



**VEER NARMAD SOUTH GUJARAT UNIVERSITY**

University Campus, Udhna-Magdalla Road, Surat – 395001, Gujarat, India.

**Department of Information and Communication Technology  
M.Sc. (ICT) Programme**

**AS PARTIAL REQUIREMENT FOR THE DEGREE  
OF  
MASTER OF SCIENCE IN INFORMATION AND COMMUNICATION  
TECHNOLOGY (MSC ICT 2 Year Course)**

**2024-25**

**(SEMESTER – III)**

**PROJECT TITLE**

**“Home Owner Association Connect”**

**GUIDED BY**

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY**

**Department of Information and Communication  
Technology**

**M.Sc.(Information and Communication Technology)  
Programme**

***Certificate***

This is to certify that Mr. Prajapati Priya Vashrambhai with exam seat number 1033 and PG Enroll Number 2024041600 has worked on his/her project work entitled as HOME OWNER CONNECT PORTAL at **Department of ICT** as a partial fulfillment of requirement of M.Sc. (Information and Communication Technology) - 3rd Semester, during the academic year 2024-2025.

Date:

Place: Department of ICT, VNSGU, Surat

**Internal Project Guide  
MSc(ICT) 3rd Semester  
Department of ICT  
VNSGU, Surat**

**Head of the Department  
Department of ICT  
VNSGU, Surat**



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This is to certify that Mr. Jadhav Swati Narendra with exam seat number 1050 and PG Enroll Number 2024041619 has worked on his/her project work entitled as HOME OWNER CONNECT PORTAL at **Department of ICT** as a partial fulfillment of requirement of M.Sc. (Information and Communication Technology) - 3rd Semester, during the academic year 2024-2025.

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VNSGU, Surat.**

**Head of the Department  
Department of ICT  
VNSGU, Surat**

## **ACKNOWLEDGEMENT**

When we reach the completion of the project, giving credit becomes a must, as without the support of other so many people's help and guidance, this project couldn't be completed successfully.

Success in such a comprehensive project cannot be achieved single-handled. It is team effort that sails the ship to the coast. So, we would like to express our sincere thanks to all the dignitaries who were involved in making this project a great joy and turning it into successful piece of work.

We would like to take opportunity to thank our **Department J.P. Dawer Institute of Information Science & Technology, Surat** for giving us this tremendous opportunity to work in the real-time project.

**Shreya Kapadia**, our professor and project coordinator, has been very prudent to us throughout our college studies. She is the person who has been giving direction to our work and the shape to our imagination and always ready to give best guidance, give solutions whenever required. We express our regards to her from the core of our heart.

Last but not the least, our heartfelt appreciation goes to all those not named here, but who have rendered their co-operation, little or more, directly or indirectly involved in the development of this system.

Thanking All.

**Prajapati Priya V.**

**Jadhav Swati N.**

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# 1. INTRODUCTION

Home Owner Associations (HOAs) play a vital role in managing residential communities by maintaining amenities, collecting payments, resolving complaints, and ensuring smooth communication between residents and management. As residential societies grow in size and complexity, manual and semi-digital management systems become inefficient, time-consuming, and difficult to monitor.

**HOA Connect** is a web-based management portal developed using the **MERN Stack** (**MongoDB, Express.js, React.js, Node.js**) that provides a centralized and secure platform for managing residential communities. The system introduces **three clearly defined user roles** — **Super Admin, HOA Admin, and Resident** — each with controlled access and responsibilities.

The application ensures **transparency, operational efficiency, and self-governance** by enabling online payments, amenity booking, complaint tracking, announcements, meetings, polls, and analytics. By digitizing core HOA operations, HOA Connect reduces manual effort, improves communication, and enhances resident participation.

## 1.1 Customer Profile

The HOA Connect Portal is designed for **residential communities and housing societies** that require an organized, scalable, and role-based management system. The system caters to all stakeholders involved in community governance and daily operations.

The primary customers include:

- Home Owner Associations managing one or more residential communities
- HOA Board Members responsible for administration and decision-making
- Residents seeking convenient access to community services

### 1.1.1 Current System

Most residential communities currently rely on **traditional manual or semi-digital systems** for managing their daily operations. The existing system typically involves:

- Community records maintained using registers, spreadsheets, or isolated software tools
- HOA Admins manually assigning roles without centralized access control
- Amenities managed informally or through notice boards
- Complaints submitted verbally or via messaging applications
- Payments collected through cash, bank transfers, or external payment apps
- Announcements shared through printed notices or informal WhatsApp groups
- Meetings conducted offline with no structured RSVP or tracking mechanism

#### **Limitations of the Existing System:**

- No centralized platform for community management
- Lack of role-based access and security
- Difficulty in tracking payments and complaints
- Poor transparency in administrative decisions
- No global reporting or analytics
- High dependency on manual coordination
- Difficult to scale for multiple communities

## 1.1.2 Customer Details

### **1. Super Admin (Platform Owner / System Administrator)**

- Manages multiple residential communities
- Creates communities and assigns HOA Admins
- Defines amenities available for each community
- Monitors global payment analytics and system-wide activity
- Ensures consistent governance across communities

### **2. HOA Admin (Community Board Member)**

- Responsible for managing a specific residential community
- Manages residents, complaints, announcements, documents, payments, and polls
- Oversees amenity usage and availability
- Organizes meetings and monitors participation
- Has the authority to replace themselves with another resident if required

### **3. Residents**

- Homeowners or tenants residing in the community
- Interact with the system to:
  - Book amenities
  - Raise and track complaints
  - Make online payments
  - View announcements and documents
  - Participate in polls and meetings
- Manage their own profile and receive community notifications

## **2. PROPOSED SYSTEM**

### **2.1 Scope**

- ❖ The scope of the HOA Connect Project covers various aspects of residential community (Home Owner Association) management through a centralized web-based platform.
- ❖ This includes community management, resident record maintenance, complaint handling, amenities management, online payments, announcements, meetings, and polls.
- ❖ The system facilitates transparent communication between HOA Admins and residents by providing real-time notifications, document sharing, and community updates.
- ❖ Overall, the system aims to improve operational efficiency, reduce manual work, and ensure smooth day-to-day functioning of residential societies.

### **2.2 Objective**

- ❖ To understand and implement the complete workflow of Home Owner Association management, including resident onboarding, complaint resolution, and payment handling.
- ❖ To provide a centralized platform that enhances communication between Super Admins, HOA Admins, and Residents.
- ❖ To explore the technical implementation of a full-stack web application using the MERN stack for efficient data management and role-based access control.
- ❖ To improve resident satisfaction by providing easy access to amenities booking, notifications, and community information.

## 2.3 Constraints

### **2.2.1 Hardware Constraints:**

#### **1. Server Limitations :**

- Limited server processing power and memory may affect handling of concurrent users, real-time notifications, and analytics processing.
- Storage limitations could restrict document uploads such as meeting minutes, circulars, and community records.
- Dependence on hosting infrastructure introduces a risk of downtime affecting access to the system.

#### **2. Network Limitations :**

- Limited internet bandwidth may affect real-time features such as notifications, payments, and dashboard analytics.
- Unstable connectivity could delay data synchronization between frontend and backend services.

#### **3. Scalability Issues :**

- Hardware limitations may restrict support for a growing number of communities and residents.
- Expanding infrastructure for large-scale deployment may require additional investment.

### **2.2.1 Hardware Constraints:**

#### **1. Platform Dependency :**

- The system depends on web browser compatibility; older browsers may not fully support all features.
- Mobile responsiveness may vary across devices if not properly optimized.

#### **2. Performance Constraints :**

- High traffic during peak times (payments, announcements, voting) may affect performance.
- Inefficient database queries or un-optimized backend APIs may cause delays.

## 2.4 Advantages

### **1. Efficient Community Management:**

- Automates resident records, complaints, payments, and amenities management.
- Reduces paperwork and manual administrative effort.

### **2. Improved Transparency:**

- Residents can track complaints, payments, and announcements in real time.
- Polls and meetings ensure democratic decision-making.

### **3. Streamlined Communication:**

- System-wide and community-specific notifications improve engagement.
- Centralized announcements reduce miscommunication.

### **4. Data-Driven Insights:**

- Admins can view analytics on complaints, payments, and community activity.
- Helps management make informed decisions.

### **5. Enhanced Resident Experience:**

- Easy access to services like payments, amenities booking, and documents.
- User-friendly dashboards improve convenience and satisfaction.

### **6. Secure and Role-Based Access:**

- JWT authentication and role-based permissions ensure data security..
- Each user accesses only authorized information.

## 2.5 Limitations

### **1. Initial Setup Cost :**

- Development, deployment, and maintenance may require significant investment.
- Training users to adapt to the system may take time.

### **2. Technical Dependency :**

- Continuous internet access is required for system usage.
- Non-technical users may require support during initial adoption.

### **3. Maintenance Requirements :**

- Regular updates, bug fixes, and backups are essential.
- Downtime during maintenance may temporarily affect access.

### **4. Scalability Bottlenecks :**

- Performance issues may arise if the system is not scaled properly for large communities.

### **5. Data Privacy Risks :**

- Improper security configurations could expose sensitive resident or payment data.
- Strong security practices are required to prevent breaches.

### **3. ENVIRONMENT SPECIFICATION**

#### **3.1 Hardware and Software Requirements**

<b>Hardware Requirements</b>	
<b>Processor</b>	Intel Core i5-4310U CPU
<b>RAM</b>	12.0 GB
<b>Hard Disk</b>	1.16 TB
<b>Input Device</b>	Keyboard , Mouse

<b>Software Requirements</b>	
<b>Host Operating System (Server Side)</b>	Windows 10
<b>Operating System</b>	Any Operating System
<b>Browser</b>	Google Chrome, Mozilla Firefox
<b>Database</b>	MongoDB
<b>Development</b>	Visual Studio Code
<b>Server</b>	NodeJS

## 3.2 Development Description

### **1. Project Planning and Requirements Gathering :-**

- **Objective :** To define the project scope, identify stakeholders, gather HOA-specific requirements, and establish a structured development timeline for the HOA Connect system.
- **Activities :**
  - Conduct discussions with HOA board members, residents, and administrators to understand community management needs.
  - Identify core modules such as community management, resident management, payments, complaints, amenities, meetings, and notifications.
  - Prepare a detailed project plan with milestones for module development, integration, testing, and deployment.
  - Finalize role-based access requirements for Super Admin, HOA Admin, and Residents.

### **2. Design Phase :-**

- **Objective :** To design the system architecture, user interfaces, and database structure suitable for managing residential communities efficiently.
- **Activities :**
  - Design the database schema with collections such as Users, Communities, Amenities, Complaints, Payments, Announcements, Meetings, Polls, and Documents.
  - Prepare system architecture diagrams illustrating interaction between frontend (React), backend (Node.js/Express), and database (MongoDB).
  - Design role-based dashboards for Super Admin, HOA Admin, and Residents.
  - Define API structure and data flow between client and server.

### **3. Frontend Development :-**

- **Objective :** To develop a responsive, user-friendly interface that allows smooth interaction for all user roles.
- **Technologies :** HTML, CSS, JavaScript, React.js, Bootstrap/Tailwind CSS
- **Activities :**
  - Implement UI Components for login, registration, dashboards, and role-based navigation.

- Develop pages for announcements, complaints, amenity booking, payments, polls, meetings, and documents.
- Implement form validations and error handling for better user experience.
- Integrate frontend with backend APIs using Axios or Fetch.

#### **4. Backend Development :-**

- **Objective :** To build secure and efficient server-side logic for handling HOA operations and enforcing business rules.
- **Technologies :** Node.js, Express.js, JWT Authentication
- **Activities :**
  - Develop RESTful APIs for users, communities, amenities, complaints, payments, polls, meetings and notifications.
  - Implement role-based authorization using JWT tokens.
  - Apply business rules such as Admin replacement, community-wise data isolation, and amenity booking limits.
  - Handle error management, data validation, and secure API access.

#### **5. Database Development :-**

- **Objective :** To store and manage HOA-related data securely, efficiently, and in a scalable manner.
- **Technologies :** MongoDB, Mongoose ODM
- **Activities :**
  - Create collections for Users, Communities, Amenities, Complaints, Payments, Announcements, Meetings, Polls, and Documents.
  - Define relationships between collections (e.g., Community → Users, Community → Amenities).
  - Implement indexing for faster data retrieval.
  - Ensure data consistency and validation using Mongoose schemas.

#### **6. Testing Phase:-**

- **Objective :** To verify that the system functions correctly, securely, and meets all functional requirements.
- **Activities :**
  - Perform unit testing on individual modules such as login, payments, complaints, and bookings.

- Conduct integration testing to ensure proper communication between frontend, backend, and database.
- Test role-based access control for Super Admin, HOA Admin, and Residents.
- Fix identified bugs and optimize performance.

## **7. Deployment and Maintenance:-**

- **Objective :** To deploy the application and ensure its smooth operation and future enhancements.
- **Activities :**
  - Deploy the backend server and database on a local server or cloud platform.
  - Host the frontend application for user access.
  - Monitor system performance and security.
  - Provide maintenance through bug fixes, updates, and future feature additions such as parking or vendor management.

## 4. SYSTEM PLANNING

### 4.1 Feasibility Study

A **Feasibility Study** plays a crucial role in the development of any software system. In the case of the **Home Owner Association (HOA) Connect Portal**, it was essential to evaluate the system's practicality in terms of operational impact, technical requirements, available resources, and time constraints before initiating development.

Before the development phase began, a detailed feasibility analysis was conducted to assess whether the proposed system would meet the needs of residential communities while remaining cost-effective, reliable, and scalable.

#### Operating Feasibility:

The operational feasibility study focused on evaluating how the HOA Connect system would integrate with the day-to-day functioning of residential communities. The system was designed to simplify administrative tasks such as resident management, payment tracking, complaint handling, and amenity booking without disrupting existing community operations.

#### Technical Feasibility:

The technical feasibility assessment examined the hardware and software requirements necessary for developing and deploying the HOA Connect portal. Based on project requirements and available infrastructure, the **MERN Stack** was selected:

- **Frontend:** React.js
- **Backend:** Node.js with Express.js
- **Database:** MongoDB
- **Development Tools:** Visual Studio Code, Postman

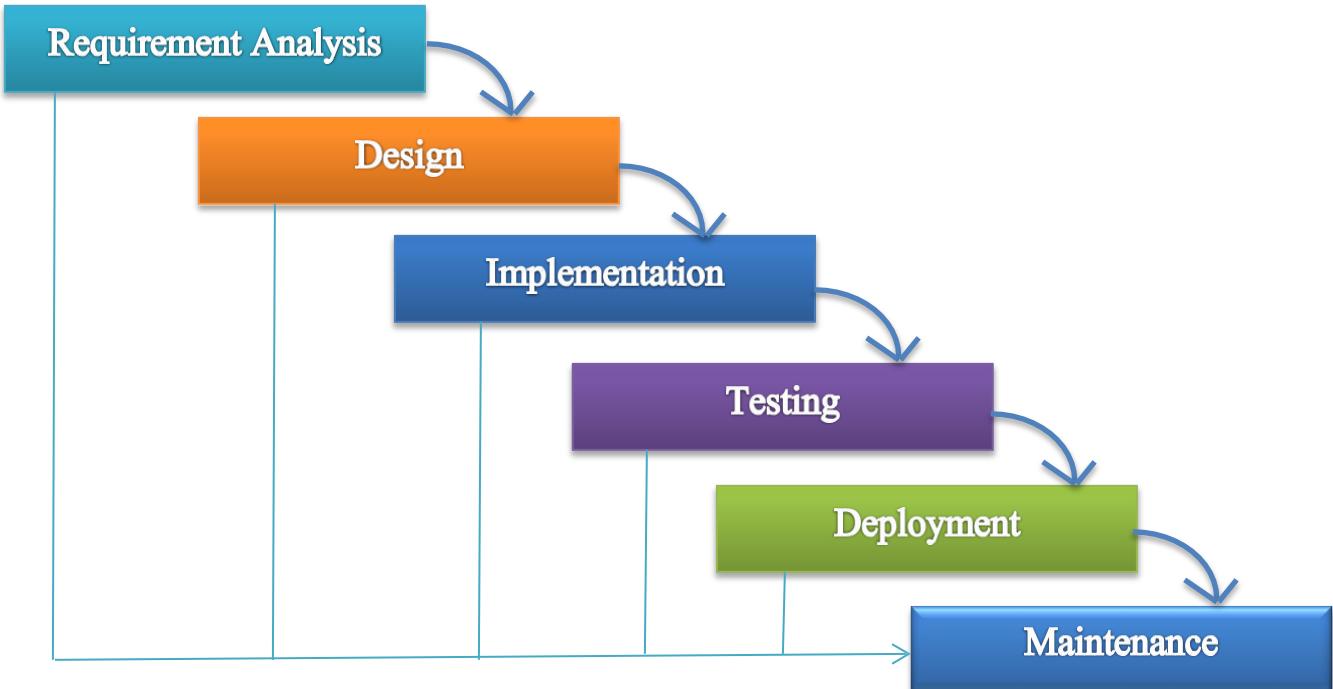
#### Resources:

The successful implementation of the HOA Connect project required adequate technical resources, skilled personnel, and network infrastructure. The development team possessed prior experience in web-based application development using the MERN stack, which contributed to smooth system design and implementation.

#### Time Duration:

A total duration of **six months** was allocated for the completion of the HOA Connect system. This time frame included phases such as requirement analysis, system design, development, testing, and deployment. A structured development schedule with defined milestones was followed to ensure timely completion of each phase.

## 4.2 Software Engineering Model

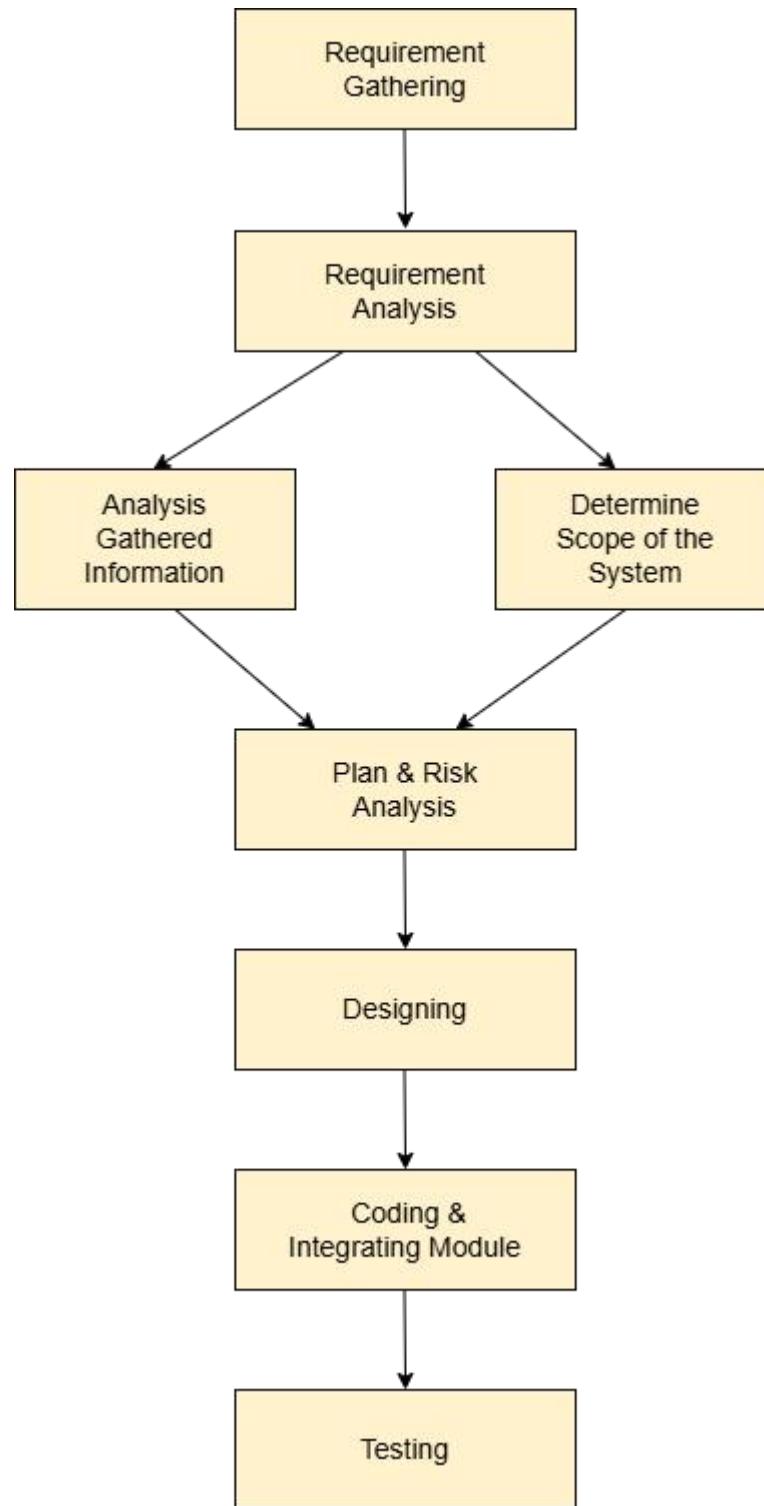


## 4.3 Risk Analysis

- The main objective of risk analysis is to identify potential problems that may affect the successful development and operation of the **HOA Connect web application**.
- Risk classification helps in understanding different risk factors and allows project managers to focus on areas that may cause maximum impact on the system.
- Risks are grouped based on similar characteristics, which makes analysis easier and helps in planning effective risk control strategies.
- In web-based applications like HOA Connect, risks can be broadly classified into **internal risks** and **external risks**.
- **Internal risks** originate within the project or organization, while **external risks** arise from factors outside the control of the development team.
- Proper planning, regular monitoring, and use of secure and reliable technologies help in minimizing these risks and ensuring successful system implementation.

## 4.4 Project Schedule

### 4.4.1 Task Dependency :



## **4.4.2 Project Table:**

Phase	Task Description	Responsible Team	Deliverables
Requirement Analysis	1. Collect requirements from stakeholders 2. Analyze user, admin, and member needs 3. Define scope of application features	Project Manager, Analyst	Requirement Specification DocumentScope Statement
Planning & Risk Analysis	1. Identify risks (data load, integration, scope creep) 2. Plan technical stack and tools 3. Break down system into modules	Project Manager, Tech Lead	Risk RegisterModule Planning Sheet
Designing	1. Design UI/UX wireframes for all panels (Admin, User, Member) 2. Create ER Diagram and Class Diagram from database design 3. Define web page navigation and flow	UI/UX Designer, Database Designer	WireframesER DiagramClass Diagram
Development	1. Develop login/signup functionality with role-based access 2. Implement system modules and features 3. Integrate backend with database	Backend Developers, Full Stack Developers	Fully functional application with integrated modules
Testing	1. Unit testing of individual modules 2. Integration testing across modules 3. User Acceptance Testing (UAT) with feedback	QA Team, Testers	Test PlanBug ReportsFinal UAT Report
Deployment	1. Setup application on local or remote server 2. Deploy database and APIs 3. Perform smoke testing	Developer, DevOps (if applicable)	Deployed Working SystemHosting Information
Documentation	1. Final project report preparation 2. User manual with screenshots 3. Source code summary and documentation	Documentation Team, Analyst	Final Project ReportUser ManualCode Summary

## 5. SYSTEM ANALYSIS

### 5.1 Detailed SRS

#### **Actor :**

- ❖ Super Admin (Platform Owner)
- ❖ HOA Admin (Community Admin)
- ❖ Residents (Users)

#### **❖ Super Admin :**

- Purpose: To manage, monitor, and oversee the entire HOA Connect platform across multiple residential communities.
- Features :

- Platform Management :
  - Create, update, and delete residential communities.
  - Assign and replace HOA Admins while creating or managing communities.
  - Define available amenities for each community.
- Community Oversight:
  - Monitor activity across all communities.
  - Override or replace HOA Admins when required.
- Reports & Analytics:
  - View global analytics such as complaints, and community activity.
  - Generate consolidated reports across all communities.
- Notification Management:
  - Send system-wide announcements and notifications.
- Security & Control:
  - Ensure role-based access control and data isolation between communities.

## ❖ HOA Admin :

- Purpose: To manage and administer a specific residential community and handle its day-to-day operations.
- Features :
  - Community Management :
    - Manage residents within the assigned community (view, add, remove).
    - Access all features strictly limited to the assigned community.
  - Amenity Management :
    - Manage existing amenities defined by Super Admin (view, activate, deactivate).
    - Monitor amenity availability and bookings.
  - Complaint Management :
    - View, update, and resolve complaints raised by residents.
  - Announcements & Notifications :
    - Create announcements visible to community residents.
    - Send community-wide notifications.
  - Payments Management :
    - Manage and monitor maintenance payments for the community.
  - Meetings & Polls :
    - Organize meetings (agenda, date, mode).
    - Create and manage polls for community decisions.
  - Document Management :
    - Upload and share important documents such as rules, notices, and meeting minutes.
  - Admin Replacement:
    - Replace themselves with another resident as HOA Admin when required.
  - Reports & Analytics:
    - View community-level analytics including payments, complaints, and bookings.

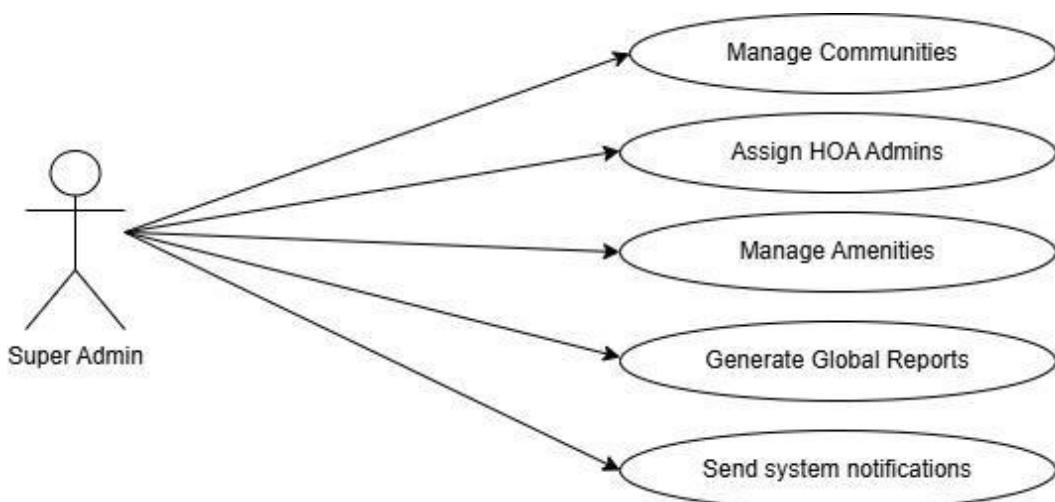
**❖ Resident :**

- Purpose: To participate in community activities and access HOA services conveniently.
- Features :
  - Self-Service Dashboard :
    - View announcements and community updates.
    - Manage personal profile details.
  - Complaint Management :
    - Raise new complaints and track their resolution status.
  - Payments :
    - Make online maintenance payments.
    - View payment history and receipts.
  - Amenity Booking:
    - View available amenities and book slots.
  - Meetings & Polls :
    - View meeting details.
    - Participate in polls and voting processes.
  - Documents Access:
    - Download community documents and notices.
  - Notifications:
    - Receive alerts related to payments, complaints, meetings, and announcements.

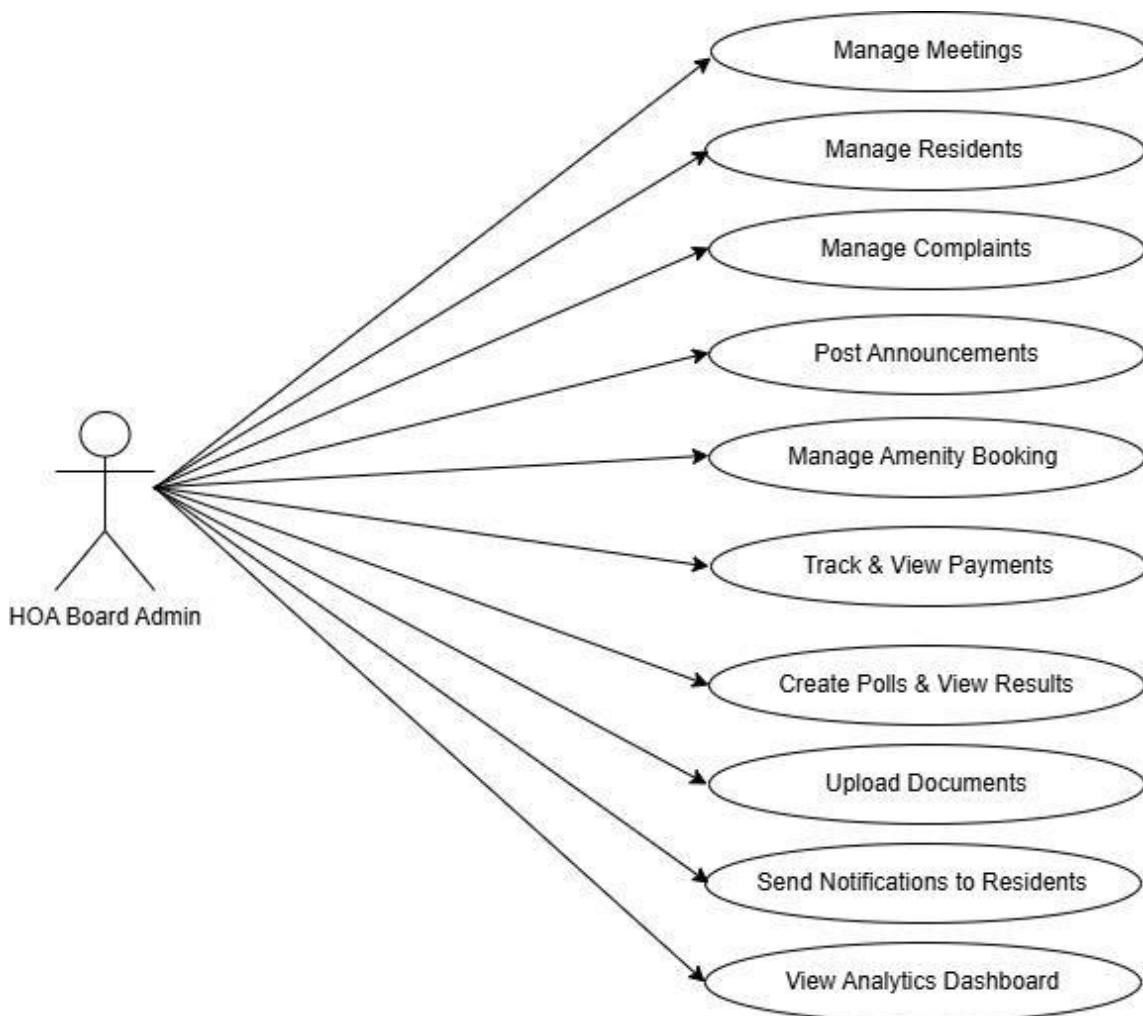
## 5.2 UML Diagram

### 5.2.1 Use Case Diagram:

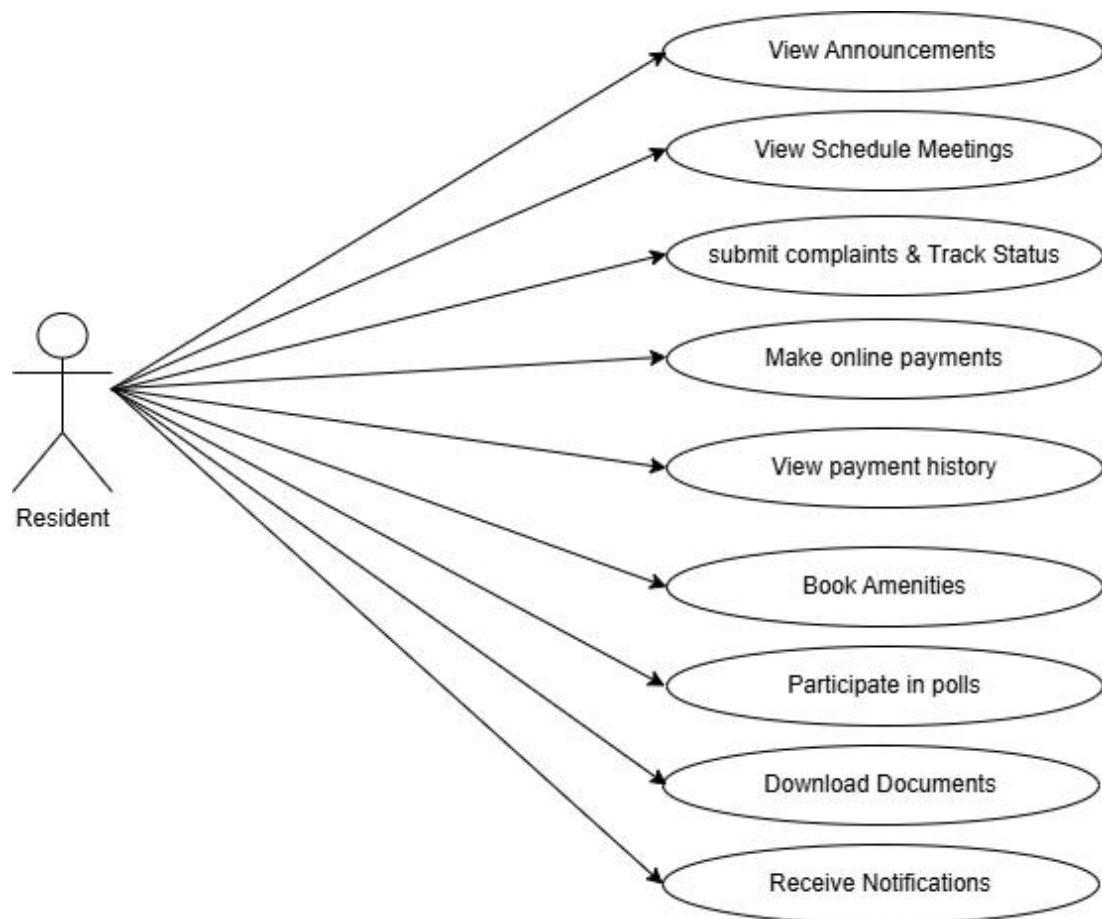
❖ Super Admin:



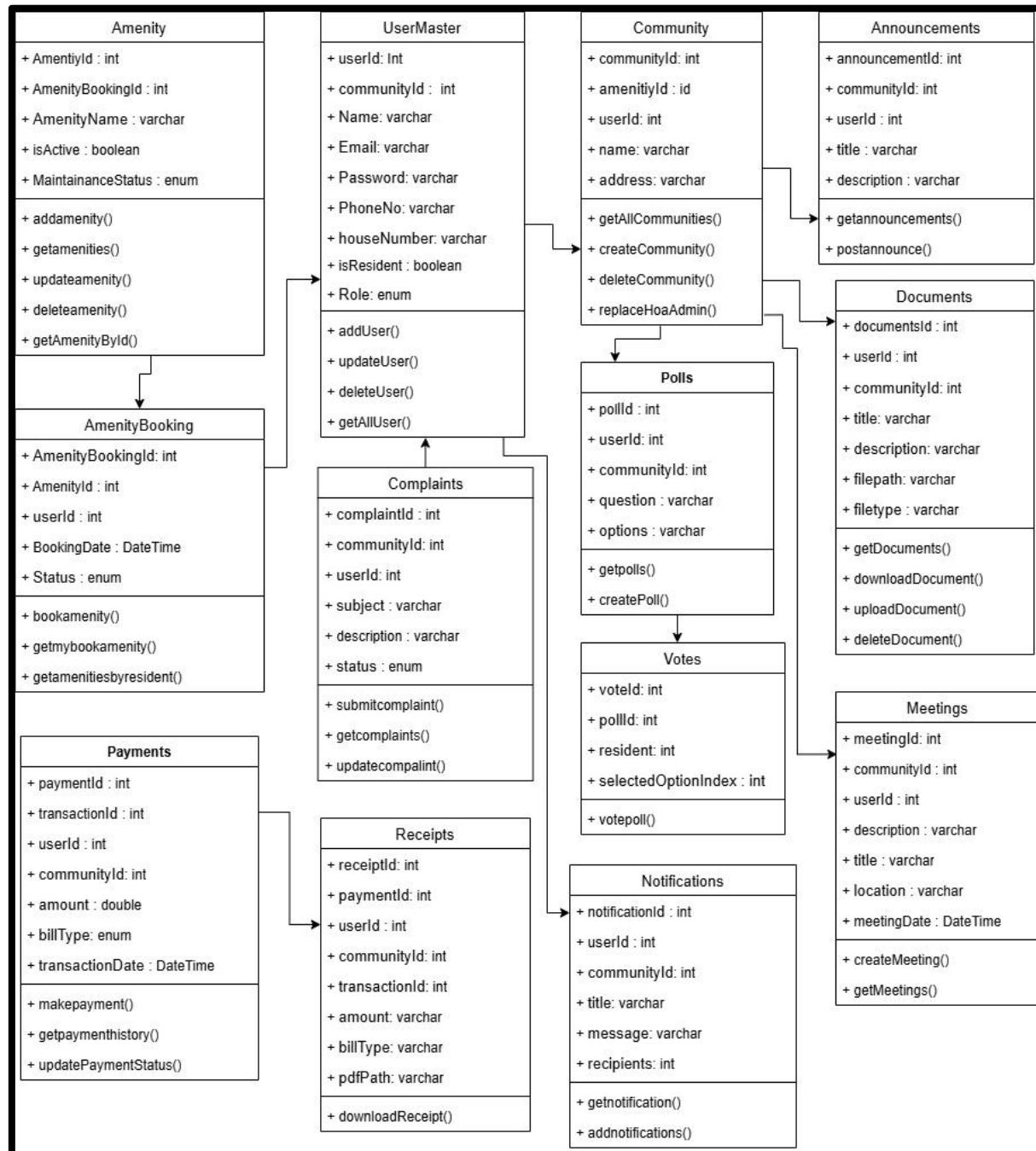
❖ **HOA Admin:**



❖ **Resident:**

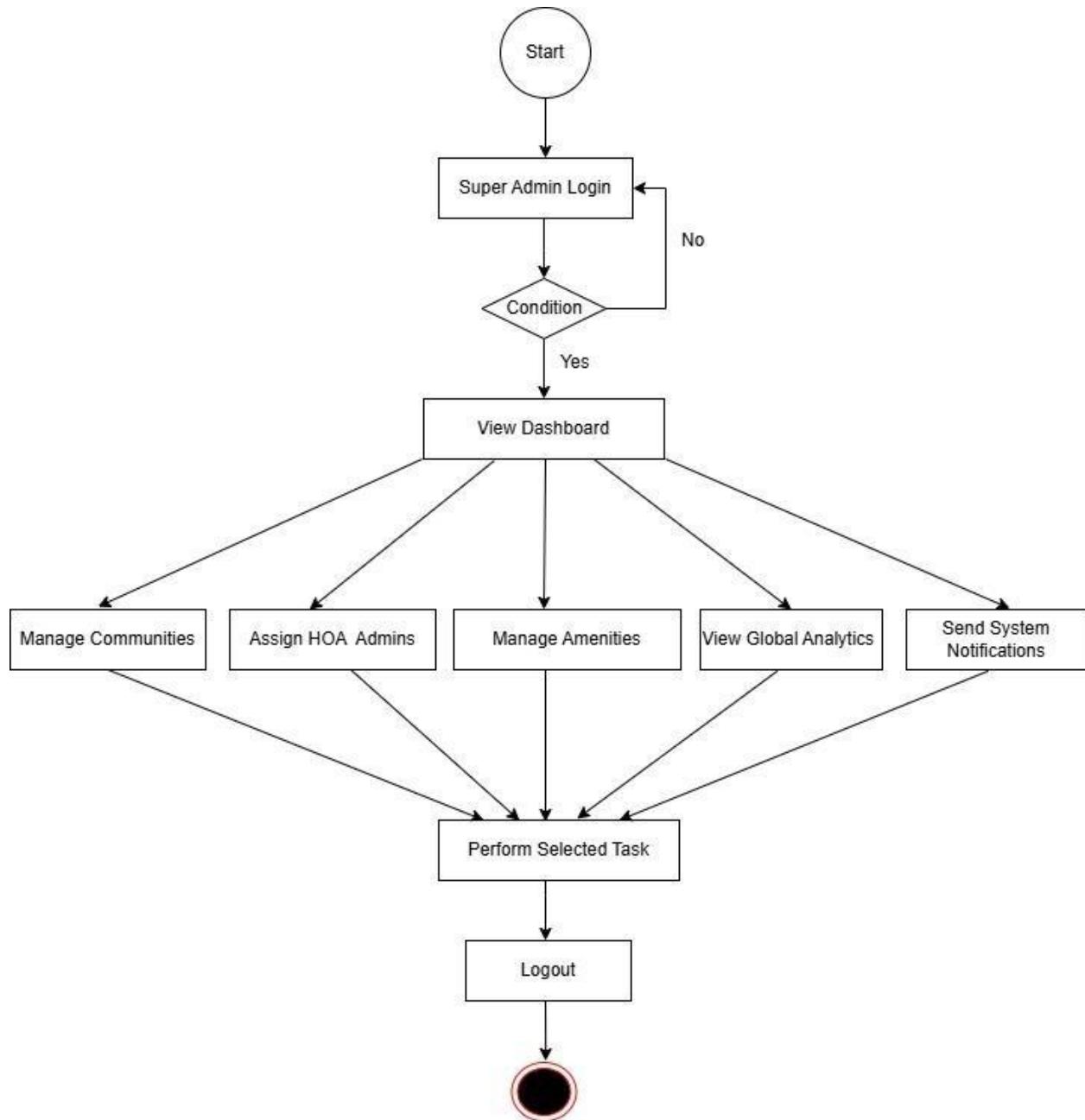


## 5.2.2 Class Diagram:

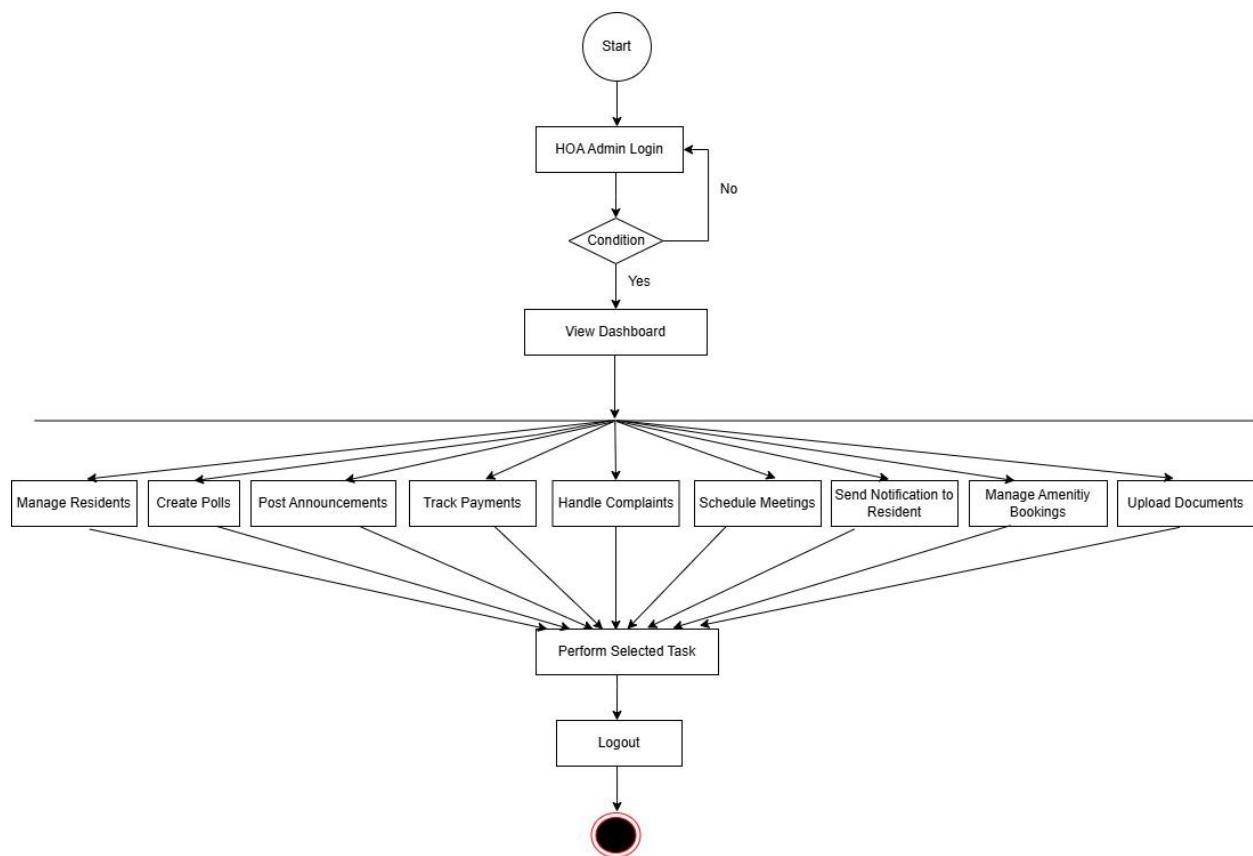


### **5.2.3 Activity Diagram:**

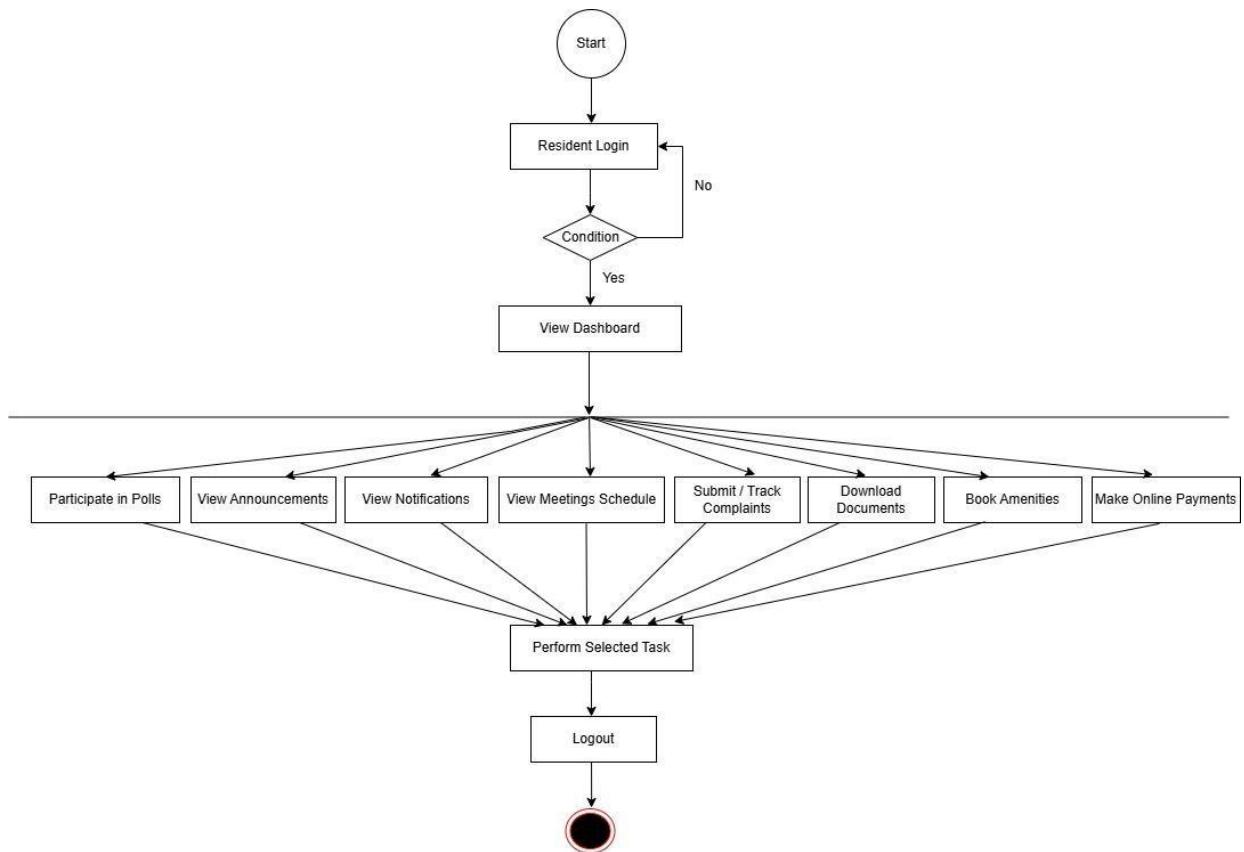
#### **❖ Super Admin:**



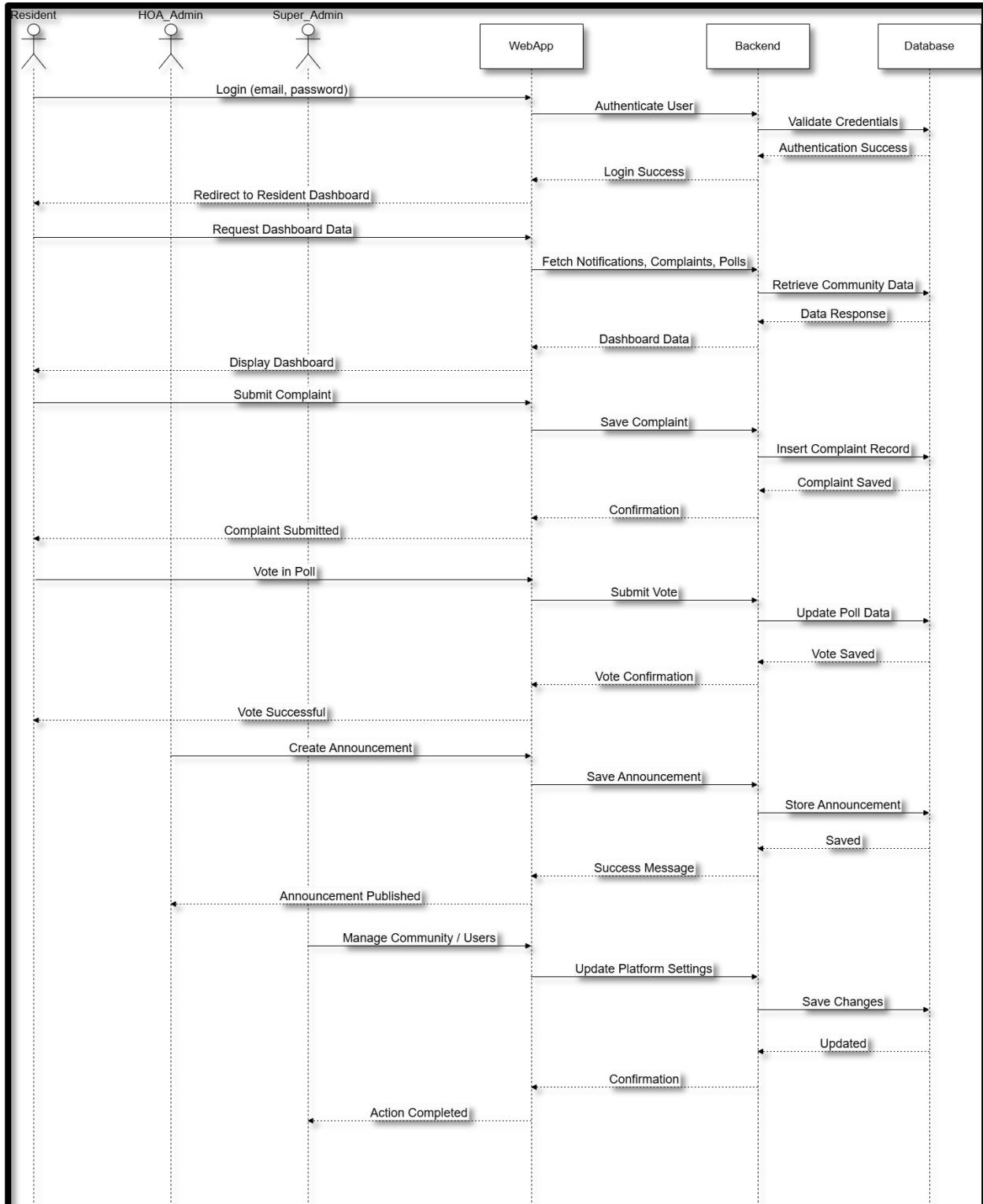
❖ **HOA Admin:**



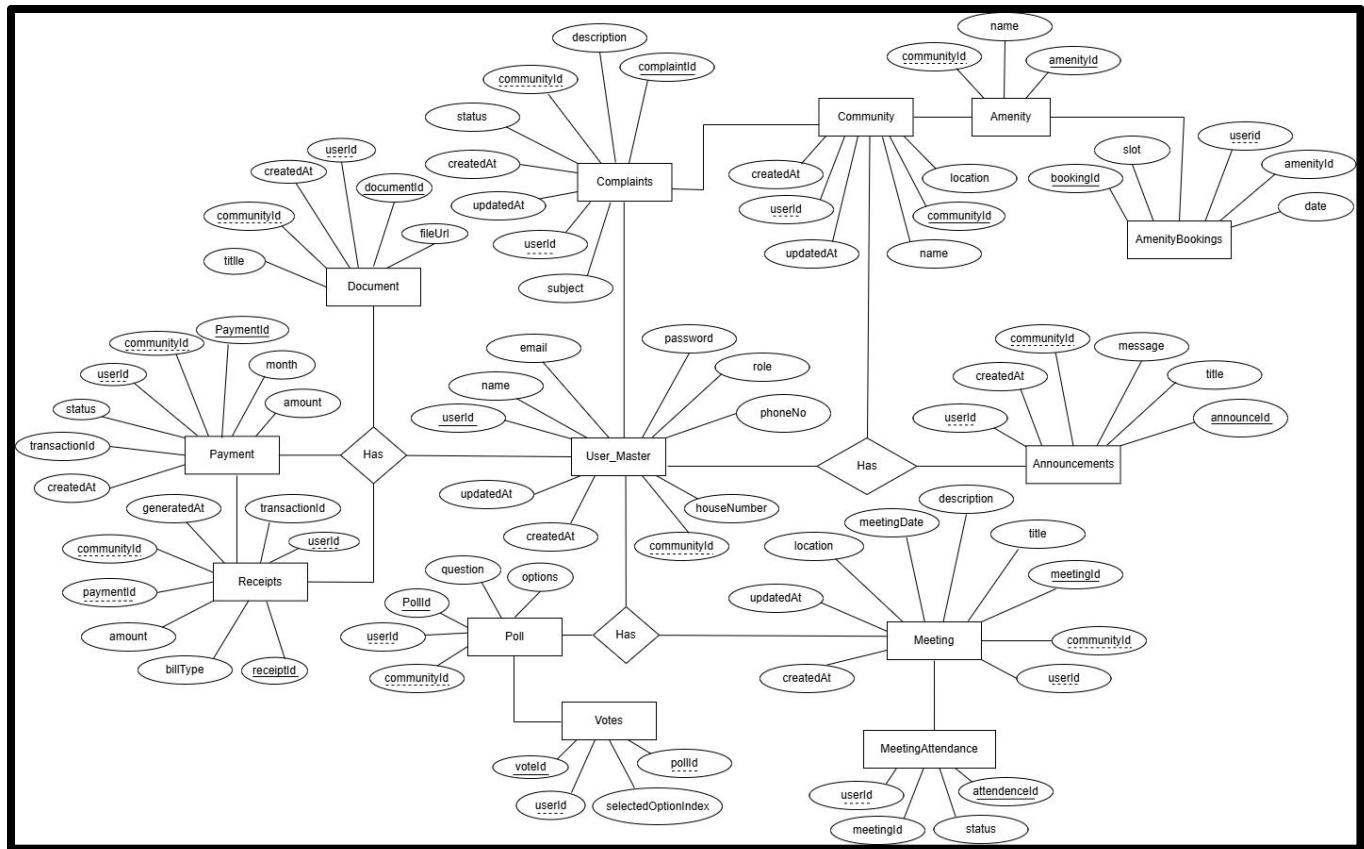
❖ **Resident:**



## 5.2.4 Sequence Diagram:



### 5.3 ER Diagram



## 6. SOFTWARE DESIGN

### 6.1 Database Design

#### 1. User :

Column Name	Data Type	Size	Constraints
userId	int		Primary Key
name	varchar	50	
email	varchar	100	
mobileNo	varchar	100	
password	varchar	255	
role	enum		
houseNo	varchar	100	
communityId	int		Foreign Key
isResident	boolean		

#### 2. Amenity :

Column Name	Data Type	Size	Constraints
amenityId	int		Primary Key
name	varchar	50	
description	varchar	100	
isActive	boolean		
bookingId	int		Foreign Key

#### 3. AmenityBooking :

Column Name	Data Type	Size	Constraints
bookingId	int		Primary Key
bookingDate	date		
status	enum	100	
isActive	boolean		
amenityId	int		Foreign Key
userId	int		Foreign Key

#### **4. Announcement :**

Column Name	Data Type	Size	Constraints
announcementId	int		Primary Key
title	varchar	100	
description	varchar	150	
amenityId	int		Foreign Key
userId	int		Foreign Key

#### **5. Community :**

Column Name	Data Type	Size	Constraints
communityId	int		Primary Key
name	varchar	100	
address	varchar	150	
amenityId	int		Foreign Key
userId	int		Foreign Key

#### **6. Complaint :**

Column Name	Data Type	Size	Constraints
complaintId	int		Primary Key
subject	varchar	100	
description	varchar	150	
status	enum		
communityId	int		Foreign Key
userId	int		Foreign Key

#### **7. Document :**

Column Name	Data Type	Size	Constraints
documentId	int		Primary Key
title	varchar	100	
filePath	varchar	255	
fileType	varchar	100	
communityId	int		Foreign Key
userId	int		Foreign Key

## 8. Meeting:

Column Name	Data Type	Size	Constraints
meetingId	int		Primary Key
title	varchar	100	
description	varchar	200	
meetingDate	date		
location	varchar	100	
communityId	int		Foreign Key
userId	int		Foreign Key

## 9. Notification :

Column Name	Data Type	Size	Constraints
notificationId	int		Primary Key
title	varchar	100	
message	varchar	150	
communityId	int		Foreign Key
userId	int		Foreign Key

## 10. Payment:

Column Name	Data Type	Size	Constraints
paymentId	int		Primary Key
amount	double		
method	enum		
status	enum		
billType	enum		
transactionId	int		Unique
transactionDate	date		
communityId	int		Foreign Key
userId	int		Foreign Key

## 11. Poll :

Column Name	Data Type	Size	Constraints
pollId	int		Primary Key
question	varchar	100	
options	enum		
communityId	int		Foreign Key
userId	int		Foreign Key

## 12. Receipt :

Column Name	Data Type	Size	Constraints
receiptId	int		Primary Key
amount	double		
billType	varchar	100	
pdfPath	varchar	150	
transactionId	int		
paymentId	int		Foreign Key
communityId	int		Foreign Key
userId	int		Foreign Key

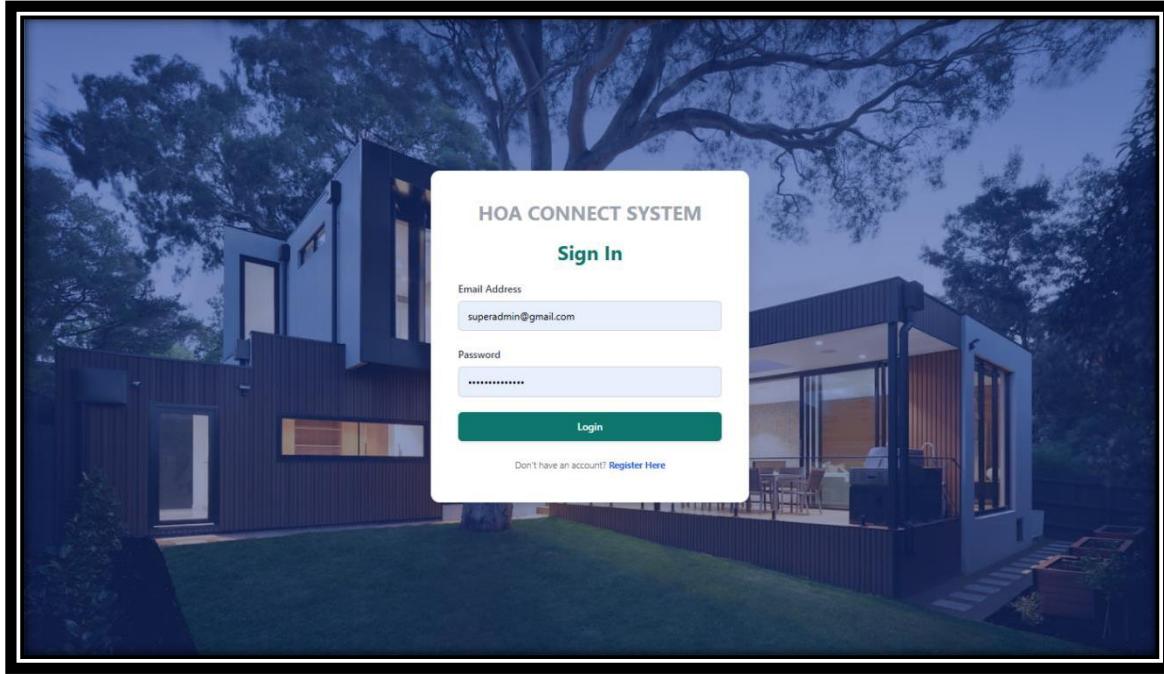
## 13. Vote :

Column Name	Data Type	Size	Constraints
voteId	int		Primary Key
selectedOption	varchar	100	
pollId	int		Foreign Key
userId	int		Foreign Key

## 6.2 Interface Design

### ❖ Super Admin :

#### ➤ Login :-



#### ➤ Dashboard :-

The image shows the Super Admin Dashboard for the HOA Connect System. The dashboard has a dark teal header with the title "HOA Connect System" and a small house icon. On the left is a vertical sidebar with navigation links: "Dashboard" (selected), "Communities", "Amenities", and "Notifications". The main content area is titled "Super Admin Dashboard". It features three summary cards with gradients: "Total Communities" (3), "HOA Admins" (3), and "Total Amenities" (3). Below these is a large section titled "Global Analytics Overview" with a placeholder message "[Chart Component Integration Placeholder — use Recharts or Chart.js]". At the bottom left is a teal "Logout" button.

➤ Manage Amenity :-

The screenshot shows the HOA Connect System interface. On the left, there's a sidebar with icons for Dashboard, Communities, Amenities (which is highlighted in green), and Notifications. The main content area has a title "Manage Amenities". It features two input fields: "Amenity Name" and "Amenity Description", followed by a "Add Amenity" button. Below this is a table listing three amenities:

Name	Description	Actions
Club House	Community events and meetings.	
Swimming Pool	Common swimming pool for residents.	
Gym	Fully equipped gym.	

At the bottom left of the main area is a "Logout" button.

➤ Manage Community and HOA Admin :-

The screenshot shows the HOA Connect System interface. On the left, there's a sidebar with icons for Dashboard, Communities (highlighted in green), Amenities, and Notifications. The main content area has a title "Manage HOA Admin Communities". It includes several input fields: "Community Name" and "Community Address", "HOA Admin Name" and "HOA Admin Email", and "HOA Admin Password" and "HOA Admin Phone Number". Below these is a dropdown menu listing "Club House", "Swimming Pool", and "Gym". A checkbox labeled "HOA Admin is also a resident" is checked. At the bottom is an "Add Community" button. Below this is a table listing three communities:

Name	Address	Admin Name	Email	Phone No	Amenities	Actions
Suman Ekta	Morabhalal, Surat	Vicky Rathod	vicky@gmail.com	9824197676	Club House, Swimming Pool, Gym	
Green Valley	Adajan, Surat	Swati Jadhav	swati@gmail.com	9106706566	Club House, Gym	
Sunrise Apartment	Pal, Surat	Khushi Soni	khushisoni@gmail.com	9104352855	Club House, Swimming Pool	

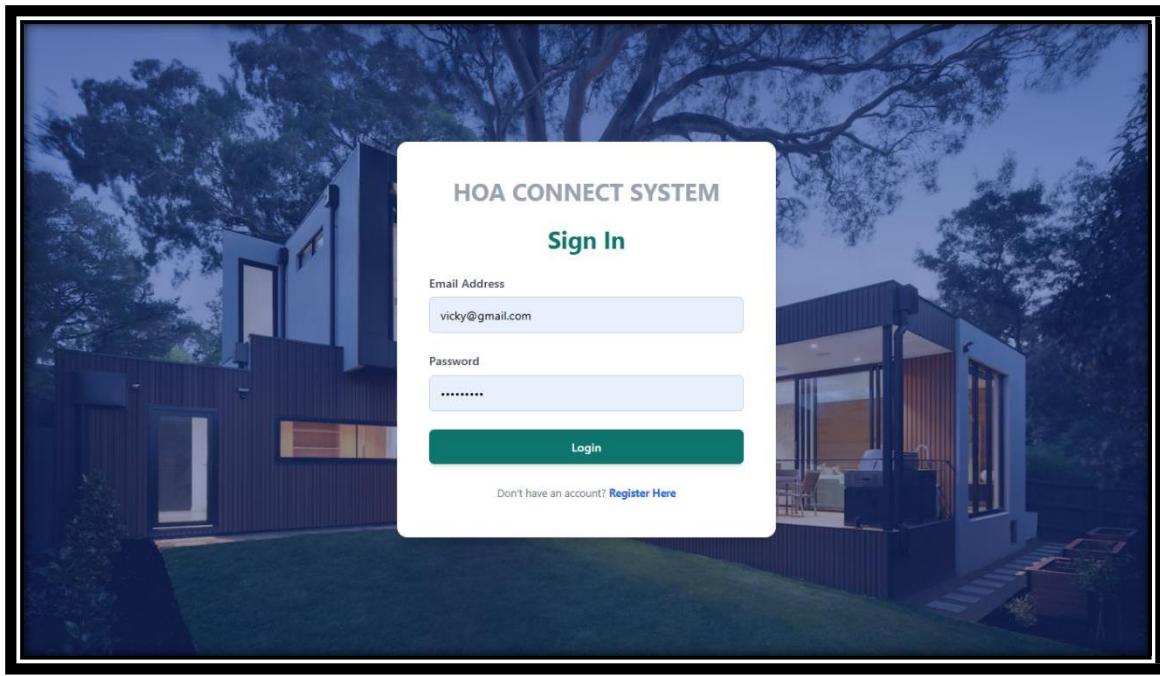
At the bottom left of the main area is a "Logout" button.

➤ Manage System-wide Notifications:-

The screenshot shows the HOA Connect System interface. On the left, there's a sidebar with icons for Dashboard, Communities, Amenities, and Notifications, where 'Notifications' is highlighted. The main area is titled 'System Notifications'. It has fields for 'Notification title' and 'Notification message', a dropdown for 'All Communities', and a large green 'Send' button. Below this is a search bar with placeholder text 'Search notifications...'. A section titled 'All Notifications' shows a single item: 'New Community' with the message 'Welcome to the Community'.

❖ HOA Admin :

➤ Login :-



➤ Dashboard:-

**HOA Connect System**

Welcome! ADMIN

**Admin Dashboard**

- Total Notifications: 2
- Total Residents: 2
- Complaints: 1
- Announcements: 1
- Amenities: 3
- Total Payments: ₹4,333

**Dashboard**

Residents  
Announcements  
Complaints  
Amenities  
Documents  
Meetings  
Payments  
Notifications  
Polls

**Logout**

➤ Manage Notification:-

**HOA Connect System**

Welcome! ADMIN

**Notification Details**

Notification Title: \_\_\_\_\_ Notification Message: \_\_\_\_\_

**SEND NOTIFICATION**

**Resident Details**

Name	Email	Phone	House Number	Select All
Bindiya Rathod	bidiya@gmail.com	9011402514	B-701	<input type="checkbox"/>
Khushi Soni	khushi@gmail.com	9106706577	H-1402	<input type="checkbox"/>

➤ Manage Announcement:-

The screenshot shows the HOA Connect System dashboard. On the left, a sidebar menu includes options like Dashboard, Residents, Announcements (which is selected and highlighted in green), Complaints, Amenities, Documents, Meetings, Payments, Notifications, and Polls. A Logout button is at the bottom of the sidebar. The main content area is titled "Announcements". It features a form with "Title" and "Description" fields, a "POST" button, and a message "Announcement created". Below this is a table with columns "Title", "Description", "Posted By", and "Date". Two announcements are listed:

Title	Description	Posted By	Date
Water Supply Maintenance	Water supply will be unavailable from 10 AM to 2 PM tomorrow.	Vicky Rathod (vicky@gmail.com)	12/15/2025, 10:35:50 PM
Power Supply	Power Cut off today from 10 AM to 3 PM	Vicky Rathod (vicky@gmail.com)	11/30/2025, 9:05:57 PM

A photograph of a residential street with houses and a driveway is visible in the background.

➤ Manage Amenities:-

The screenshot shows the HOA Connect System dashboard. The sidebar menu is identical to the previous screenshot, with the "Amenities" option selected. The main content area is titled "Amenities". It displays a table with columns "Name", "Description", "Maintenance Status", and "Actions". Three amenities are listed:

Name	Description	Maintenance Status	Actions
Club House	Community events and meetings.	Available	Delete
Swimming Pool	Common swimming pool for residents.	Under Maintenance	Delete
Gym	Fully equipped gym.	Closed	Delete

A photograph of a residential street with houses and a driveway is visible in the background.

➤ Manage Documents:-

The screenshot shows the 'Documents' section of the HOA Connect System. At the top, there is a message 'Document uploaded successfully'. Below it, there are input fields for 'Document Title' and 'Document Description', and a file upload button labeled 'Choose File' with the path 'IMG-20190312-WA0014.jpg'. A large green button labeled 'UPLOAD' is centered below these fields. Below the upload area is a table listing two documents:

Title	Description	File Type	Uploaded By	Actions
Notice	About Maintenance Update	image/jpeg	Vicky Rathod (vicky@gmail.com)	<button>Delete</button>
Festival	This is about festival.	image/jpeg	Vicky Rathod (vicky@gmail.com)	<button>Delete</button>

➤ Manage Meeting:-

The screenshot shows the 'Meetings' section of the HOA Connect System. At the top, there is a message 'Meeting created successfully.' Below it, there are input fields for 'Meeting Title' and 'Agenda', and another for 'Meeting Location' with a date/time picker. A large green button labeled 'SUBMIT' is centered below these fields. Below the submission area is a table listing two meetings:

Title	Agenda	Location	Date & Time
Monthly	Month ending discussion	Parking	11/30/2025, 10:08:00 PM
Maintenance	Pending Maintenance	Terrace	12/20/2025, 10:47:00 PM

➤ Manage Payments:-

The screenshot shows the HOA Connect System interface. The left sidebar has a teal header "HOA Connect System" with icons for Dashboard, Residents, Announcements, Complaints, Amenities, Documents, Meetings, Payments (which is highlighted in green), Notifications, and Polls. Below the sidebar is a "Logout" button. The main content area has a teal header "Payments" with a message "Payment status updated." and a dropdown menu "Search by Status". A table lists four payment entries:

Resident	Email	Amount	Status	Actions
Bindiya Rathod	bindiya@gmail.com	₹233	Paid	Update Save
Khushi Soni	khushi@gmail.com	₹1000	completed	Update Save
Khushi Soni	khushi@gmail.com	₹2000	failed	Update Save
Khushi Soni	khushi@gmail.com	₹1100	pending	Update Save

The background of the main area shows a photograph of a residential street with houses and trees.

➤ Search Payment Status:-

The screenshot shows the HOA Connect System interface, similar to the previous one but with a different search filter. The left sidebar and main content area are identical, including the teal header "HOA Connect System", the "Payments" highlight, and the "Completed" dropdown in the search bar. The table now shows only one entry:

Resident	Email	Amount	Status	Actions
Khushi Soni	khushi@gmail.com	₹1000	completed	Update Save

The background of the main area shows a photograph of a residential street with houses and trees.

➤ **View Notifications:-**

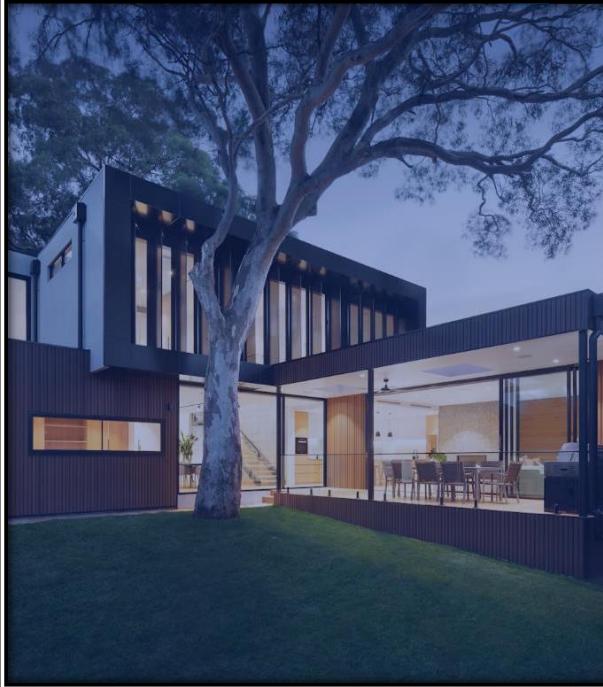
The screenshot shows the HOA Connect System interface. The left sidebar includes icons for Dashboard, Residents, Announcements, Complaints, Amenities, Documents, Meetings, Payments, Notifications (which is selected and highlighted in green), and Polls. The main content area is titled "Notifications" and displays a table with two rows of data. The columns are "Title", "Message", "Created By", and "Date & Time". The first row is for "System Maintenance" with the message "Server maintenance tonight from 10 PM to 12 AM." created by "Super Admin" on "12/15/2025, 10:25:37 PM". The second row is for "Community Wise Notification" with the message "Hello Message from super admin" created by "Super Admin" on "12/1/2025, 10:00:27 PM". Below the table is a photograph of a residential street with houses and trees.

➤ **Manage Polls:-**

The screenshot shows the HOA Connect System interface. The left sidebar includes icons for Home, People, Announcements, Complaints, Amenities, Documents, Meetings, Payments, Notifications, and Polls (which is selected and highlighted in green). The main content area is titled "Polls" and displays a message "Poll created successfully.". Below this, there are fields for "Poll Question" and four options: "Option 1" and "Option 2" in the top row, and "Option 3 (optional)" and "Option 4 (optional)" in the bottom row. A "CREATE POLL" button is located below the options. A table at the bottom lists three polls with their details. The columns are "Question", "Options", and "Created At". The first poll is "Which amenity needs improvement?" with options "Gym (0 votes)", "Swimming Pool (0 votes)", and "Parking (0 votes)", created on "12/15/2025, 10:55:44 PM". The second poll is "Navratri Aarti Time" with options "9 PM (0 votes)" and "10 PM (1 votes)", created on "12/1/2025, 9:57:09 AM". The third poll is "Maintenance price increment vote a poll" with options "100 (0 votes)" and "200 (0 votes)", created on "11/30/2025, 9:12:17 PM".

❖ **Resident:**

➤ **Sign Up:-**



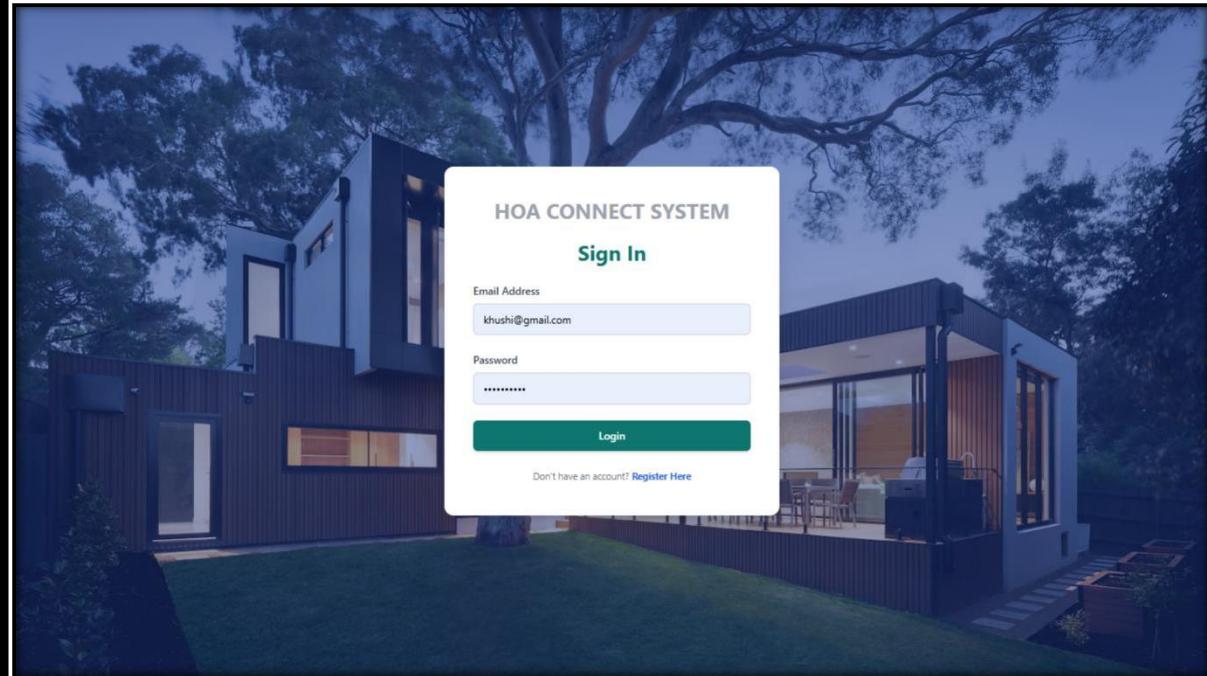
**HOA CONNECT SYSTEM**  
**Sign Up**

Enter your name  
Enter your email  
Enter password  
Enter phone number  
Enter house / flat number  
resident  
Suman Ekta

**Register**

Already have an account? [Login Here](#)

➤ **Sign In:-**



**HOA CONNECT SYSTEM**  
**Sign In**

Email Address  
khushi@gmail.com

Password  
.....

**Login**

Don't have an account? [Register Here](#)

➤ Dashboard:-

The screenshot shows the Resident Dashboard of the HOA Connect System. On the left, a sidebar menu lists: Dashboard (selected), Announcements, Complaints, Amenities, Documents, Meetings, Payments, Notifications, and Polls. A "Logout" button is at the bottom. The main area features a background image of a residential street with houses and trees. Overlaid are four rounded rectangular boxes containing statistics: "New Notifications" (1), "Total Complaints" (1), "New Announcements" (2), and "Amenities" (3). The title "Resident Dashboard" is centered above the stats.

➤ View Announcements:-

The screenshot shows the Announcements page of the HOA Connect System. On the left, a sidebar menu includes icons for Home, Announcements (selected), Complaints, Amenities, Documents, Meetings, Payments, Notifications, and Polls. A "Logout" button is at the bottom. The main content area has a header "Announcements". Below it is a table with four rows of data:

Title	Description	Posted By	Date
Water Supply Maintenance	Water supply will be unavailable from 10 AM to 2 PM tomorrow.	Vicky Rathod	15/12/2025, 10:35:50 PM
Power Supply	Power Cut off today from 10 AM to 3 PM	Vicky Rathod	30/11/2025, 09:05:57 PM

The background of the main area shows a residential street scene.

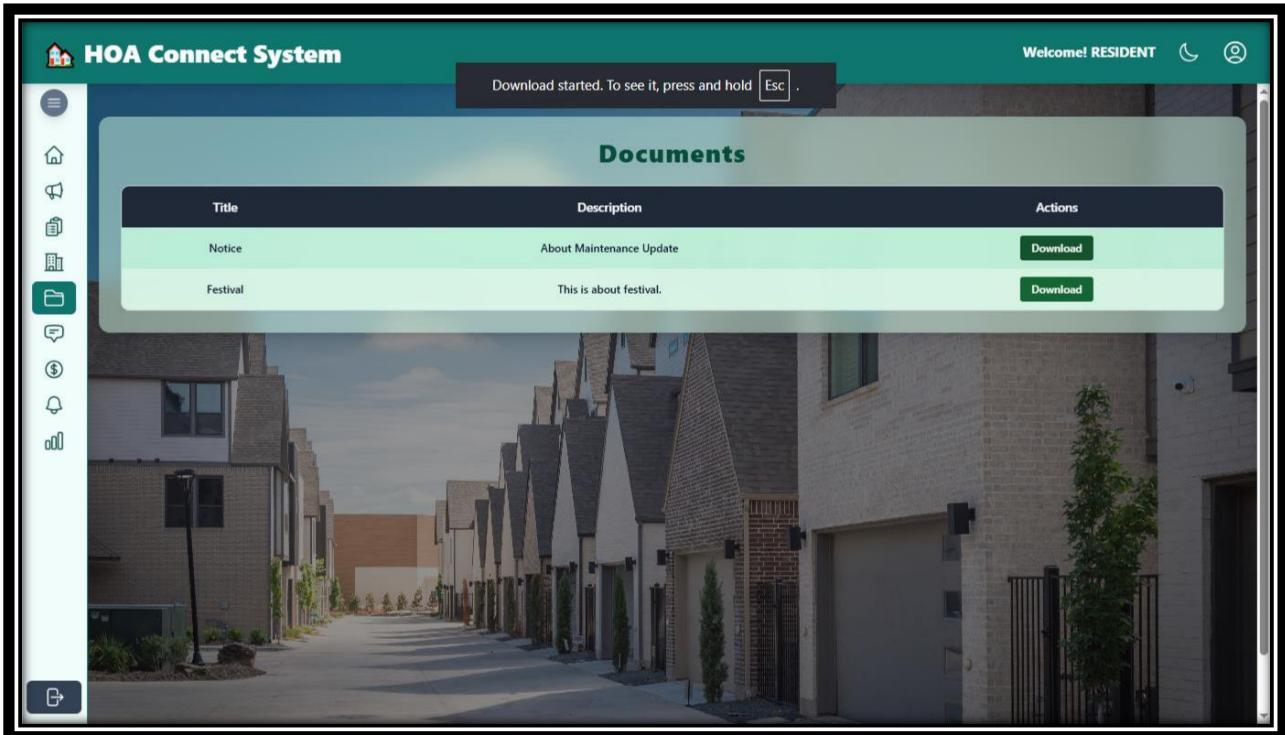
## ➤ Add Complaint:-

The screenshot shows the HOA Connect System interface. The left sidebar has a teal header with the system name and navigation links: Dashboard, Announcements, Complaints (selected), Amenities, Documents, Meetings, Payments, Notifications, and Polls. A 'Logout' button is at the bottom. The main content area has a teal header 'Complaints'. It contains fields for 'Subject' and 'Description', a 'SUBMIT' button, and a message 'Complaint Submitted Successfully!'. Below is a table with columns Subject, Description, Status, and Date. Two entries are listed: 'Lift' (In Progress, 30/11/2025, 09:12:58 PM) and 'Parking Issue' (Pending, 15/12/2025, 11:15:38 PM). The background features a photograph of a residential street.

## ➤ Book Amenities:-

The screenshot shows the HOA Connect System interface. The left sidebar has a teal header with the system name and navigation links: Dashboard, Announcements, Complaints, Amenities (selected), Documents, Meetings, Payments, Notifications, and Polls. A 'Logout' button is at the bottom. The main content area has a teal header 'Amenities'. It displays a table with columns Name, Description, Maintenance, and Action. Three items are listed: 'Club House' (Available, Book button), 'Swimming Pool' (Under\_maintenance, Unavailable button), and 'Gym' (Closed, Unavailable button). Below is a section titled 'My Booked Amenities' with a table showing a single booking for 'Club House' on 2025-12-19. The background features a photograph of a residential street.

➤ Documents Download:-

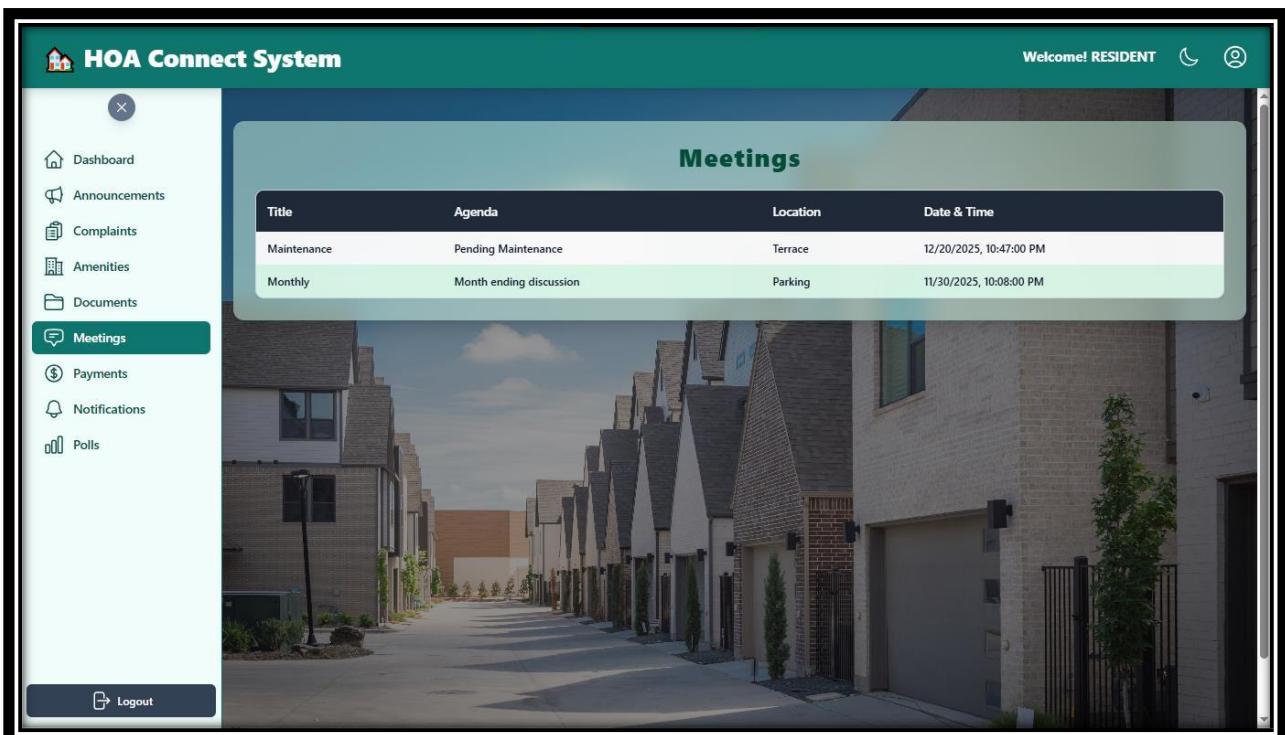


The screenshot shows the 'Documents' section of the HOA Connect System. At the top, there is a navigation bar with icons for Home, Announcements, Complaints, Amenities, and Documents. A sidebar on the left contains links for Dashboard, Announcements, Complaints, Amenities, Documents (which is highlighted in green), Meetings, Payments, Notifications, and Polls. The main content area has a title 'Documents' and a table with two rows:

Title	Description	Actions
Notice	About Maintenance Update	<button>Download</button>
Festival	This is about festival.	<button>Download</button>

The background of the main area features a photograph of a residential street with modern townhouses.

➤ Show and Attend Meeting:-

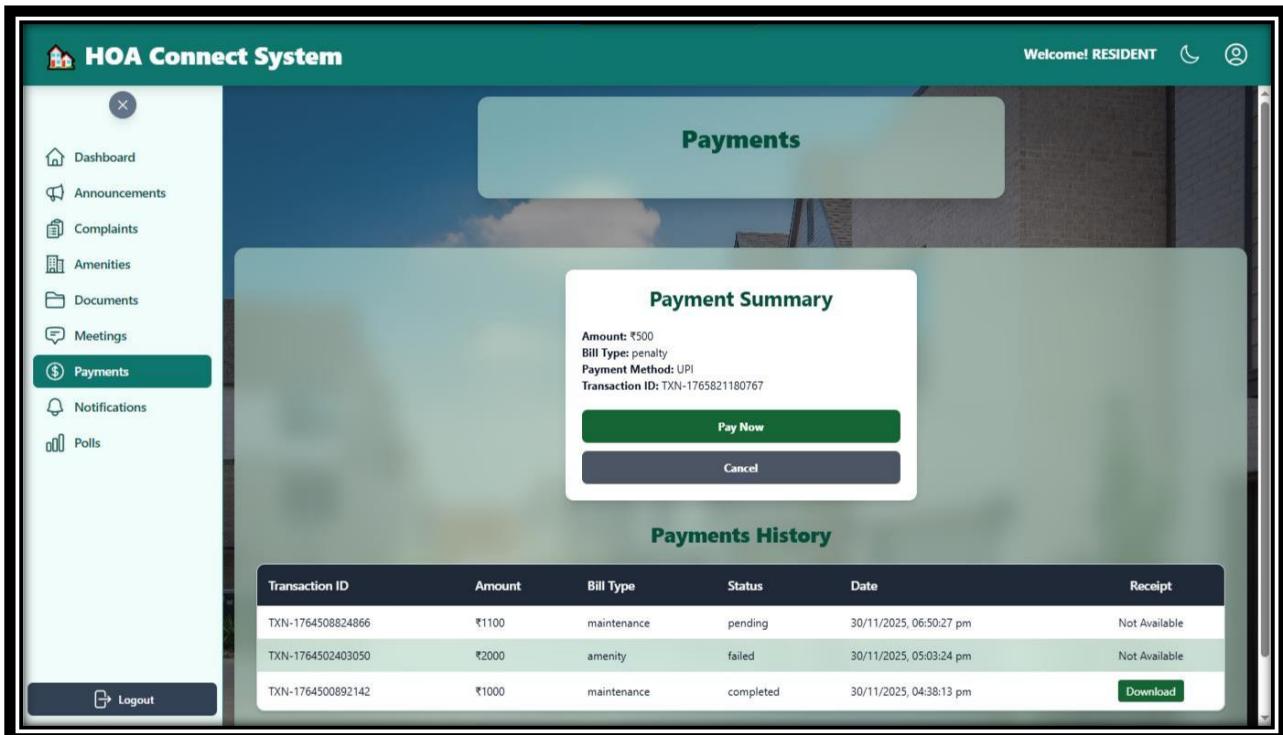


The screenshot shows the 'Meetings' section of the HOA Connect System. The sidebar on the left is identical to the one in the previous screenshot, with 'Meetings' also highlighted in green. The main content area has a title 'Meetings' and a table with two rows:

Title	Agenda	Location	Date & Time
Maintenance	Pending Maintenance	Terrace	12/20/2025, 10:47:00 PM
Monthly	Month ending discussion	Parking	11/30/2025, 10:08:00 PM

The background of the main area features a photograph of a residential street with modern townhouses.

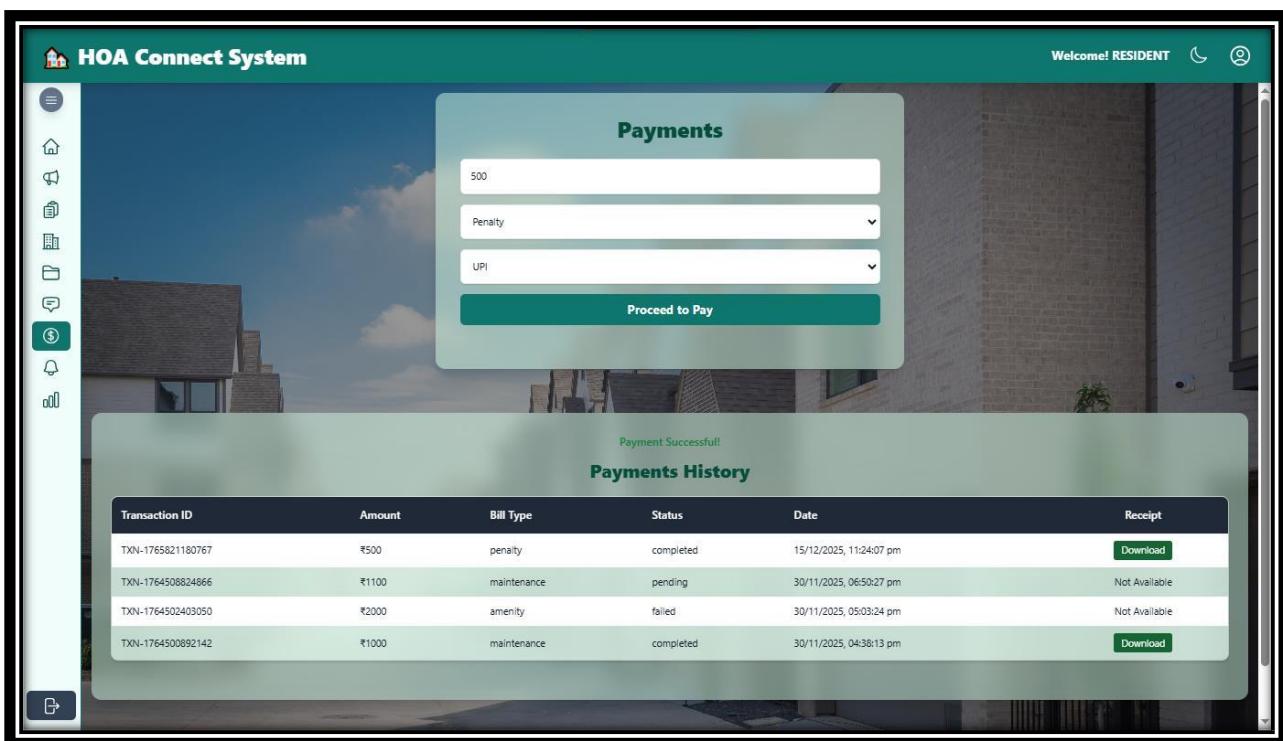
➤ Make Payment:-



The screenshot shows the HOA Connect System interface. The top navigation bar includes a logo, the text "HOA Connect System", and a "Welcome! RESIDENT" message with icons for notifications and profile. On the left, a sidebar menu lists "Dashboard", "Announcements", "Complaints", "Amenities", "Documents", "Meetings", "Payments" (which is selected and highlighted in green), "Notifications", and "Polls". A "Logout" button is at the bottom of the sidebar. The main content area has a header "Payments" and a "Payment Summary" box containing details: Amount: ₹500, Bill Type: penalty, Payment Method: UPI, Transaction ID: TXN-1765821180767. Below this are two buttons: "Pay Now" (green) and "Cancel" (grey). A "Payments History" section follows, displaying a table of transactions:

Transaction ID	Amount	Bill Type	Status	Date	Receipt
TXN-1764508824866	₹1100	maintenance	pending	30/11/2025, 06:50:27 pm	Not Available
TXN-1764502403050	₹2000	amenity	failed	30/11/2025, 05:03:24 pm	Not Available
TXN-1764500892142	₹1000	maintenance	completed	30/11/2025, 04:38:13 pm	<a href="#">Download</a>

➤ View Payment History:-



This screenshot shows the same HOA Connect System interface after a payment has been made. The "Proceed to Pay" button is now greyed out, indicating the process is complete. A green success message "Payment Successful!" is displayed above the "Payments History" table. The table of transactions is identical to the one in the previous screenshot.

Transaction ID	Amount	Bill Type	Status	Date	Receipt
TXN-1765821180767	₹500	penalty	completed	15/12/2025, 11:24:07 pm	<a href="#">Download</a>
TXN-1764508824866	₹1100	maintenance	pending	30/11/2025, 06:50:27 pm	Not Available
TXN-1764502403050	₹2000	amenity	failed	30/11/2025, 05:03:24 pm	Not Available
TXN-1764500892142	₹1000	maintenance	completed	30/11/2025, 04:38:13 pm	<a href="#">Download</a>

➤ **Download Payment Receipt:-**

The screenshot shows the HOA Connect System interface. On the left, a sidebar menu includes options like Dashboard, Announcements, Complaints, Amenities, Documents, Meetings, Payments (which is selected), Notifications, and Polls. A 'Logout' button is at the bottom. The main content area has a header 'Download started. To see it, press and hold Esc.' and fields for 'Amount' (₹500), 'Bill Type' (Penalty), and 'UPI'. A green 'Proceed to Pay' button is below. Below this, a 'Payment Successful!' message and a 'Payments History' table are displayed. The table has columns: Transaction ID, Amount, Bill Type, Status, Date, and Receipt. It lists four transactions:

Transaction ID	Amount	Bill Type	Status	Date	Receipt
TXN-1765821180767	₹500	penalty	completed	15/12/2025, 11:24:07 pm	<button>Download</button>
TXN-1764508824866	₹1100	maintenance	pending	30/11/2025, 06:50:27 pm	Not Available
TXN-1764502403050	₹2000	amenity	failed	30/11/2025, 05:03:24 pm	Not Available
TXN-1764500892142	₹1000	maintenance	completed	30/11/2025, 04:38:13 pm	<button>Download</button>

➤ **Show User Notification:-**

The screenshot shows the HOA Connect System interface. The sidebar menu is identical to the previous one, with 'Notifications' selected. The main content area features a 'Notifications' section with a table. The table has columns: Title, Message, Created By, and Date & Time. It lists two notifications:

Title	Message	Created By	Date & Time
Notification	Message from Admin to Khushi	Vicky Rathod	12/2/2025, 10:39:05 AM
Maintenance Notice	Pay by 2 days	Vicky Rathod	11/30/2025, 3:58:07 PM

## ➤ Vote Poll:-

The screenshot shows the HOA Connect System interface. The top navigation bar includes a logo, the text "HOA Connect System", and a "Welcome! RESIDENT" message with a profile icon. On the left, a sidebar menu lists "Dashboard", "Announcements", "Complaints", "Amenities", "Documents", "Meetings", "Payments", "Notifications", and a highlighted "Polls" option. A "Logout" button is at the bottom of the sidebar. The main content area is titled "Society Polls" and displays a message "Vote submitted successfully". It contains three poll sections: 1) "Which amenity needs improvement?" with options "Gym" (0 votes), "Swimming Pool" (0 votes), and "Parking" (2 votes). A note says "You already voted". 2) "Navratri Aarti Time" with options "9 PM" (0 votes) and "10 PM" (1 vote). A "Submit Vote" button is present. 3) "Maintenance price increment vote a poll" with options "100" (0 votes) and "200" (0 votes).

This screenshot shows the same HOA Connect System interface as the first one, but with a different poll selected. The main content area is titled "Society Polls" and displays a message "You already voted in this poll". It contains the same three poll sections as the first screenshot, but the "Parking" option under the first poll is now selected (indicated by a blue outline). The other options remain unselected.

## 6.3 Architecture Design

- A **3-Tier Application Architecture** is a modular client-server architecture that separates an application into three logical layers: **Presentation Tier**, **Application Tier**, and **Data Tier**. Each tier has a distinct responsibility and can be developed, maintained, and scaled independently.

### ❖ **Presentation Tier:**

- It handles user input such as login, payments, complaints, amenity bookings, and displays responses received from the application tier. The presentation tier communicates with the application tier through secure API calls.

### ❖ **Application Tier:**

- The application tier, also known as the business logic layer, contains the core logic of the HOA Connect system. This layer processes user requests, enforces business rules, validates data, and manages role-based access.
- It handles operations such as community management, admin replacement, complaint resolution, payment processing, meeting and poll management, and notification handling. The application tier communicates with both the presentation tier and the data tier.

### ❖ **Data Tier:**

- The data tier is responsible for storing, retrieving, and managing application data. This layer contains the database where all information related to users, communities, amenities, complaints, payments, meetings, polls, and documents is stored securely.

### ❖ **Example of a 3-Tier Architecture in HOA Connect :**

- **Presentation Tier:** A web application developed using HTML, CSS, JavaScript, and React.js to provide interactive dashboards and user interfaces.
- **Application Tier:** A Node.js and Express.js based backend that handles business logic, authentication, authorization, and API communication.
- **Data Tier:** A MongoDB database used to store and retrieve application data efficiently and securely.

## 7. TESTING

### 7.1 Unit Testing

Unit testing ensures that individual components of the HOA Connect system function correctly in isolation. It is performed on small, testable units such as functions, APIs, services, or individual modules.

#### Key Aspects for HOA Connect:

- **User Authentication Tests** – Verify login, registration, JWT token generation, and role-based access.
- **Complaint Management Tests** – Ensure correct creation, status updates, and resolution handling.
- **Payment Processing Tests** – Validate payment records, transaction status, and history generation.
- **Amenity Booking Tests** – Check booking availability, date validation, and booking limits.
- **Community Management Tests** – Verify creation and assignment of communities and admins.
- **Exception Handling Tests** – Ensure proper error handling for invalid inputs, unauthorized access, and server errors.

### 7.2 Integration Testing

Integration testing evaluates how different modules of the HOA Connect system work together to ensure seamless functionality between the **frontend (React.js)** and backend (**Node.js/Express**).

#### Key Integration Areas for HOA Connect:

- **Authentication Flow** – Validate login, authorization, and session handling across roles.
- **Community-wise Data Isolation** – Ensure admins and residents access only their assigned community data.
- **Payment Integration Workflow** – Verify data flow between frontend payment actions and backend payment storage.
- **Amenity Booking Workflow** – Ensure proper interaction between amenities, users, and booking records.
- **Database Connectivity** – Confirm accurate data storage and retrieval from MongoDB.
- **Notification System** – Ensure residents receive real-time or scheduled notifications for announcements and updates.

## 8. FUTURE ENHANCEMENT

- **Advanced Security and Authentication**

Future versions of HOA Connect can implement enhanced security features such as multi-factor authentication (MFA), refresh tokens, and device-based login verification to further strengthen data protection.

- **Real-Time Notifications and Updates**

Integrating real-time communication using Web-Sockets or similar technologies can enable instant notifications for announcements, complaints updates, meeting reminders, and payment confirmations.

- **Mobile Application Support**

Developing a mobile application for Android and iOS will improve accessibility and allow residents and admins to manage community activities on the go.

- **Enhanced Analytics and Reporting**

Future enhancements may include detailed dashboards with visual graphs for payments, complaints, amenity usage, and community engagement, enabling better decision-making.

- **Additional Community Modules**

New modules such as parking management, vendor services, visitor management, and maintenance tracking can be added to expand system functionality.

## 9. GLOSSARY

- **API** : Enables communication between frontend (React.js) and backend (Node.js/Express).
- **Authentication** : Verifies user identity for secure system access..
- **Authorization** : Controls access based on user roles (Super Admin, HOA Admin, Resident).
- **Backend** : Server-side logic handling requests, validations, and business rules.
- **Community Management** : Managing residential communities and their assigned admins.
- **Complaint Management** : System for raising, tracking, and resolving resident complaints.
- **CRUD Operations** : Create, Read, Update, and Delete operations on data.
- **Database** : MongoDB used for storing user, community, and transaction data.
- **Frontend** : User interface built using React.js.
- **Integration Testing** : Ensures different modules work together correctly.
- **JWT (JSON Web Token)** : Used for secure authentication and authorization.
- **Payment Management** : Handles maintenance payments and transaction history.
- **Risk Analysis** : Identification and evaluation of project risks.
- **Unit Testing** : Testing individual modules independently.

## 10. REFERENCE

- [www.chatgpt.com](http://www.chatgpt.com)
- [www.perplexityAI.com](http://www.perplexityAI.com)
- <https://vite.dev>
- <https://nodejs.org>