STATE CHART DIAGRAM & ACTIVITY DIAGRAM

HU22CSEN0100999

ESHWAR DESHMUKH CHAVAN

State Chart Diagram in UML

- A **State Chart Diagram** (also called a **State Machine Diagram**) is a **behavioral UML diagram**.
- It represents different states of an object and shows transitions based on specific events.
- Helps analyze the **dynamic behavior** of a system and defines object lifecycles.

State Chart Diagram Notations

State Chart Diagrams use **UML symbols** to represent states and transitions:

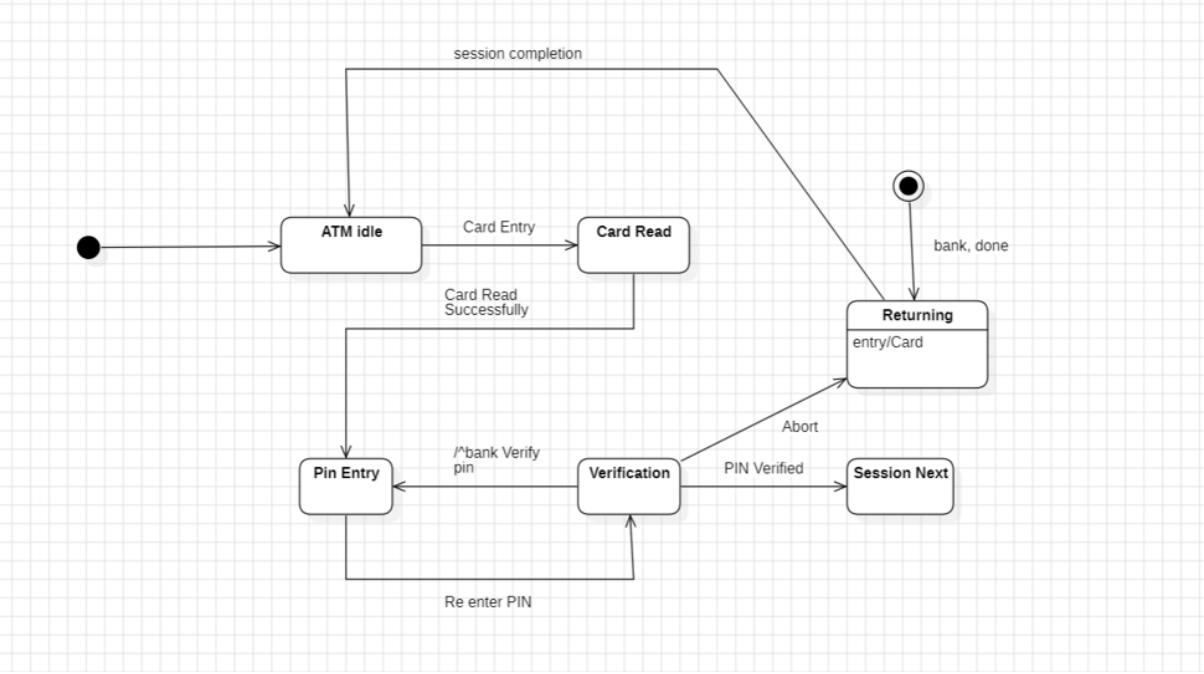
1. **States**
    - Represented as **rounded rectangles**.
    - Each state defines a **specific condition** of an object.
    - Example: **Active, Inactive, Processing**.
2. **Initial State**
    - Depicted as a **filled black circle**.
    - Marks the **starting point** of the state machine.
3. **Final State**
    - Shown as a **black circle with an outer ring**.
    - Represents the **end of the process**.
4. **Transitions**
    - Illustrated with **arrows connecting states**.

- Show how an object **changes states** when an event occurs.

Example: ATM System State Chart Diagram

States in an ATM System:

- **Idle** – ATM is ready to accept user input.
- **Card Inserted** – User inserts a card.
- **PIN Verification** – System verifies the entered PIN.
- **Transaction Selection** – User chooses a transaction type.
- **Processing Transaction** – ATM processes the selected transaction.
- **Transaction Complete** – Transaction finishes, and the card is ejected.
- **Error State** – After repeated incorrect PIN entries, the ATM locks the card.



Transitions in ATM System

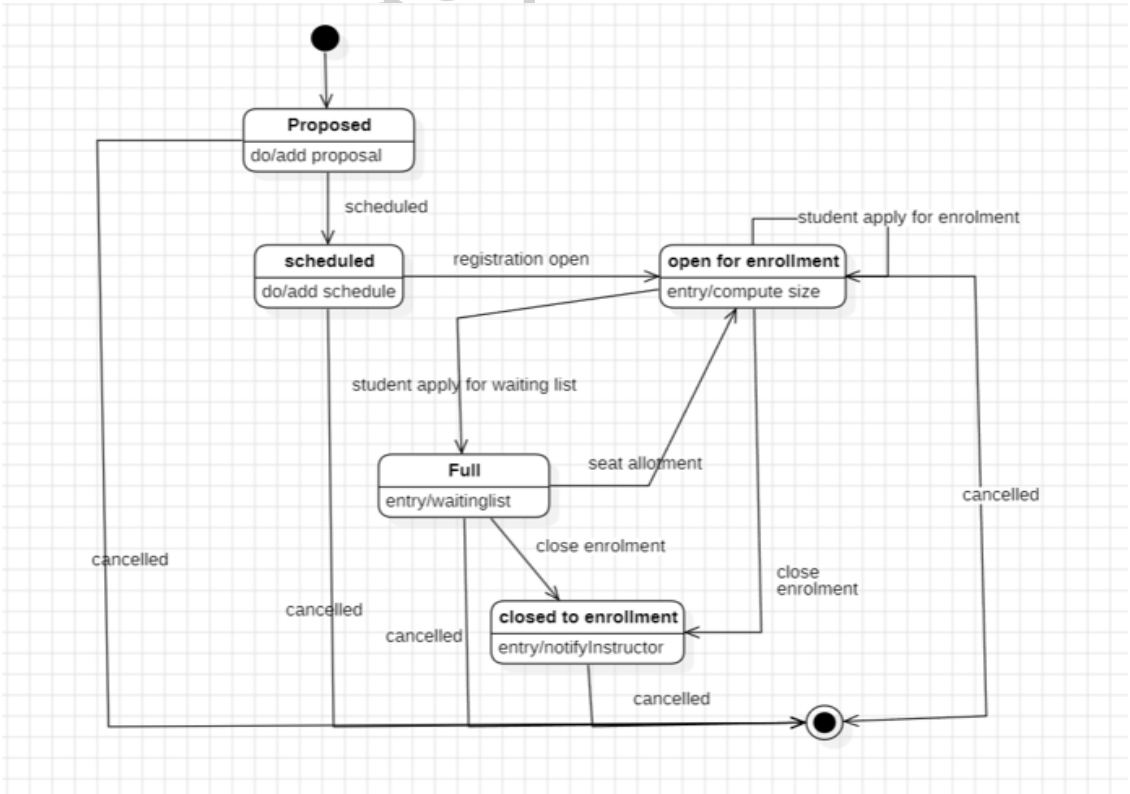
- **Idle → Card Inserted** – When the user inserts their card.

- **Card Inserted** → **PIN Verification** – After the user enters their PIN.
- **PIN Verification** → **Transaction Selection** – If the PIN is correct.
- **PIN Verification** → **Error State** – If the PIN is entered incorrectly multiple times.
- **Transaction Selection** → **Processing Transaction** – After the user selects a transaction.
- **Processing Transaction** → **Transaction Complete** – If the transaction is successful.
- **Transaction Complete** → **Idle** – The ATM resets to idle after transaction completion.

Example: University Student State Chart Diagram

States:

- Application Submitted → Application Under Review → Approved/Rejected → Enrollment Completed → Graduation



Transitions in University Student State Chart Diagram

- **Application Submitted → Application Under Review** – The university begins evaluating the application.
- **Application Under Review → Approved/Rejected** – The application is either accepted or denied.
- **Approved → Enrollment Completed** – If approved, the student completes the enrollment process.
- **Enrollment Completed → Graduation** – After fulfilling academic requirements, the student graduates.

Activity Diagram in UML

- An **Activity Diagram** is a **behavioral UML diagram** that represents the **flow of activities** in a system.
- Focuses on **procedural flow and control logic**, showing the **sequence of operations** rather than object states.

Activity Diagram Notations

Activity Diagrams use **specific UML symbols** to represent workflows and decision-making:

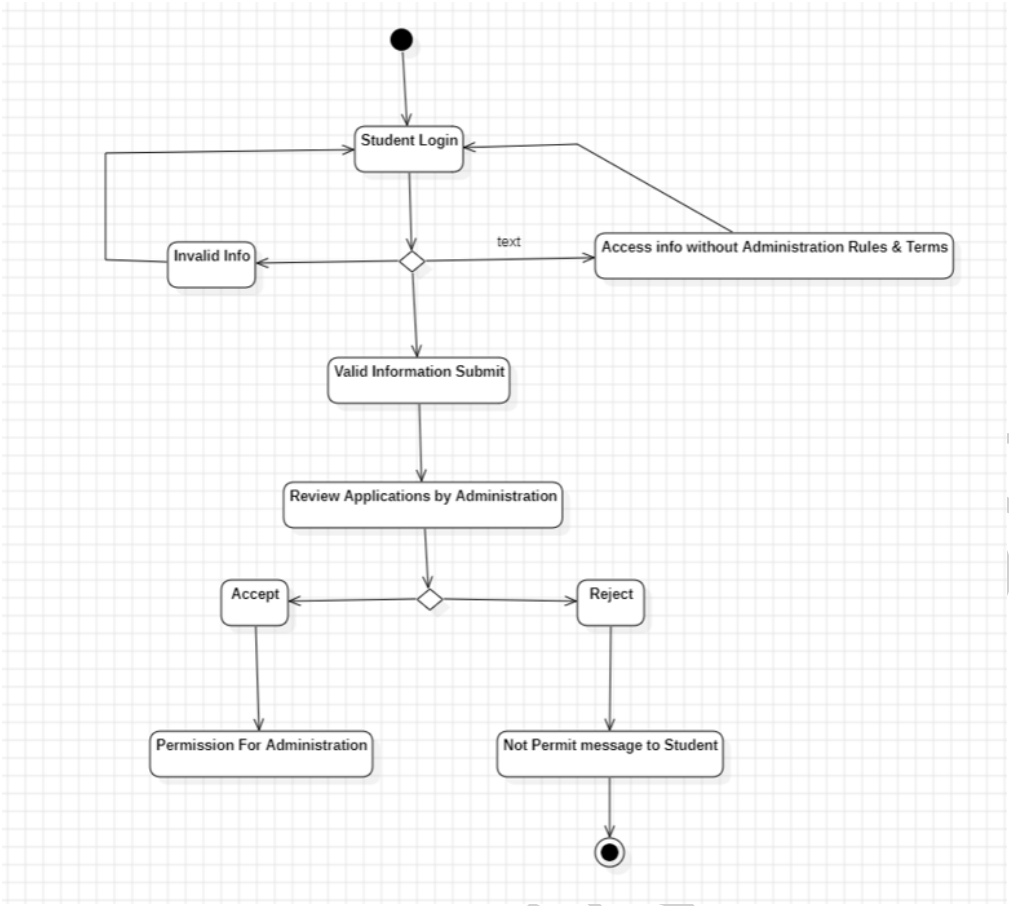
1. **Initial Node**
    - Marks the **starting point** of the activity flow.
    - Represented as a **filled black circle**.
2. **Activity (Action) Nodes**
    - Represent **specific tasks or operations** in the workflow.
    - Depicted as **rounded rectangles**.
    - Example: **Submit Form, Make Payment**.

3. **Decision Node**
    - Represents a **conditional choice** in the process.
    - Shown as a **diamond shape**.
    - Example: **Is PIN Correct? Yes → Continue, No → Retry**.
4. **Merge Node**
    - **Combines multiple paths** into a single flow.
5. **Fork and Join Nodes**
    - **Fork** – Splits the flow into **multiple parallel** paths.
    - **Join** – Merges parallel paths **back into a single flow**.
6. **Final Node**
    - Represents the **end of the activity flow**.
    - Depicted as a **black circle with an outer border**.

Example: University Student Enrollment Activity Diagram

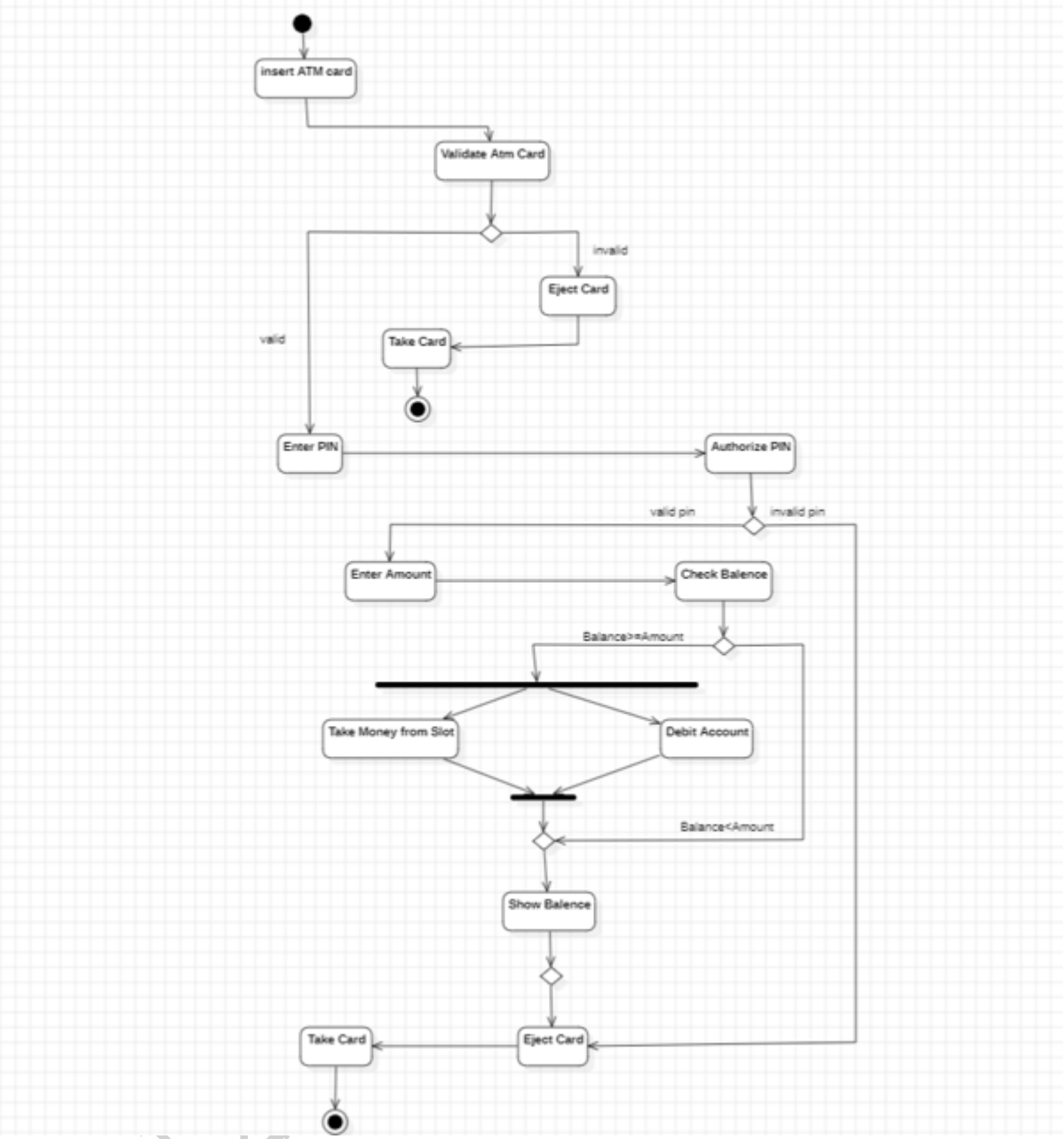
Actors & Their Roles:

- **Student** – Registers, enrolls in courses, checks grades.
- **Admin** – Approves or rejects student registrations, manages courses.
- **Teacher** – Evaluates and grades student work.



Workflow: University Student Enrollment Activity Diagram

1. **Student Registers → Initial Node** (Start of the process).
2. **Admin Reviews Registration → Decision Node (Approved/Rejected)**.
3. **If Approved → Student Logs In → Enrolls in Course**.
4. **If Rejected → Process Ends**.
5. **Student Attends Course**.
6. **Teacher Assigns Grades**.
7. **Student Checks Grades**.
8. **Process Ends** (Final Node)



Example: ATM System Activity Diagram

Actors & Their Roles:

- **Customer** – Inserts card, enters PIN, selects a transaction.
- **ATM System** – Verifies PIN, processes transactions, dispenses cash.

Workflow:

1. **Customer Inserts Card → Initial Node** (Process starts).
2. **ATM Requests PIN → Decision Node (Correct/Incorrect)**.

3. **If Correct → User Selects Transaction**.
4. **If Incorrect → Retry or Block Card (After multiple failures)**.
5. **Transaction Processed → Cash Dispensed**.
6. **Card Ejected → Process Ends** (Final Node).