Experiment no. 5

Aim: To design and draw the Activity Diagram and State Transition Diagram for a selected Software Project, illustrating dynamic behavior and system workflow

Tools: Lucidchart, Draw.io, MS Visio, StarUML, or any UML modeling tool

Theory:

Activity Diagram

An Activity Diagram is a type of UML Behavioral Diagram that represents workflows of stepwise activities and actions with support for choice, iteration, and concurrency. It models the dynamic aspects of the system, particularly the flow of control from one activity to another.

Purpose:

- To model business workflows
- To capture logic and control flow of use cases
- To represent parallel and conditional activities

Key Elements of Activity Diagram:

Element	Notation	Description
Initial Node	● (filled black circle)	Denotes the starting point of the activity flow.
Activity	Rounded rectangle	Represents an executable unit/task within the workflow.
Decision Node	Diamond symbol	Denotes decision points where alternate flows can occur based on conditions.
Merge Node	Diamond symbol	Merges alternate flows into a single one.
Fork Node	Thick horizontal/vertical bar	Splits flow into multiple concurrent activities.
Join Node	Thick bar	Synchronizes concurrent activities.
Final Node	A bullseye symbol (circle within a circle)	Denotes end of the workflow.
Control Flow	Arrow	Shows the flow of control from one activity to the next.

2. State Transition Diagram

A State Transition Diagram (also known as State Machine Diagram) represents how an object behaves in response to different events during its lifecycle. It defines the possible states of an object and the transitions that cause it to change from one state to another.

Purpose:

- To model the life cycle of a particular object
- To show how the system responds to internal or external events
- To understand object behaviour under various conditions

Key Elements of State Diagram:

Element	Notation	Description
Initial State	● (black filled circle)	Starting point of the object's lifecycle.
State	Rounded rectangle with state name	Represents a particular condition or status of an object.
Transition	Arrow from one state to another	Indicates change from one state to another triggered by an event.
Event/Trigger	Label on transition arrow	Represents the event that causes the state change.
Final State	Circle inside another circle	Represents the end of the object's lifecycle.

Procedure:

1. Analyze the system or project and select an appropriate scenario or object/module to model
2. For Activity Diagram:
    - Identify the main flow of actions and decisions
    - List down all major activities that occur in sequence or parallel
    - Define decision points and conditions for branching
    - Sketch the diagram using UML symbols ensuring correct flow and transitions
3. For State Transition Diagram:
    - Choose a system component (e.g., User account, Order, Ticket)
    - Define all possible states for the component

- Identify events that cause state changes
- Draw the initial state, states, transitions, and final state using UML notations

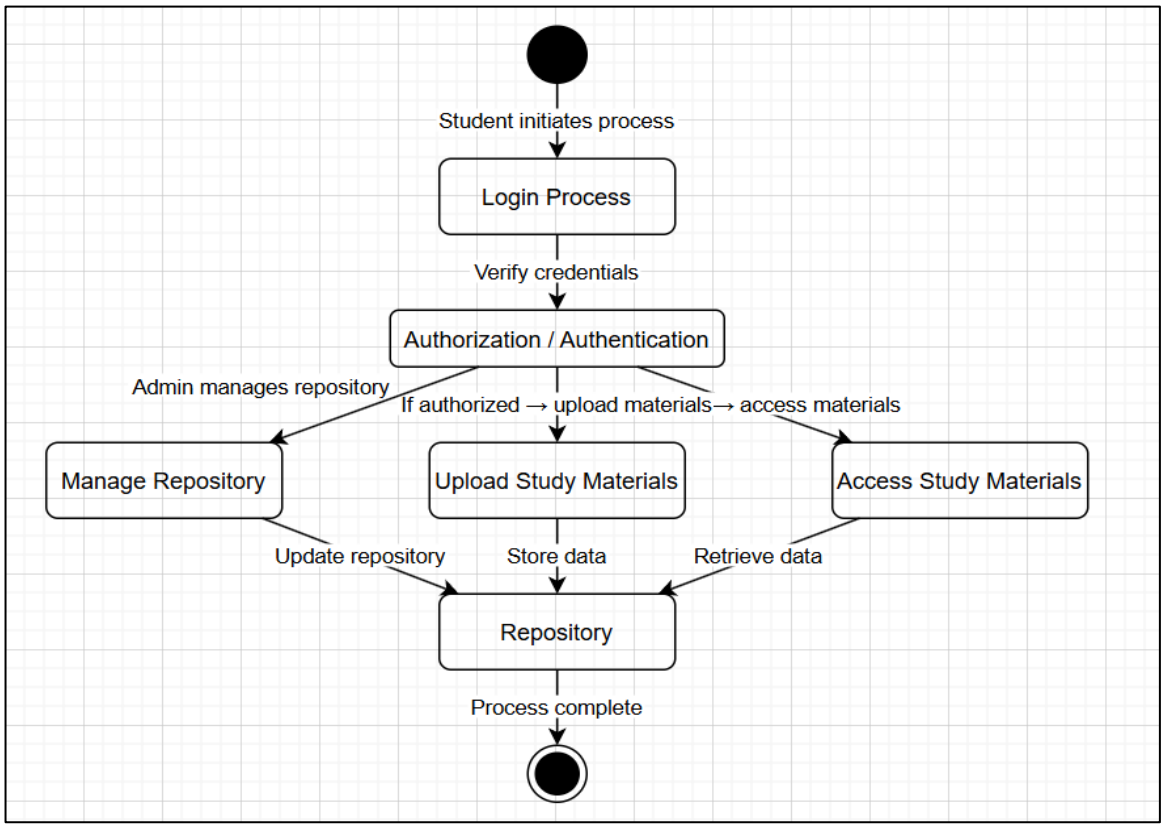
4. Use a modeling tool to prepare neat, legible diagrams

Example Applications:

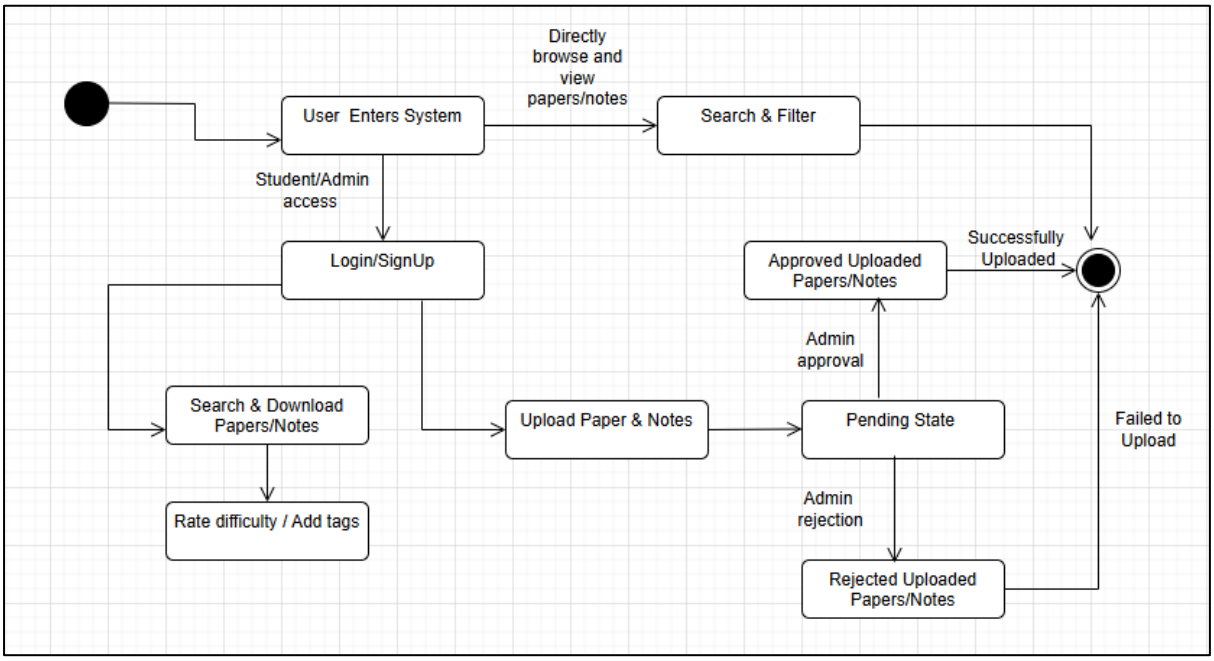
- **Activity Diagram for Online Food Ordering System:**
  - Activities: Browse Menu → Select Items → Add to Cart → Checkout → Make Payment → Receive Order
- **State Transition Diagram for Order Object:**
  - States: Created → Confirmed → Prepared → Dispatched → Delivered → Completed

Implementation :

1) Activity Diagram for Learning Repository:



2) State Transition Diagram for Learning Repository:



Learning Outcomes:

LO1: Construct UML Activity and State Transition Diagrams to represent the dynamic behaviour and workflows of a software system.

LO2: Analyze system scenarios to identify control flows and object state changes for effective behavioural modeling.

Course Outcomes:

Students will be able to model and analyze system behavior using UML Activity and State Transition Diagrams

Conclusion:

Successfully designed Activity and State Transition Diagrams to represent the dynamic behavior and workflows of the selected project using standard UML notations.

Theory Questions:

1. What is the purpose of an Activity Diagram?
2. Define a state in the context of a State Transition Diagram.

Case-Studies/Open-Ended Questions:

1. How would you represent the steps of making an online payment using an Activity Diagram?
2. How would you represent error handling (e.g., invalid input or failed payment) in a State Transition Diagram?

For Faculty Use

Correction Parameters	**Formative Assessment [40%]**	**Timely completion of Practical [40%]**	**Attendance / Learning Attitude [20%]**	
Marks Obtained				