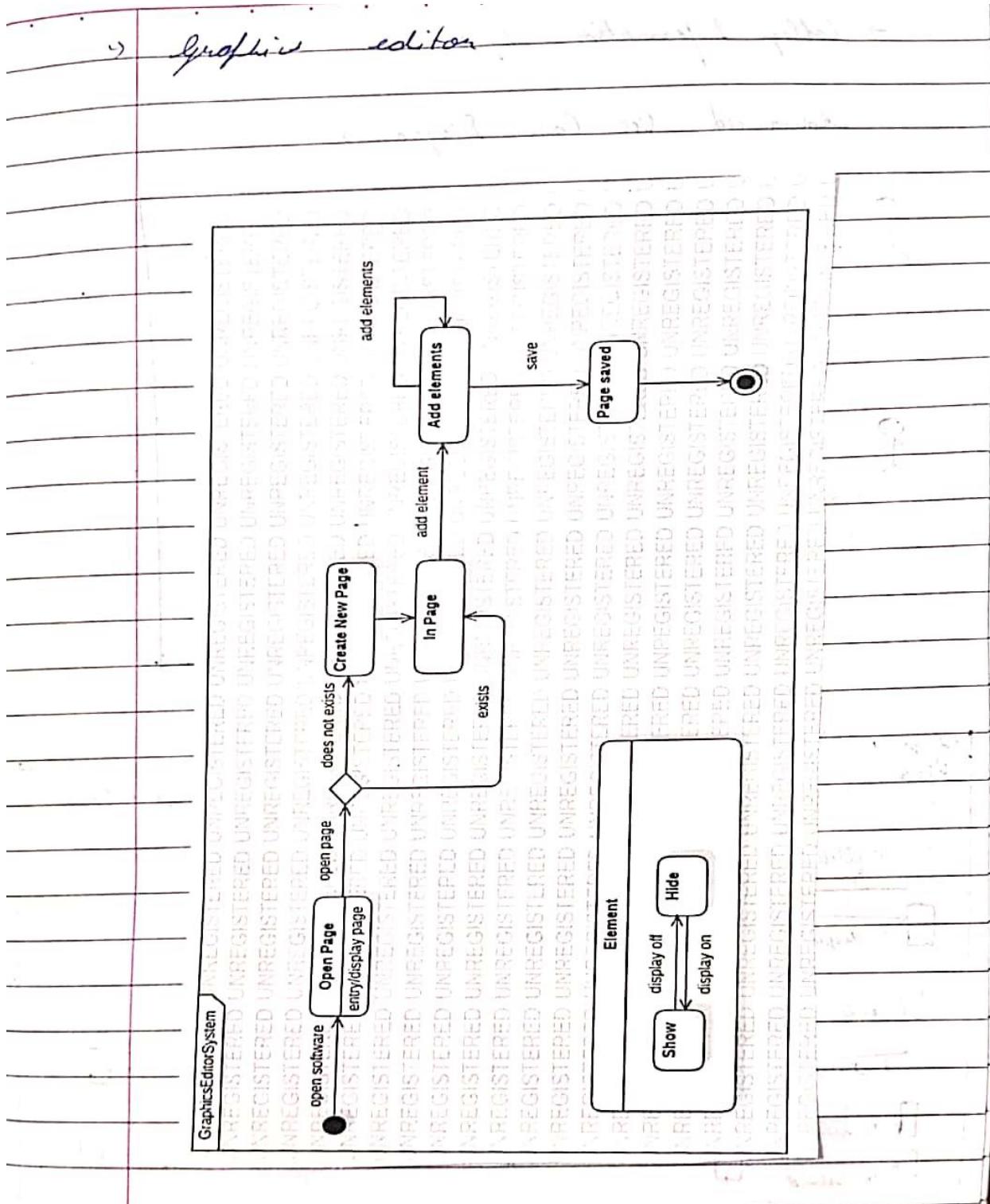


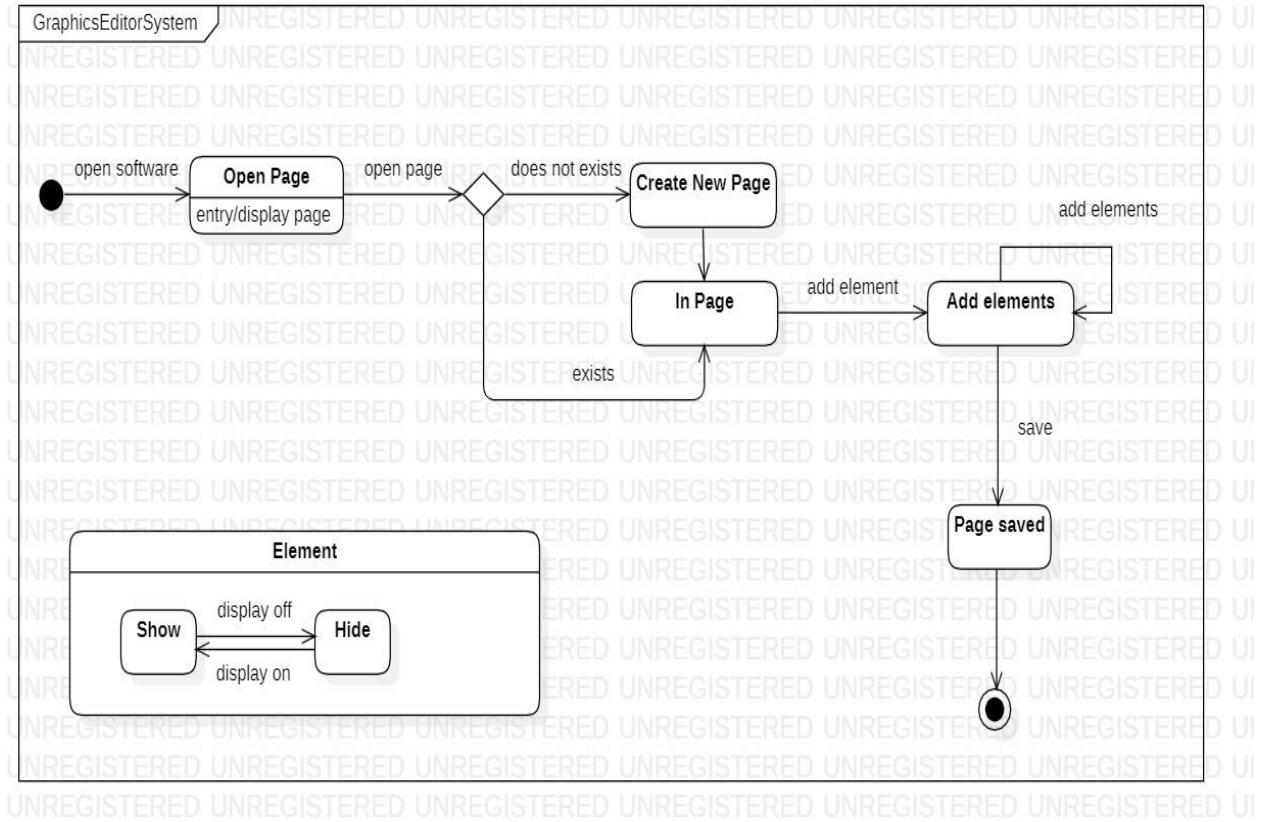
The below shown class diagram contains the following classes: GraphicEditor, Document, Sheet, Group, Object, Text, ZeroDimension, OneDimension, TwoDimension, Point, Line, Arc, Circle, Rectangle, Ellipse with multiplicities as shown.

Generalization: Text, ZeroDimension, OneDimension, and TwoDimension are generalized to Object class. Point is generalized to ZeroDimension, Line and Arc are generalized to OneDimension, Circle, Rectangle and Ellipse are generalized to TwoDimension.

Composition: GraphicsEditor made of Document, Document containsOf Sheet, Sheet has Group, Group has Object.

### 3. Draw the advanced state diagram

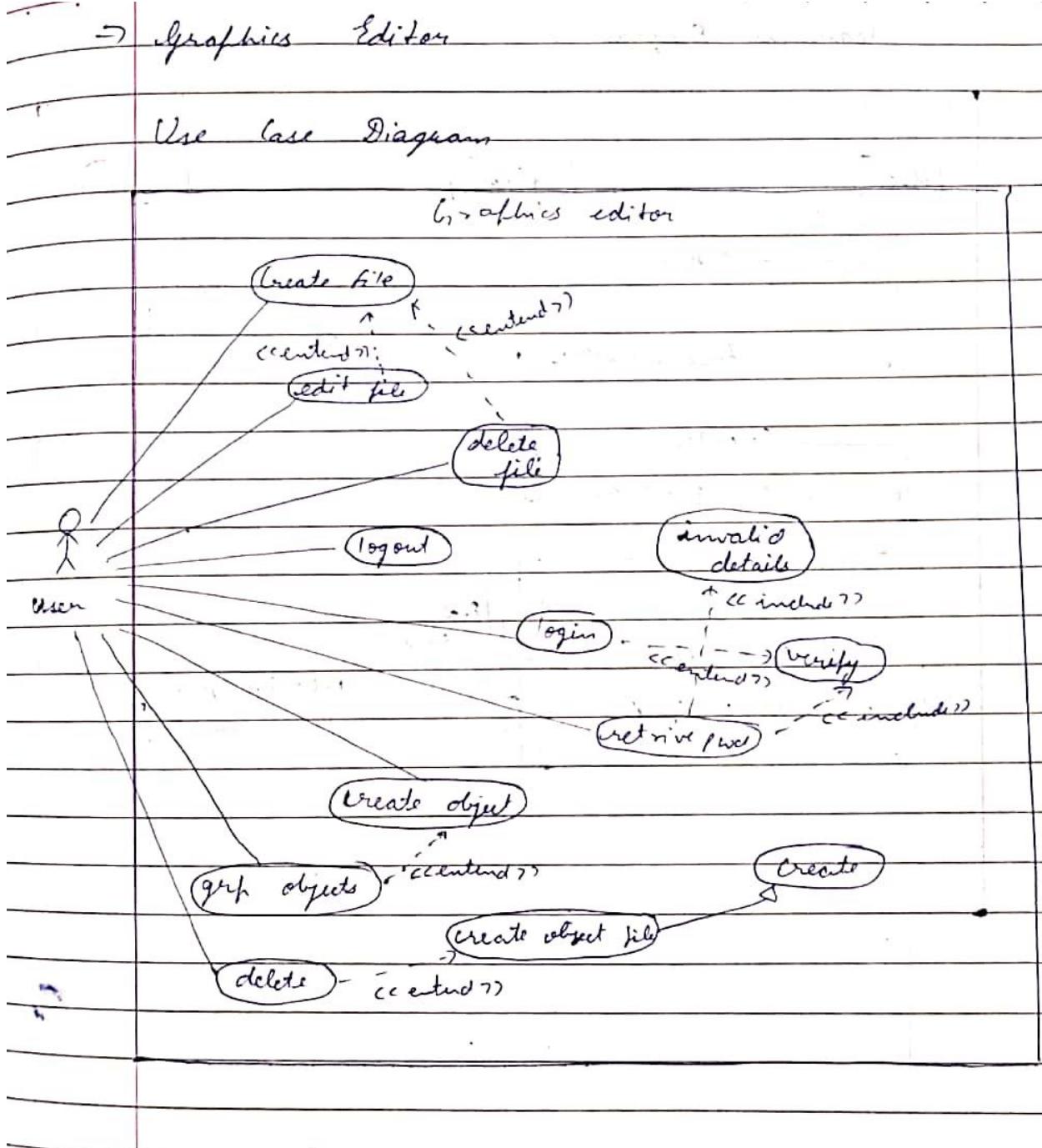


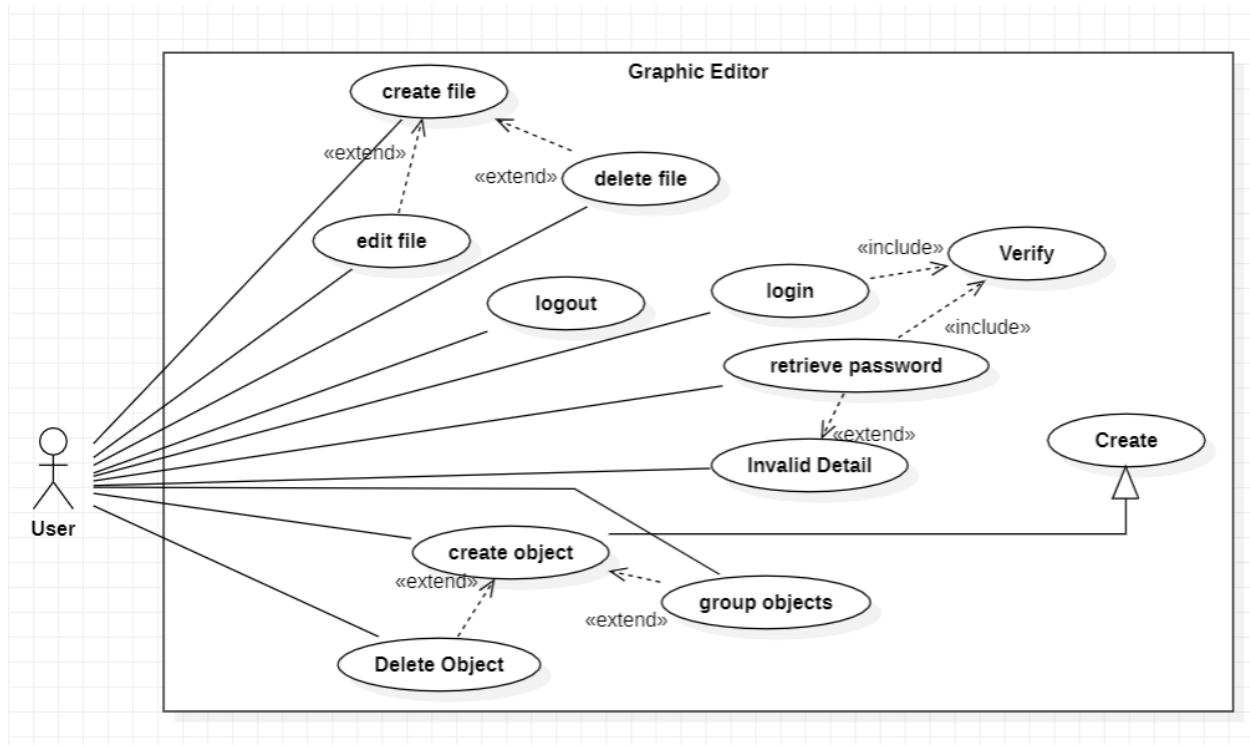


## Give a description of the scenario considered for developing the model

The advanced state diagram depicted below contains one nested state and one submachine, which on successful login shows the Saving procedure and DrawingSystem procedure. It contains initial state and termination state with Saving as a nested state including the required simple states. It also has a submachine state named DrawingSystem with initial, termination state along with simple states; Shapes, Display and format each shape.

#### 4. Draw the advanced use case diagram

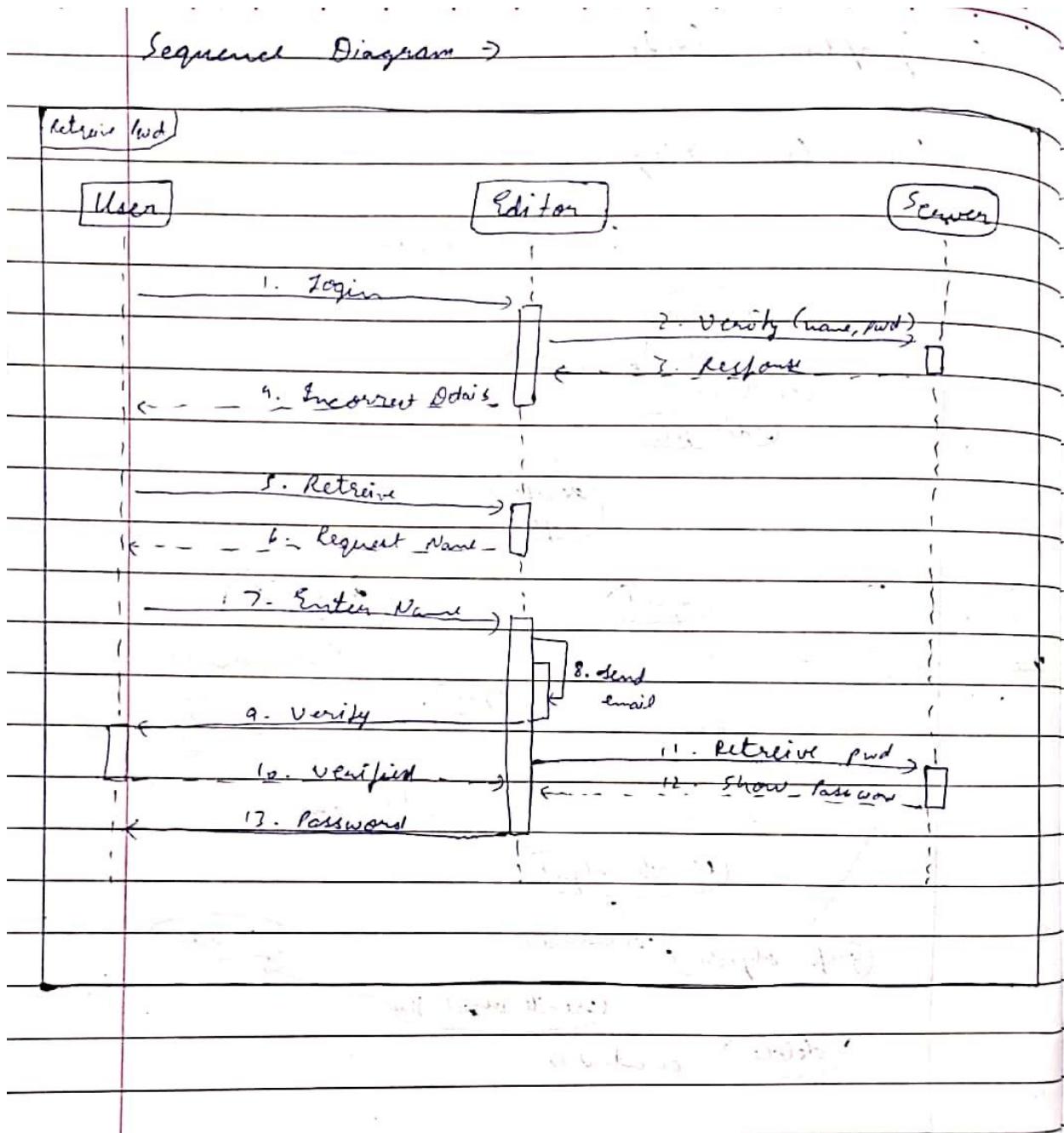


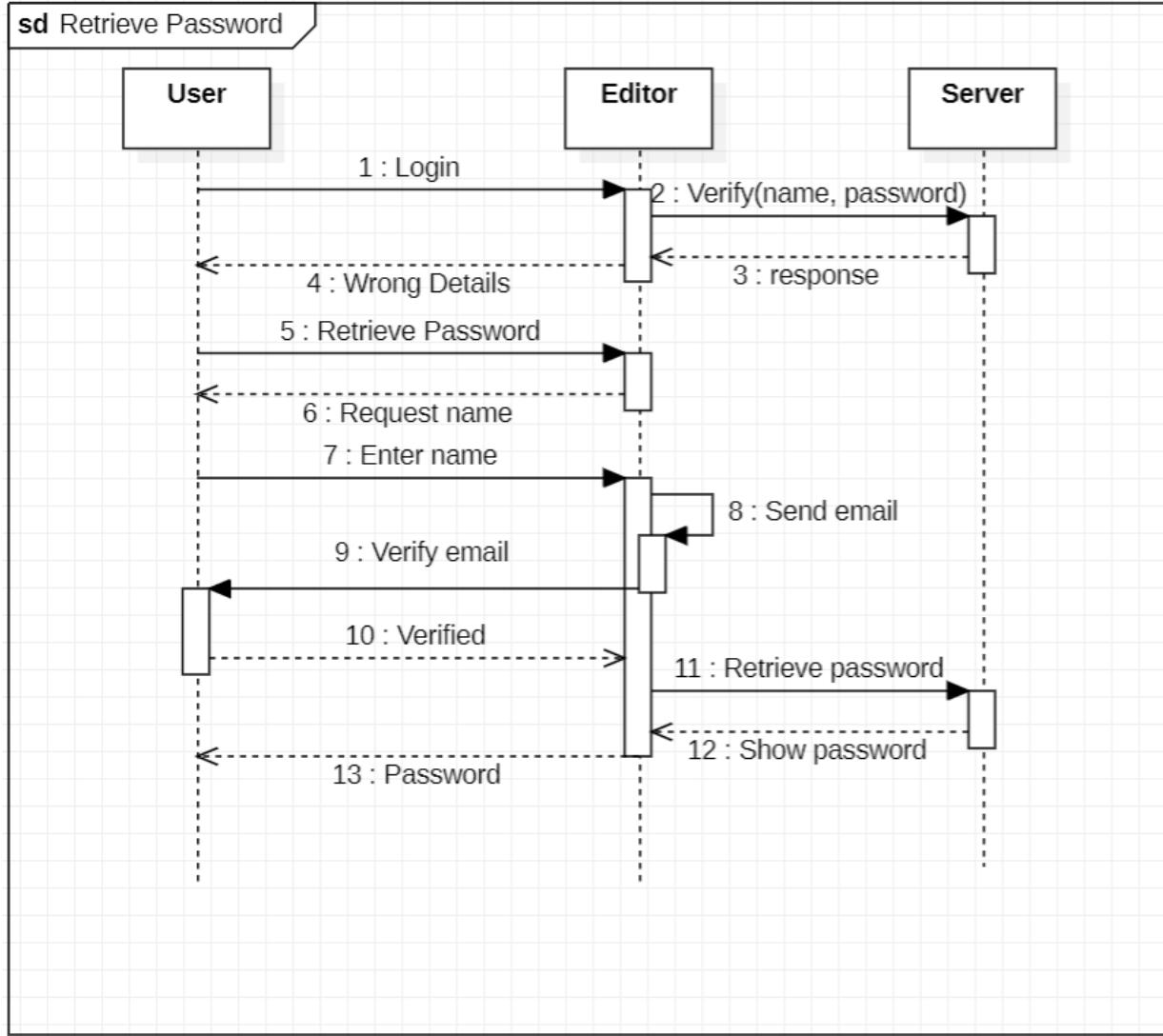


## Give a description of the scenario considered for developing the model

The advanced use case diagram has extra functionalities which includes extends, includes and generalization. The edit document use case extends new document use case, delete document usecase extends new document use case, graphic tools use case extends new document use case,new document use case includes save document use case. Insert, delete and color is generalizedto super class graphics tools.

## 5. Draw the advanced sequence diagram





## Give a description of the scenario considered for developing the model

The lifeline is the dotted line and the rectangles represent the period of time the object is executing and is hence called activation.

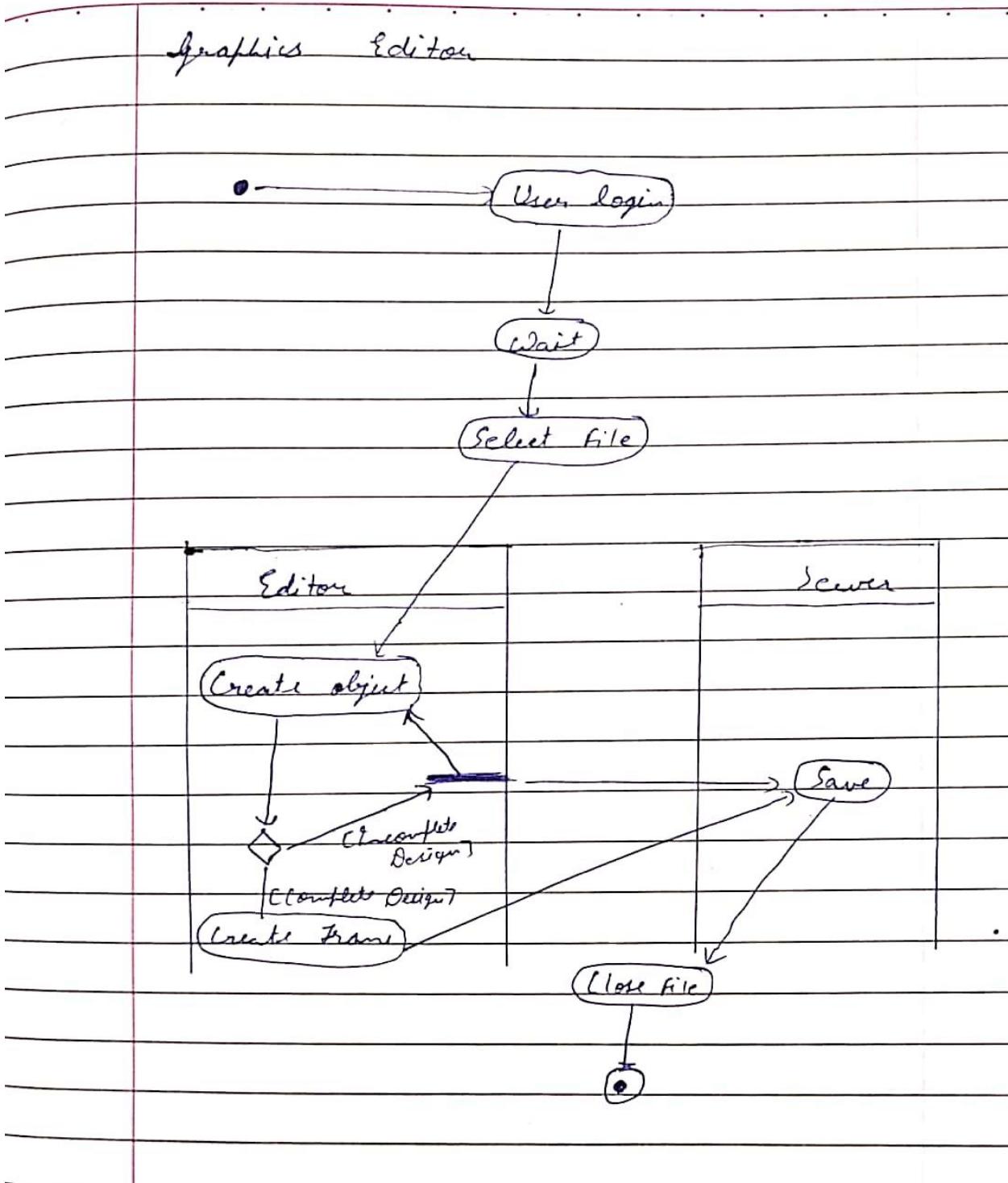
Reply message is used to return back to lifelines with the required message.

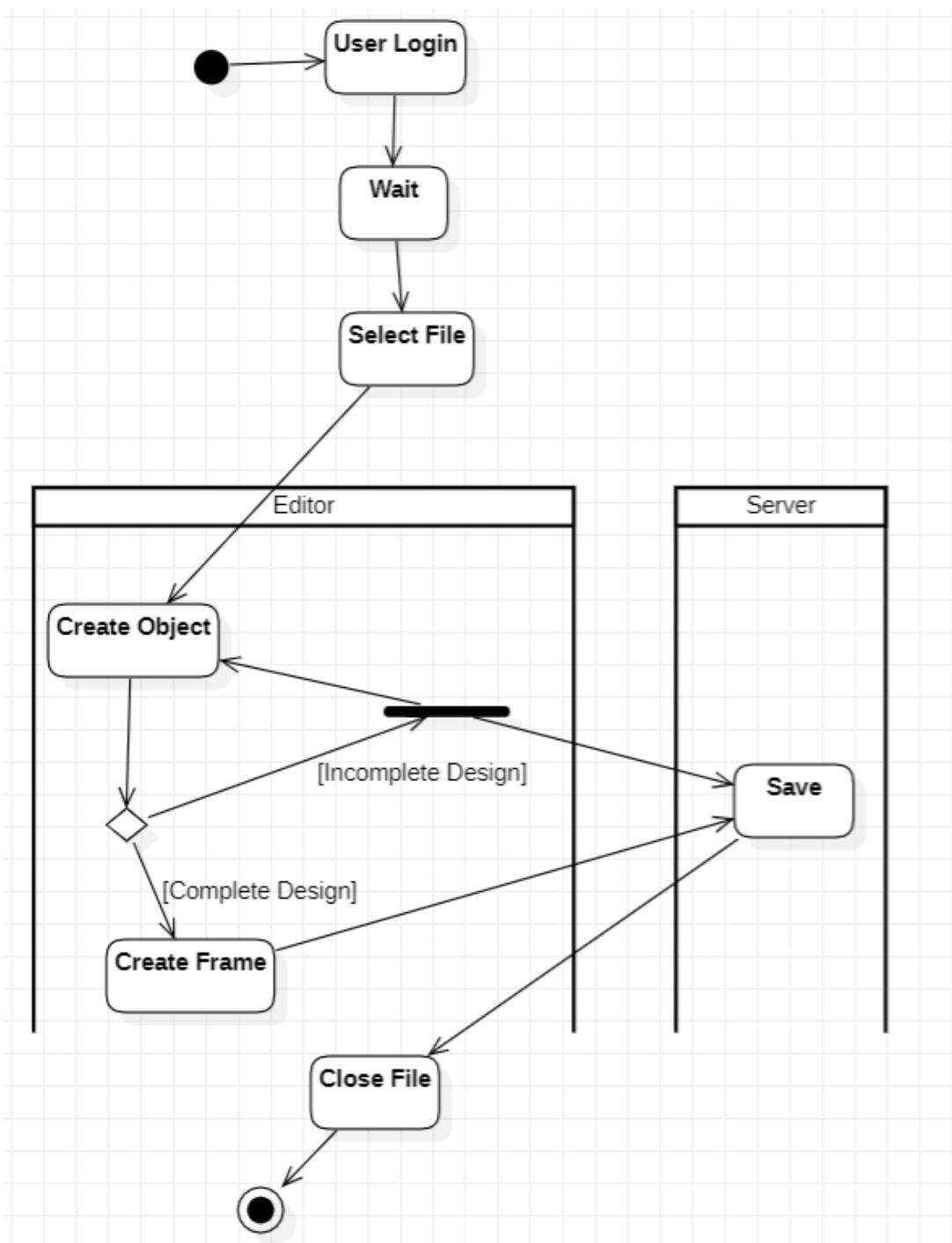
## 6. Draw the advanced activity diagram

Date \_\_\_\_\_

Page \_\_\_\_\_

SPLASH





## Give a description of the scenario considered for developing the model

The advanced activity diagram starts from initiation and in the user swimlane, the user login activity where a signal is sent to the network for request validation and upon confirmation the control flows to open file activity. There are two horizontal swimlanes namely user and editor

where each one indicates the user operations and drawing a diagram respectively. Then the control flows to the close file activity and then termination activities.