CHUBB®

CAPSTONE PROJECT
(Loan Management System)

Enterprise-Grade Secure Full-Stack Web Application

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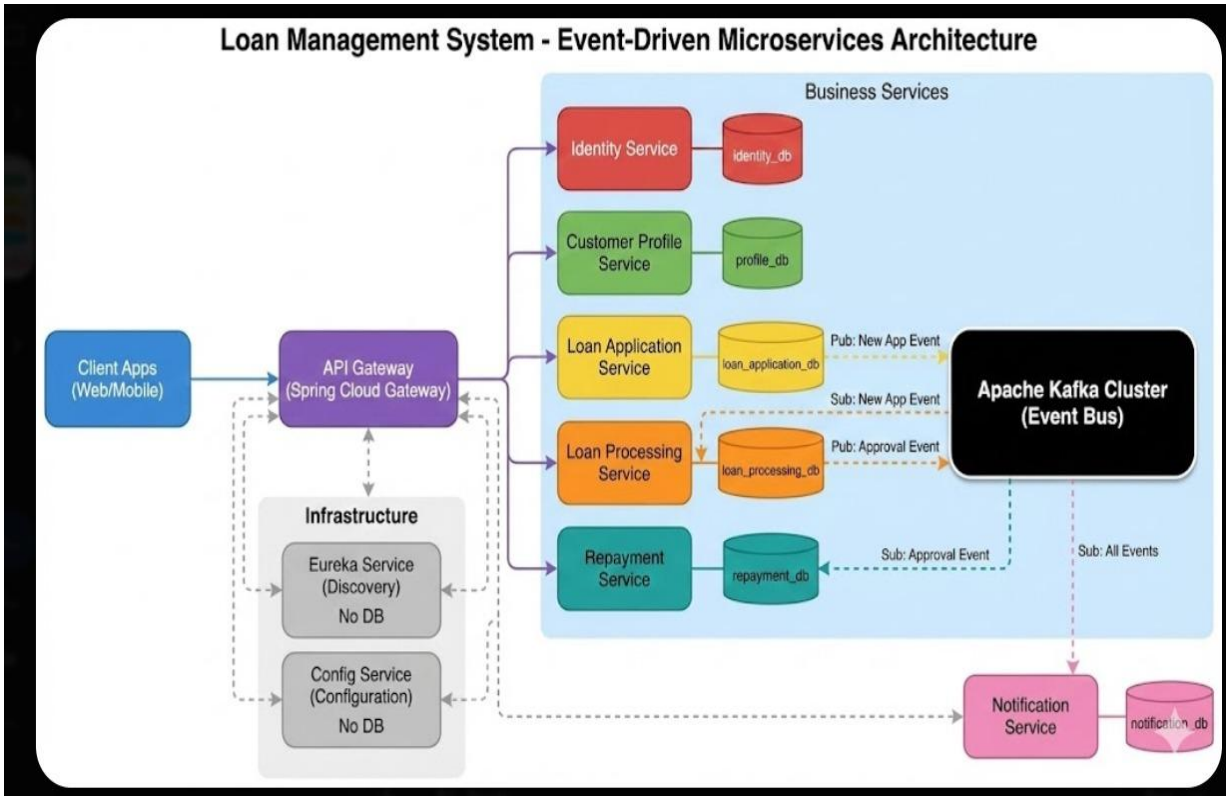
INDEX

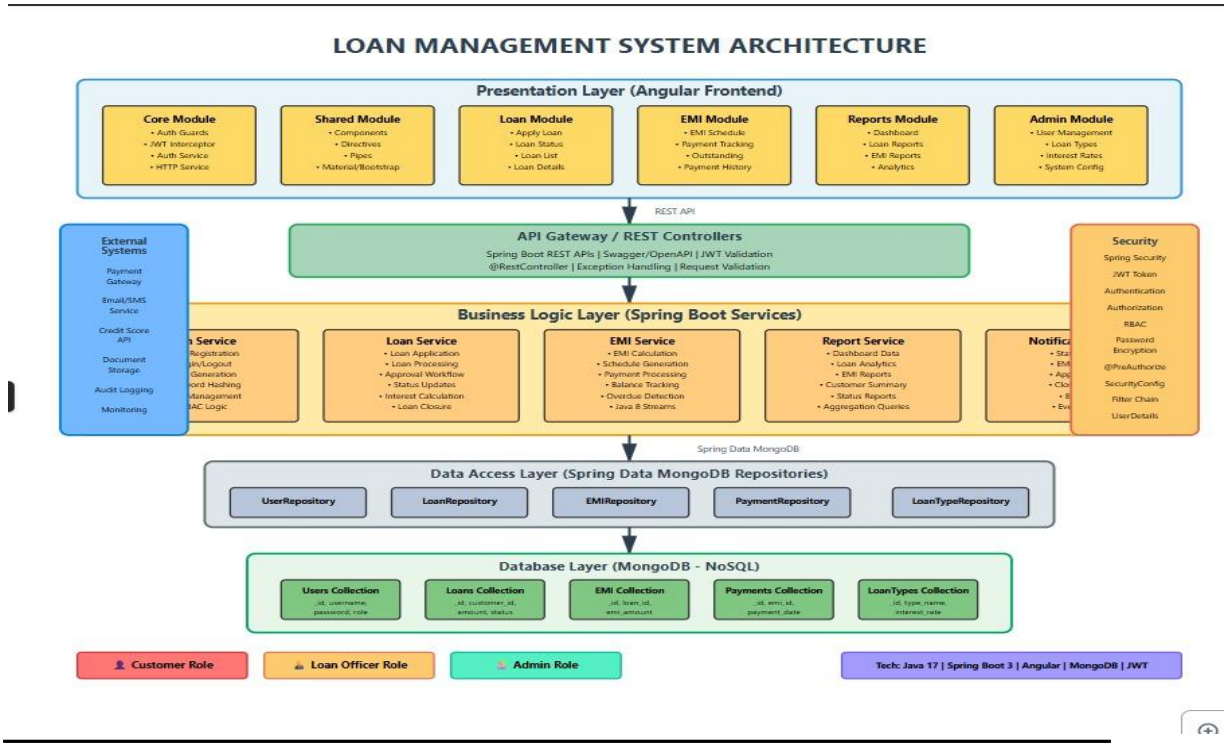
1) Purpose of the document

This document serves as the **authoritative technical and architectural reference** for the **Loan Management System (LMS)**.
Its primary objectives are to:

- Explain the **business rationale and system vision**
- Provide a **high-level system overview** for stakeholders
- Describe the **architectural style, core components, and design decisions**
- Detail the **microservice responsibilities, APIs, and data ownership**
- Define **security, error handling, validation, and non-functional requirements**
- Present a **robust testing and quality assurance strategy**

System Overview





2.1 Business Objective

The Loan Management System is designed to **digitize and automate the end-to-end loan lifecycle** for banks, NBFCs, and financial institutions.
The system replaces manual and semi-automated workflows with a **secure, scalable, and audit-ready platform.**

Key business goals include:

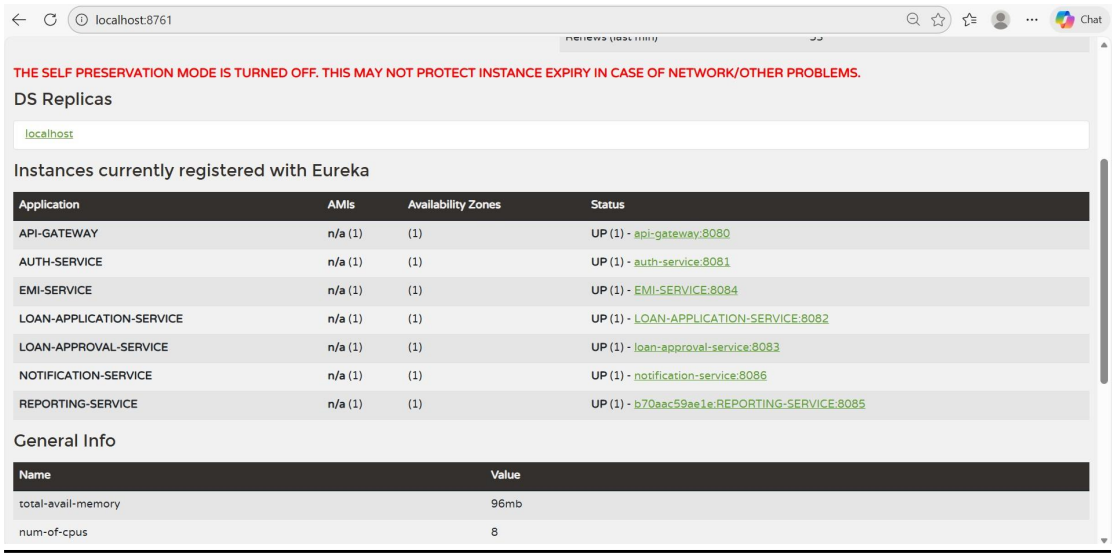
- Faster loan application processing
- Transparent approval workflows
- Accurate EMI computation and repayment tracking
- Secure handling of sensitive financial data
- Real-time dashboards and operational reports
- Cloud-ready, API-first architecture

2.2 High-Level Features

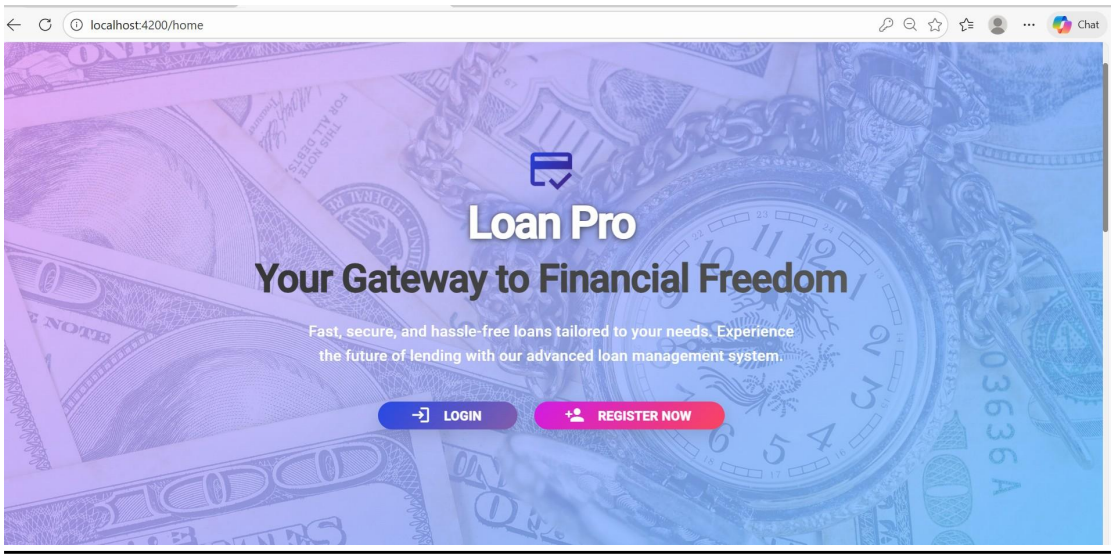
- Multi-role system: **Admin, Loan Officer, Customer**
- Online loan application and tracking

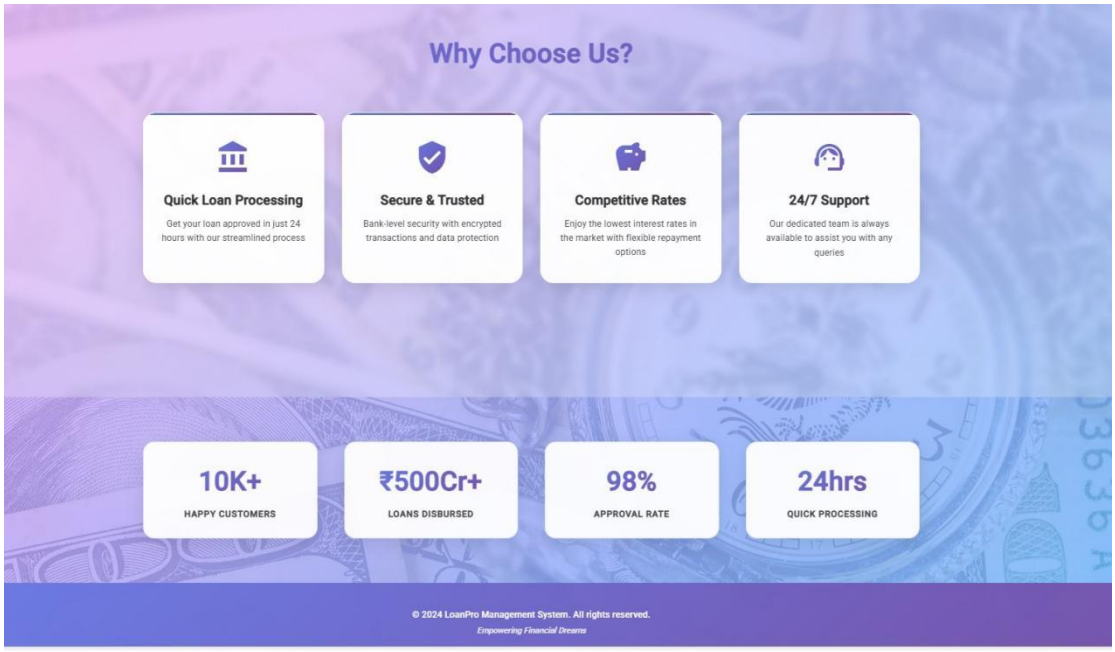
- Configurable loan types, interest rates, and tenures
- Automated EMI schedule generation
- Repayment tracking and loan closure
- Secure authentication using JWT
- Role-based authorization (RBAC)
- Reporting and dashboard analytics
- Production-ready REST APIs

EUREKA DASHBOARD

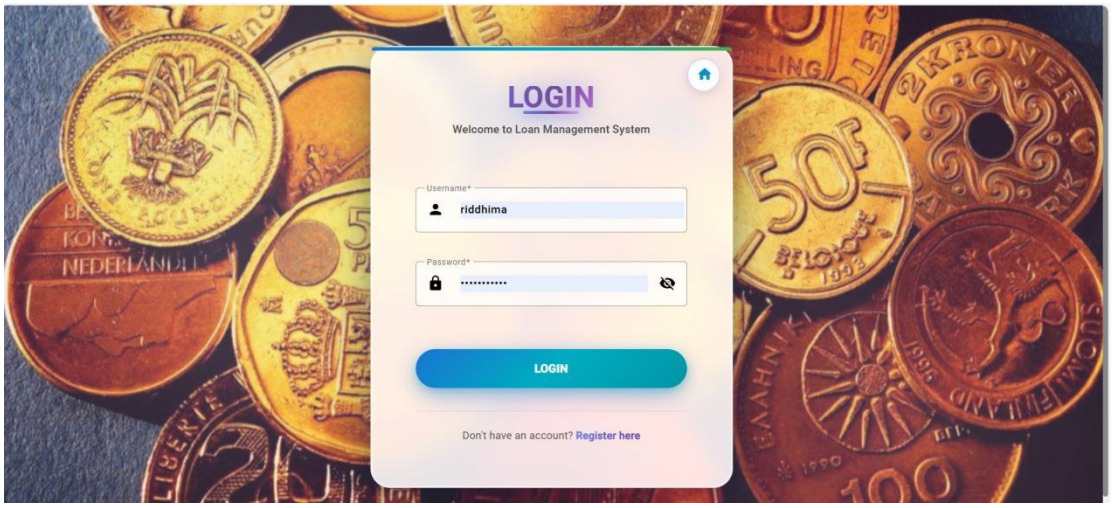


HOME PAGE

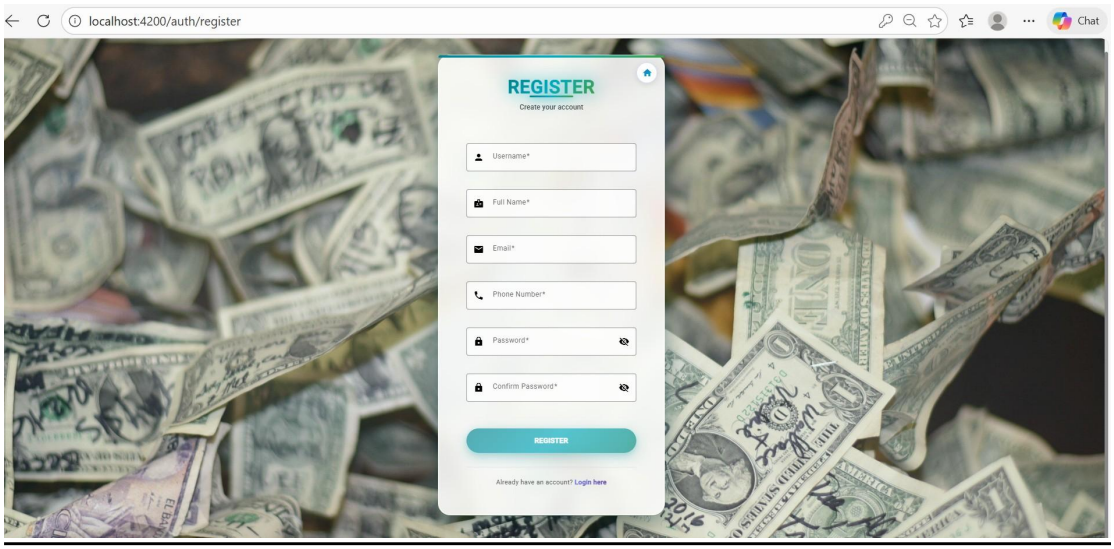



Why Choose Us?
Quick Loan Processing
Get your loan approved in just 24 hours with our streamlined process
Secure & Trusted
Bank-level security with encrypted transactions and data protection
Competitive Rates
Enjoy the lowest interest rates in the market with flexible repayment options
24/7 Support
Our dedicated team is always available to assist you with any queries
10K+
HAPPY CUSTOMERS
₹500Cr+
LOANS DISBURSED
98%
APPROVAL RATE
24hrs
QUICK PROCESSING
© 2024 LoanPro Management System. All rights reserved.
Empowering Financial Dreams

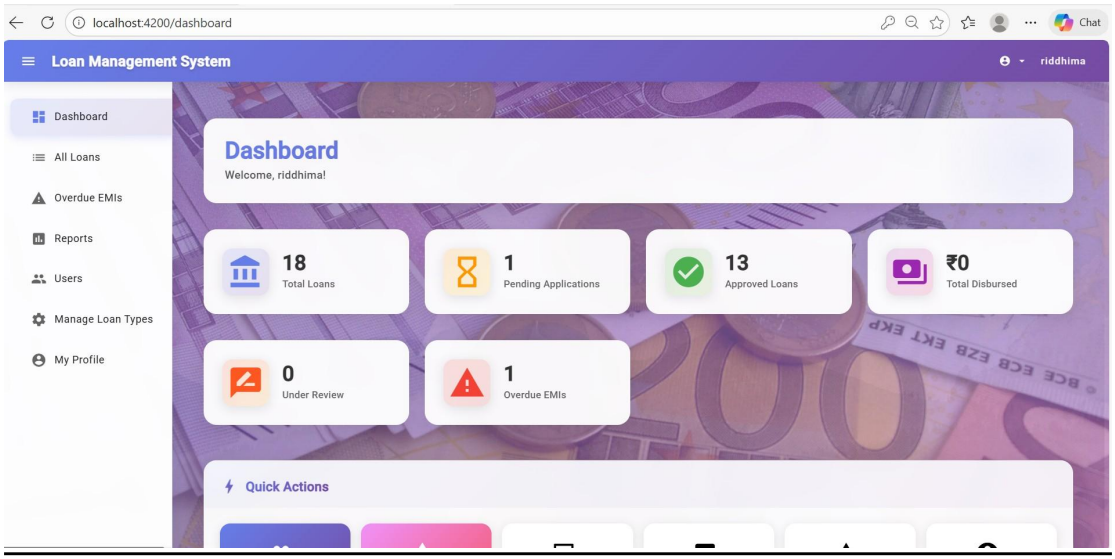
LOGIN PAGE

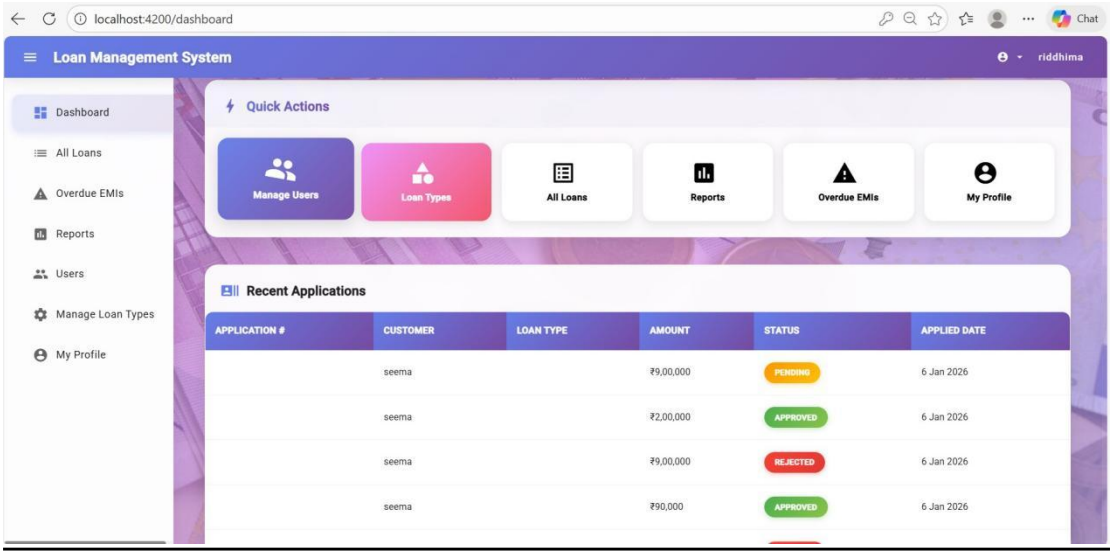

LOGIN
Welcome to Loan Management System
Username*
riddhima
Password*
LOGIN
Don't have an account? Register here

REGISTER PAGE

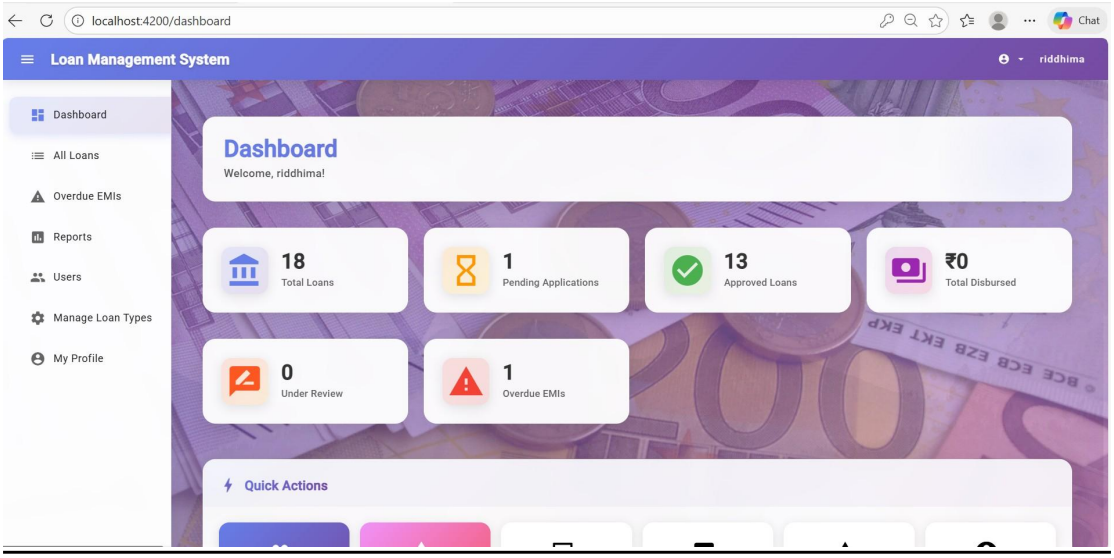


ADMIN DASHBOARD

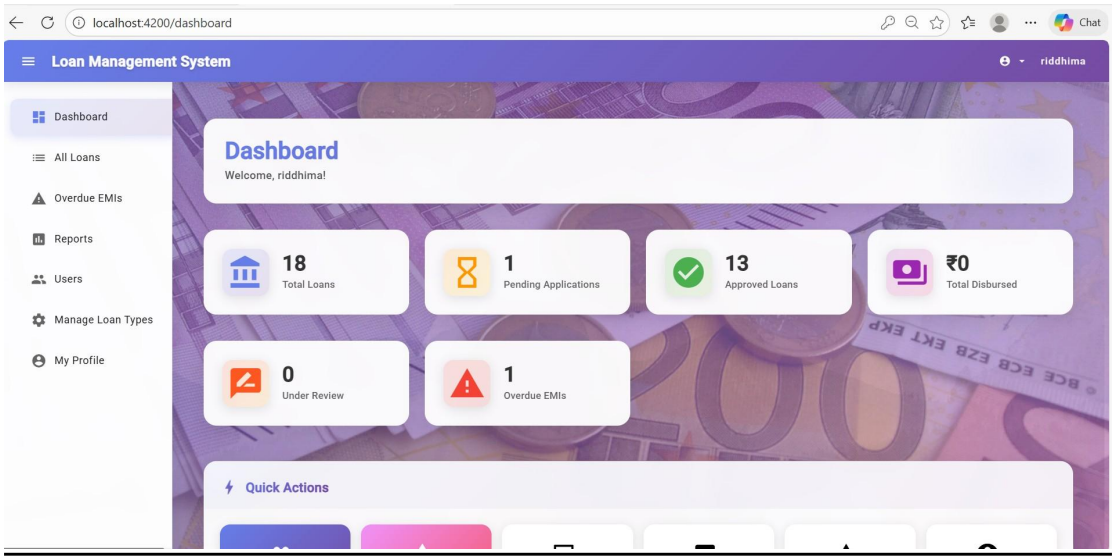




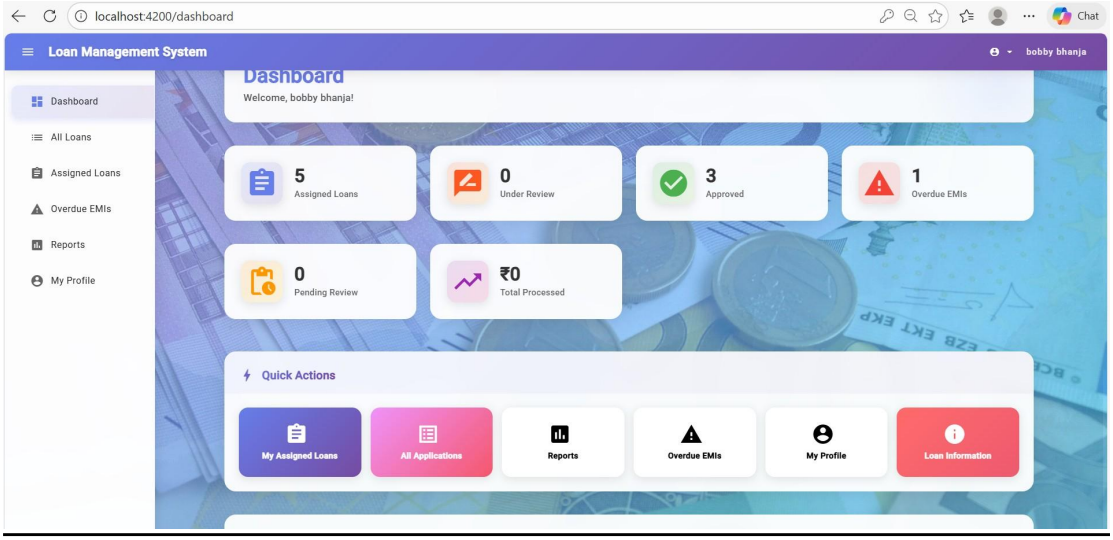
CUSTOMER DASHBOARD

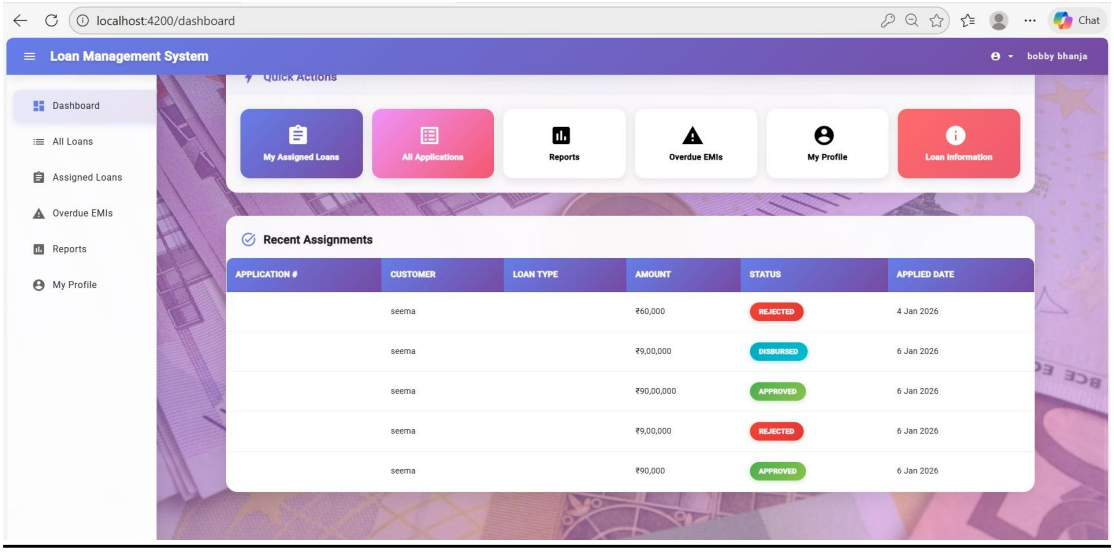


CUSTOMER EMI SCHEDULE

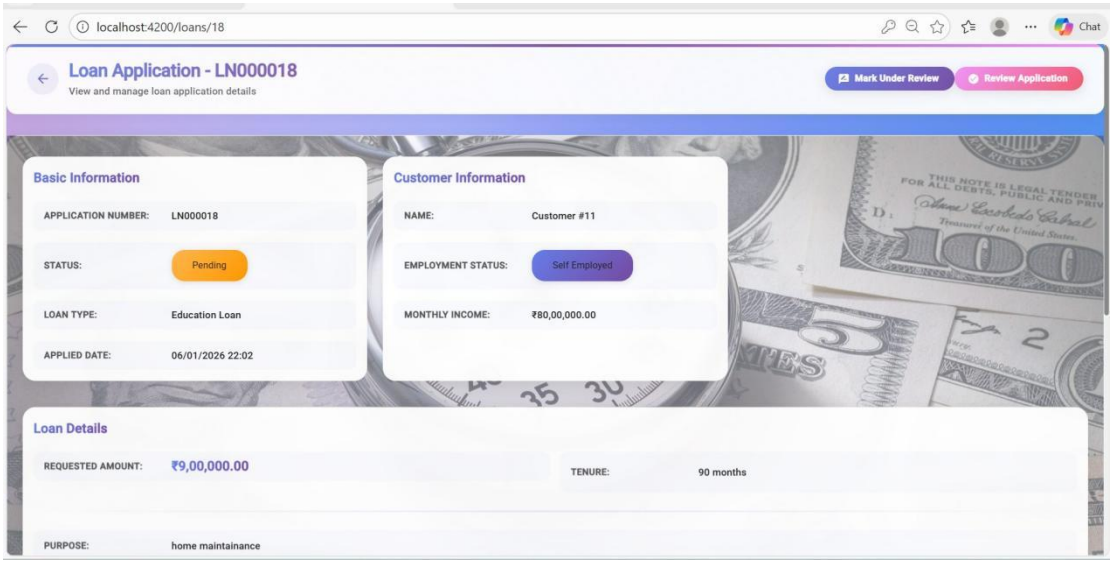


LOAN OFFICER DASHBOARD

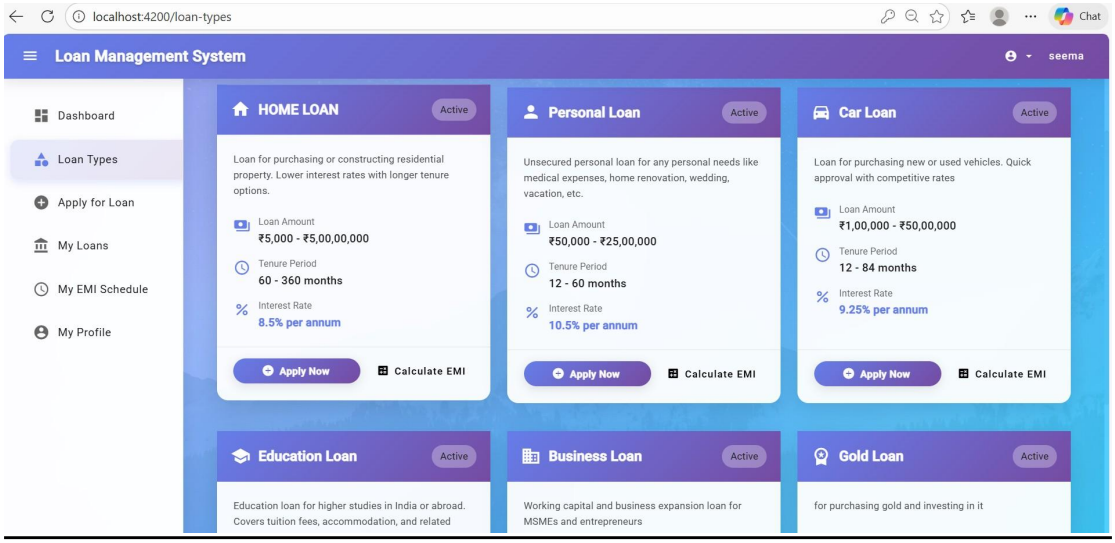




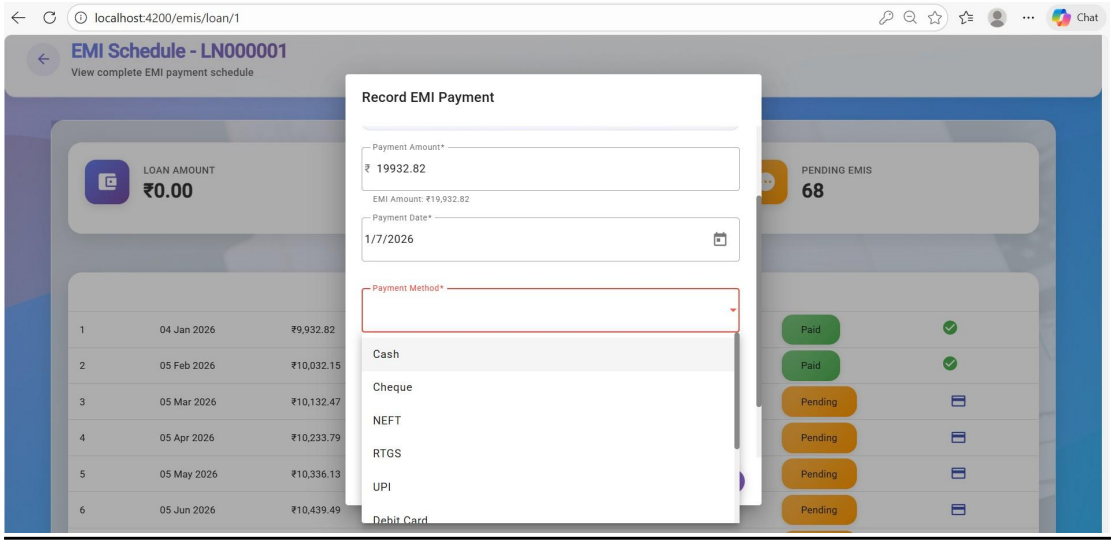
PER LOAN CUSTOMER DETAILS



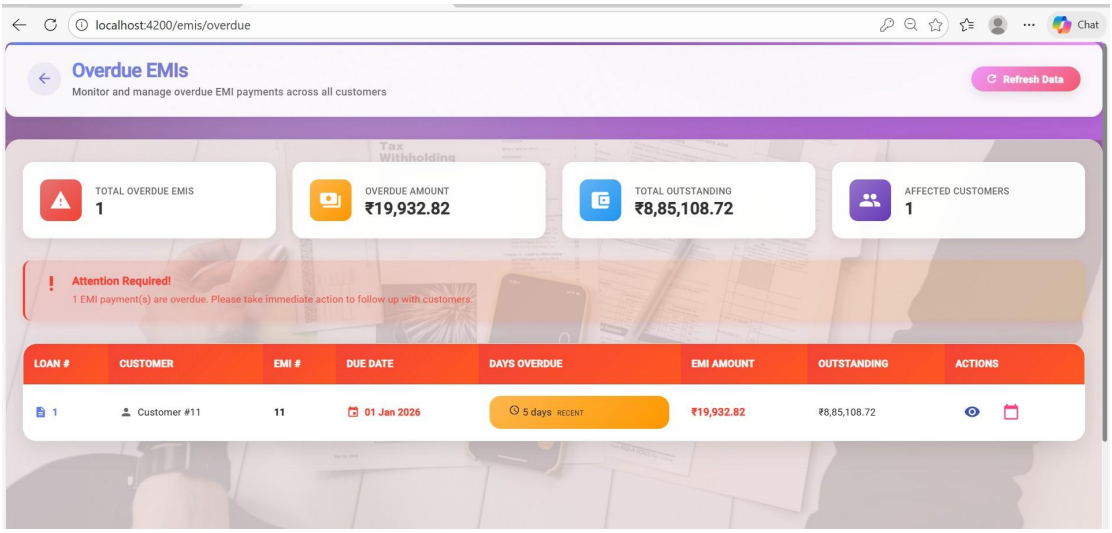
ALL LOAN TYPES CUSTOMER VIEW



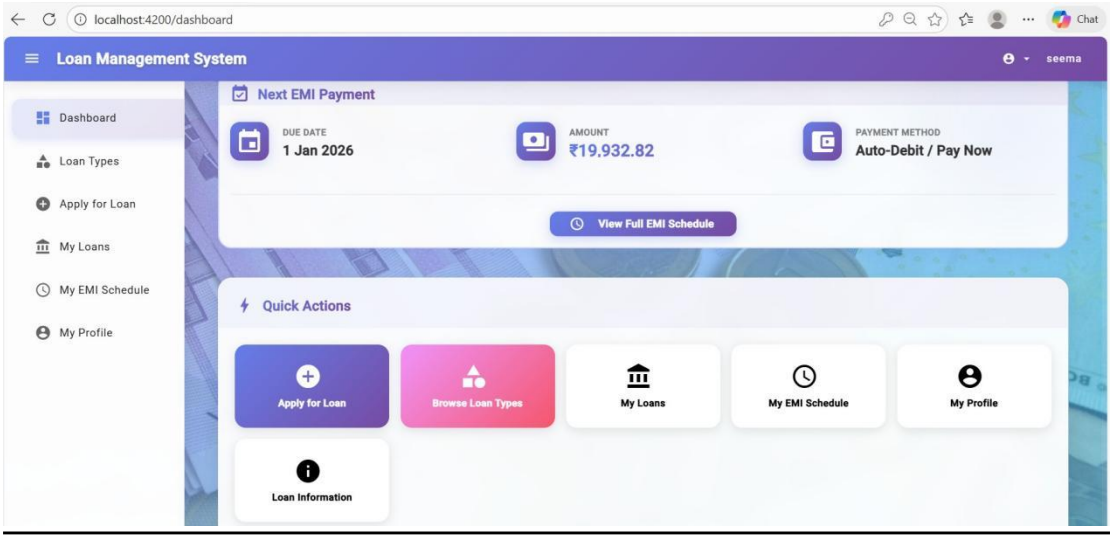
PAYMENT RECORDS



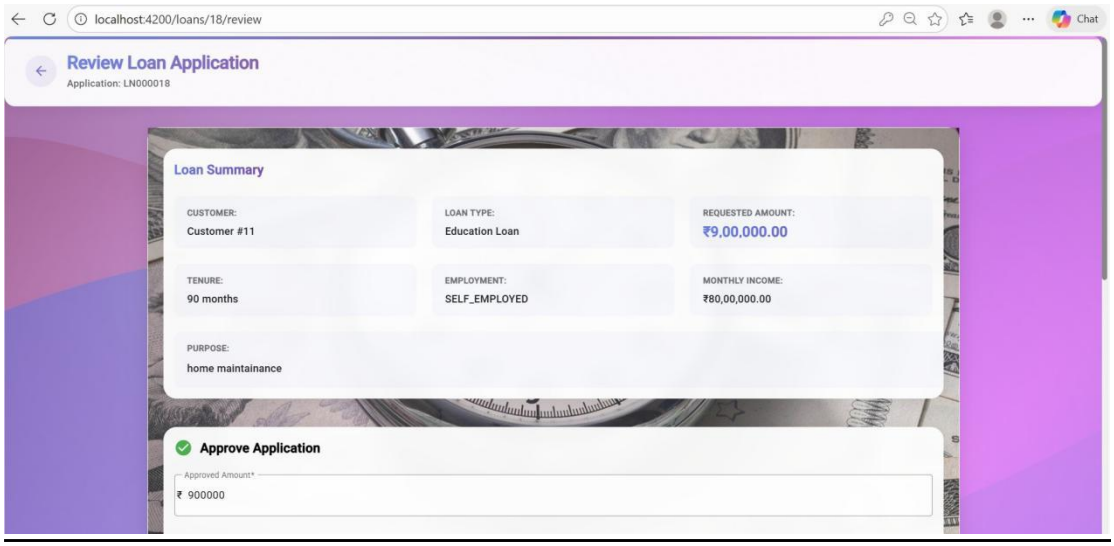
OVERDUE EMI



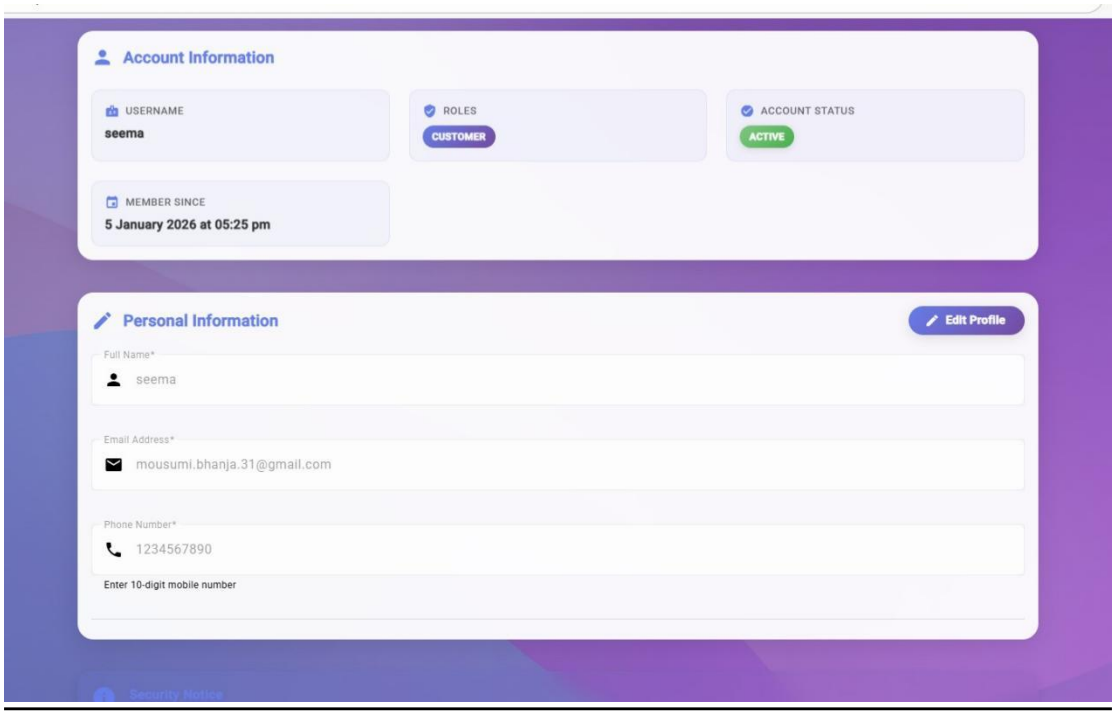
NEXT EMI SCHEDULE



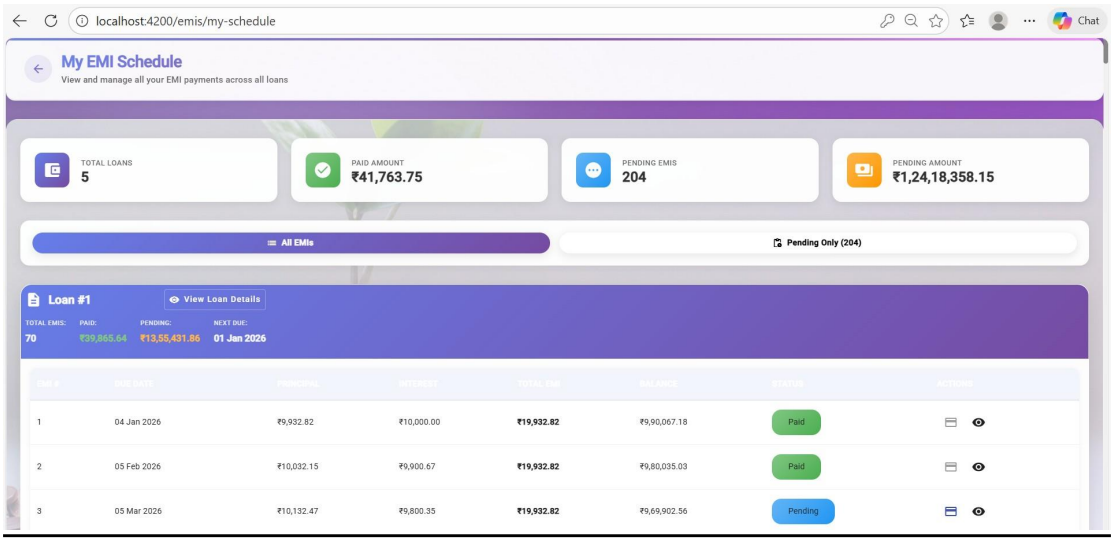
LOAN SUMMARY PER CUSTOMER



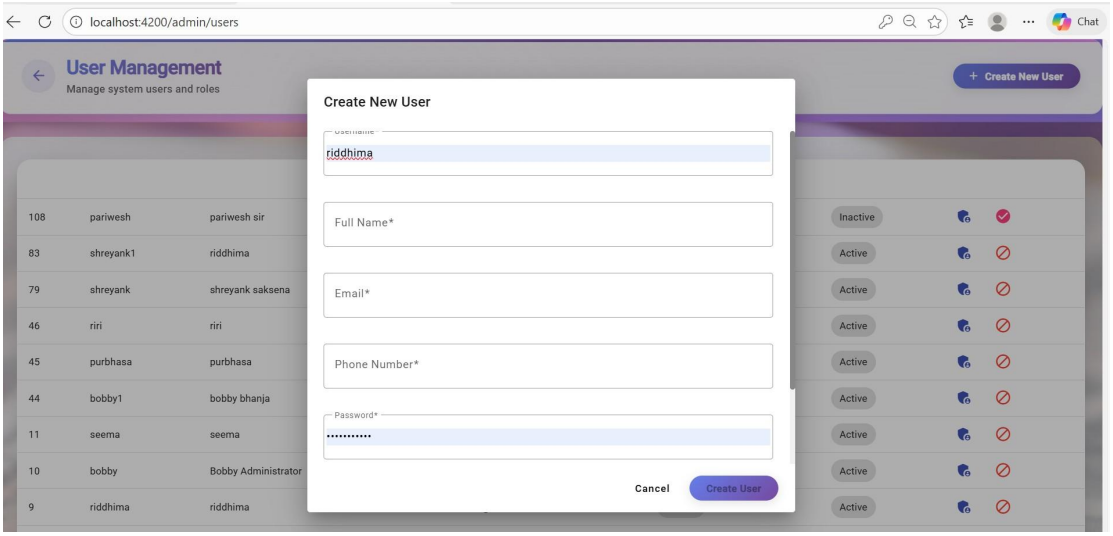
CUSTOMER PROFILE



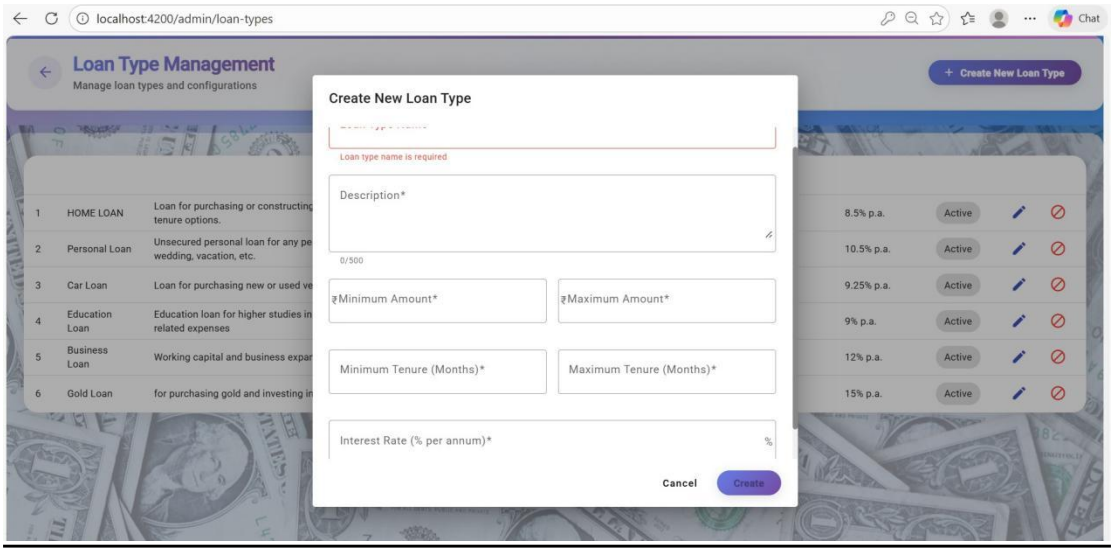
CUSTOMER EMI SCHEDULE



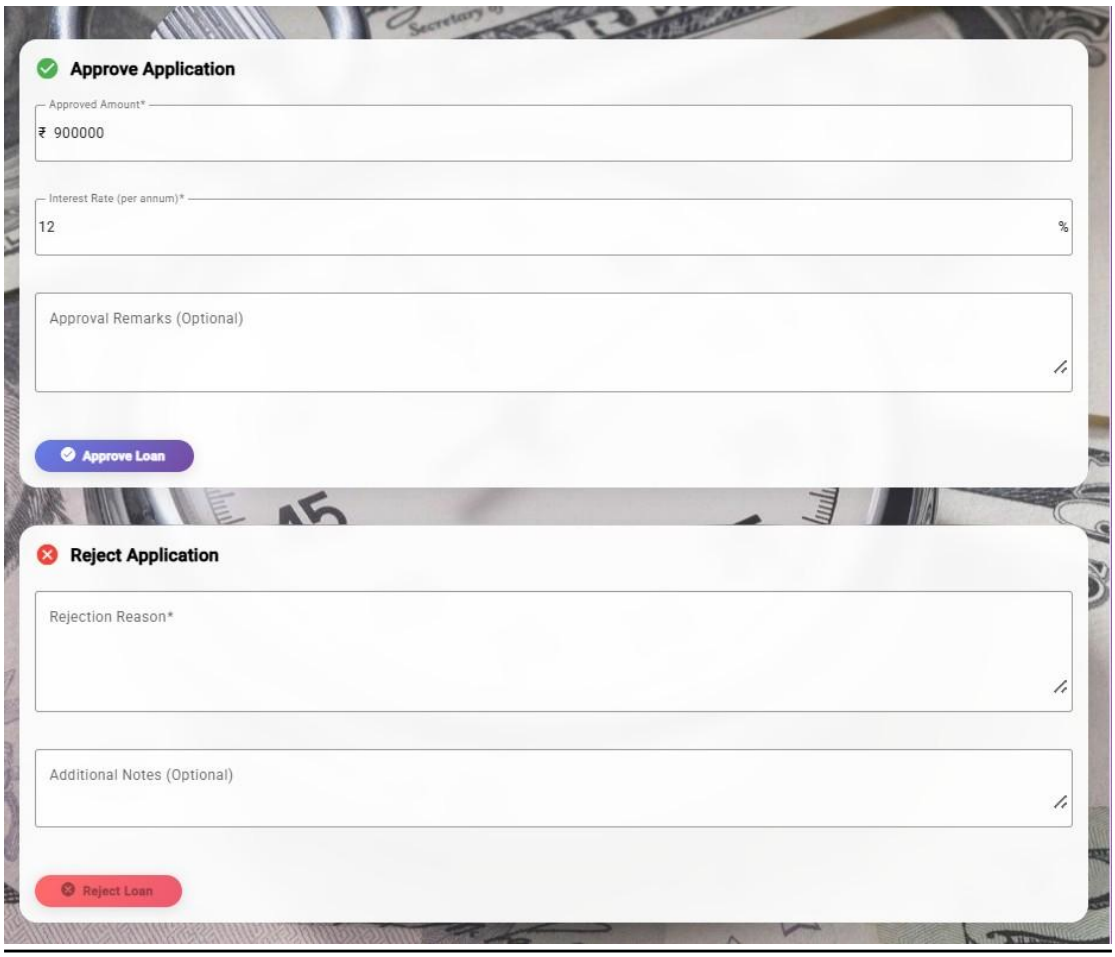
CREATE CUSTOMER



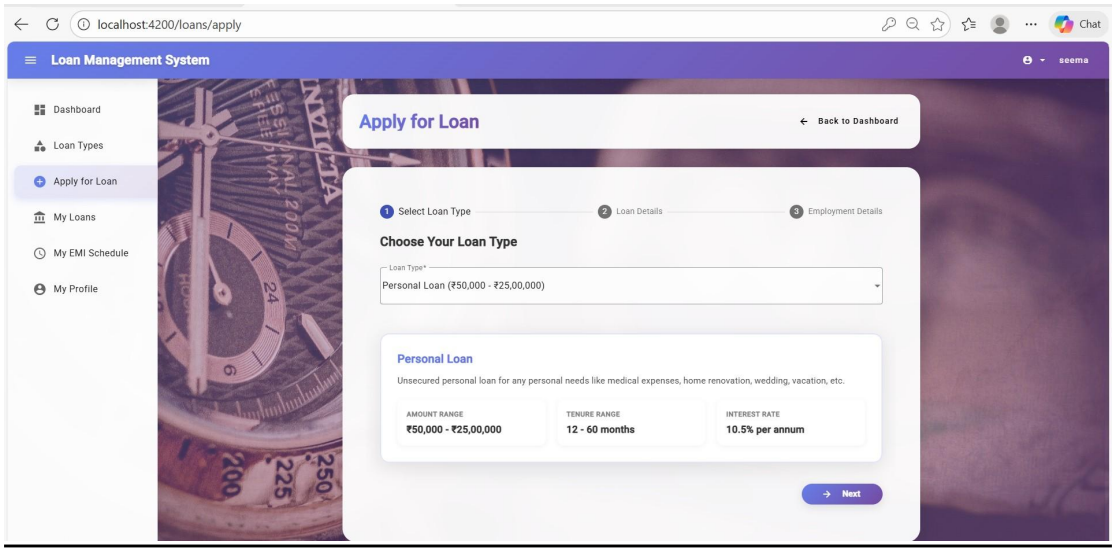
CREATE LOAN



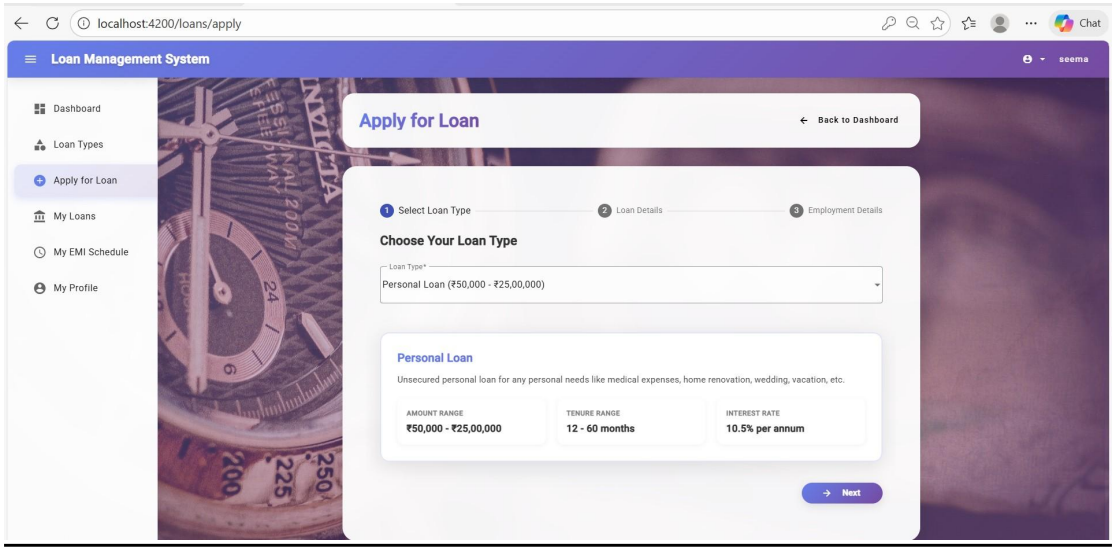
APPROVE REJECT LOAN



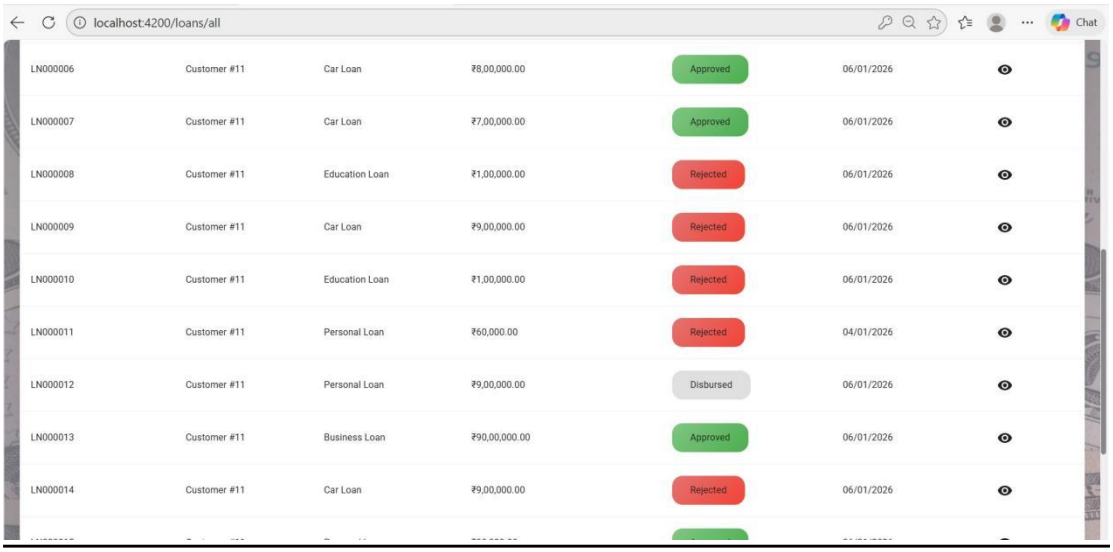
APPLY FOR LOAN AS CUSTOMER



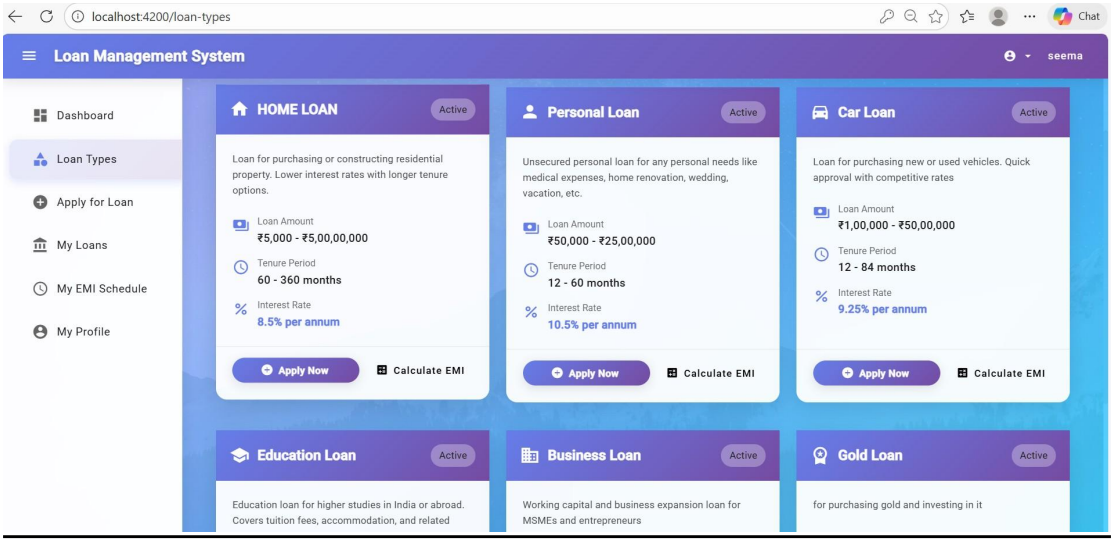
ALL LOANS(ADMIN)



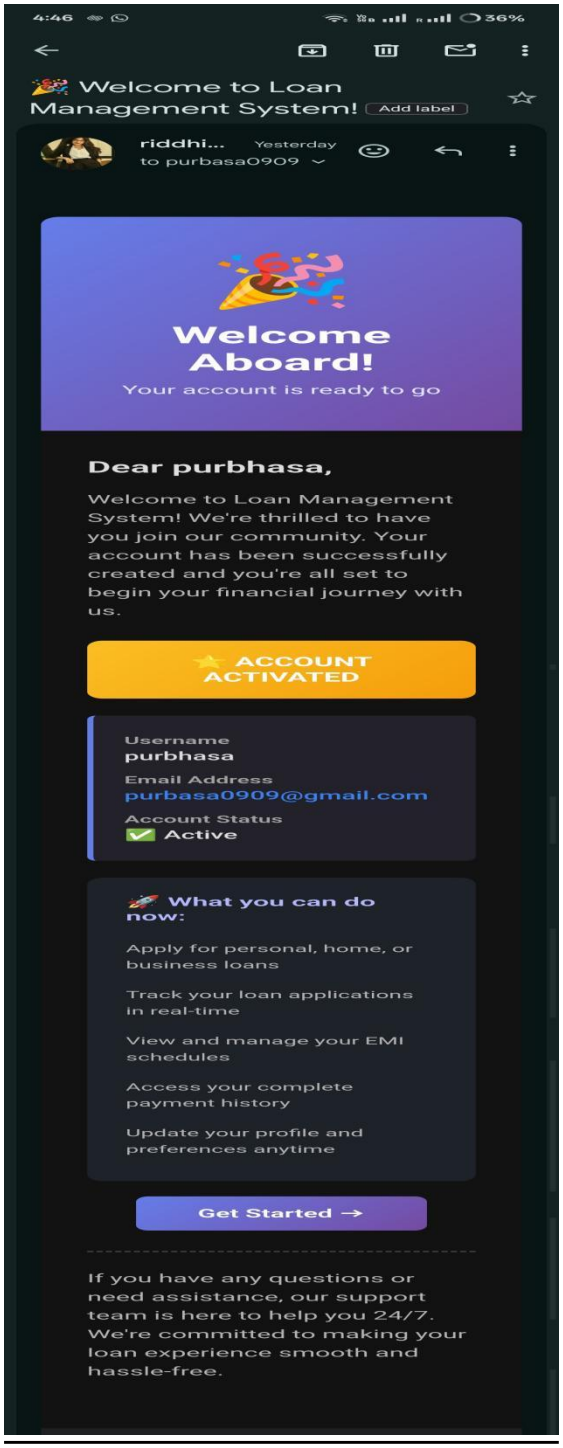
ALL APPROVED/REJECTED LOANS



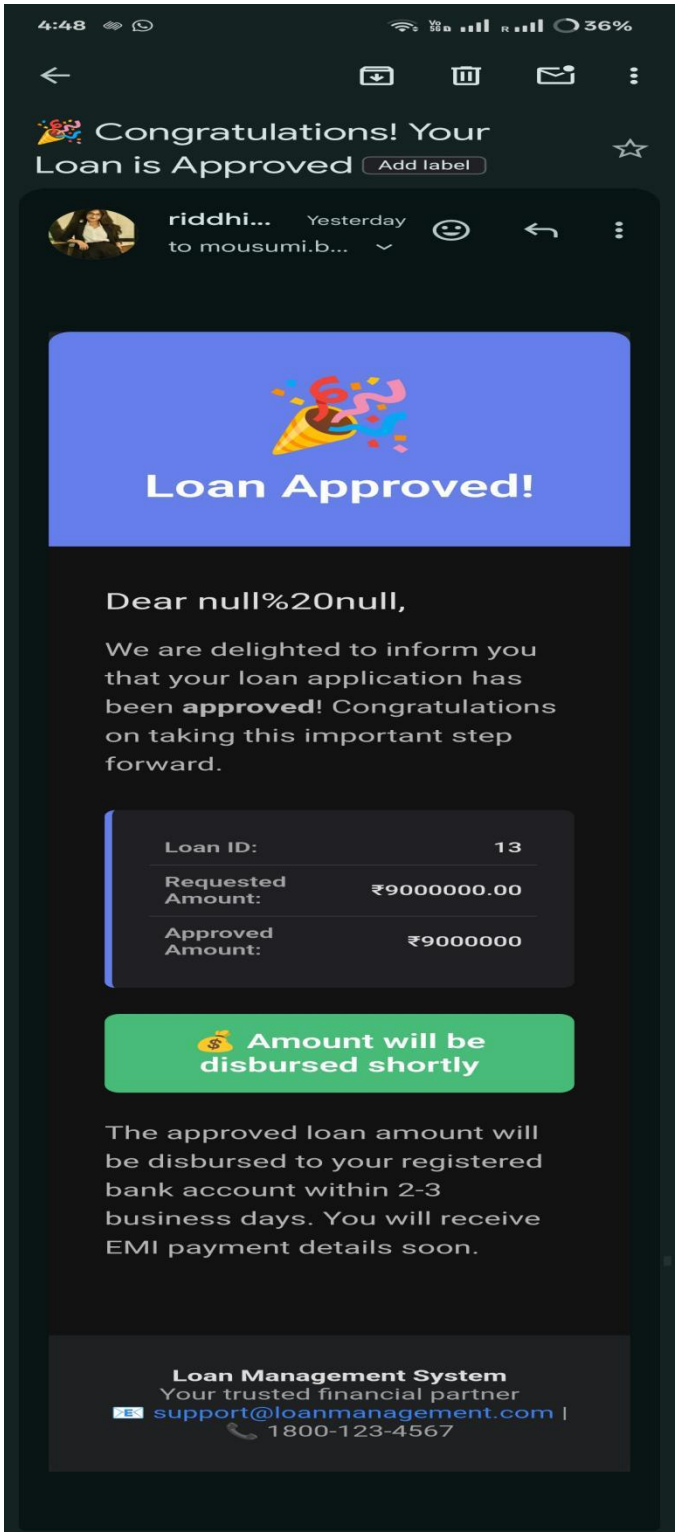
ADMIN PERSONAL INFO CARD



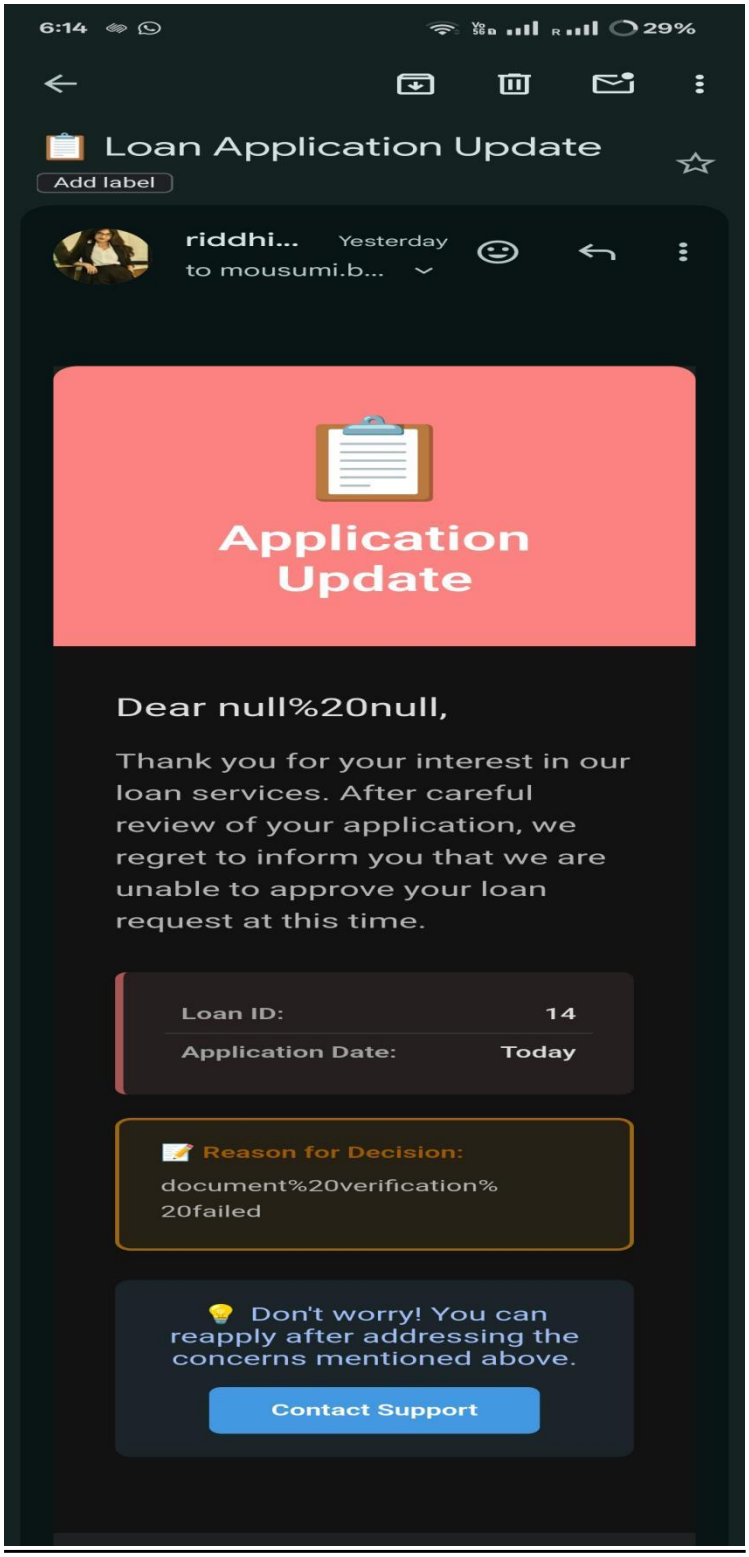
LOAN REGISTRATION EMAIL



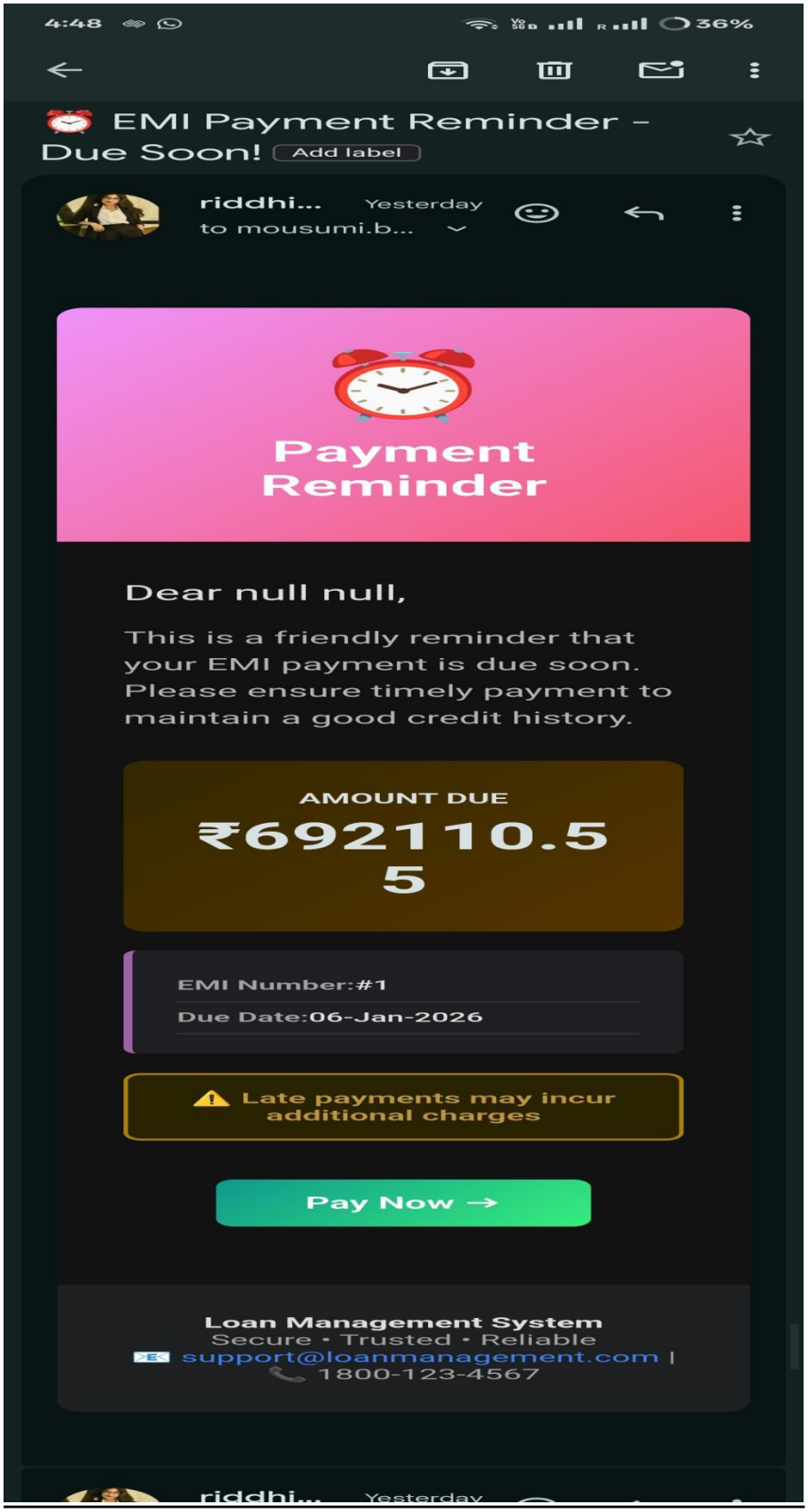
LOAN APPROVAL EMAIL



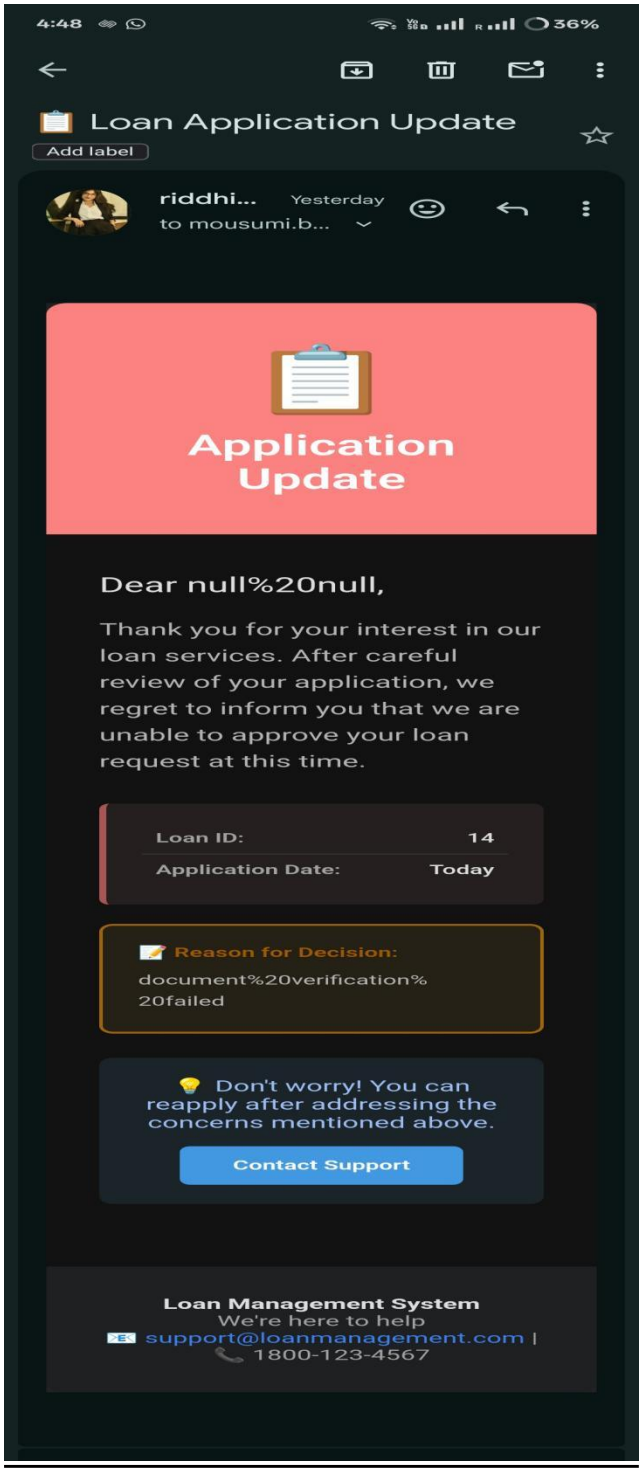
LOAN REJECTION EMAIL



EMI PAYMENT REMINDER



APPLICATION UPDATE EMAIL



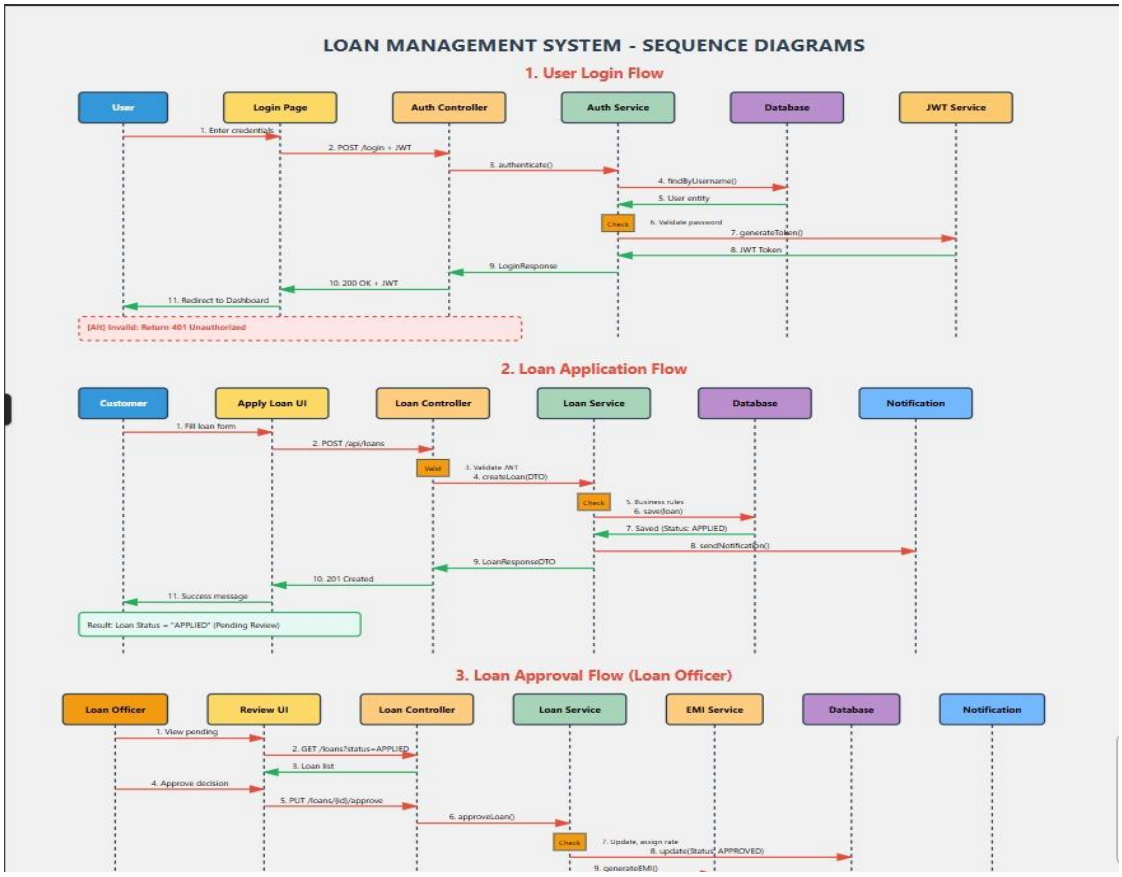
3.Architecture Style

3.1Architectural Pattern

The system follows a **Microservices-Oriented Architecture** combined with **Layered Design Principles**.

Key characteristics:

- Loose coupling between services
- Independent data ownership
- REST-based inter-service communication
- Stateless backend services
- Frontend-backend separation (SPA + APIs)



3.Core System Components

4.1 Frontend Layer

- Single Page Application (SPA)
- Handles UI rendering, form validation, and role-based navigation
- Communicates with backend via secured REST APIs

4.2 Backend Layer

- Stateless REST services
- Implements business logic, validation, security, and workflows
- Exposes versioned APIs

4.3 Persistence Layer

- Independent databases per service
- Ensures data isolation and scalability

4.4 Security Layer

- · JWT authentication
- · Role-based authorization
- · Encrypted password storage
- · Secure API endpoints

5.Technology Stack

5.1 Backend

- Java 17+
- Spring Boot 3.x
- Spring Web (REST APIs)
- Spring Data JPA
- Hibernate ORM
- Spring Security with JWT
- Swagger / OpenAPI
- Maven

5.2 Frontend

- **Angular (latest)**
- **TypeScript**
- **Angular Material / Bootstrap**
- **Reactive Forms**
- **HTTP Interceptors**
- **Route Guards**

5.3 Database

- **PostgreSQL / MySQL**
- **Separate schema per microservice**

5.4 DevOps & Tools

- Git & GitHub

- Postman
- Environment-based configuration (dev/test/prod)

5.5 Testing

- JUnit 5

- Mockito
- Postman collections

6. Microservice Design

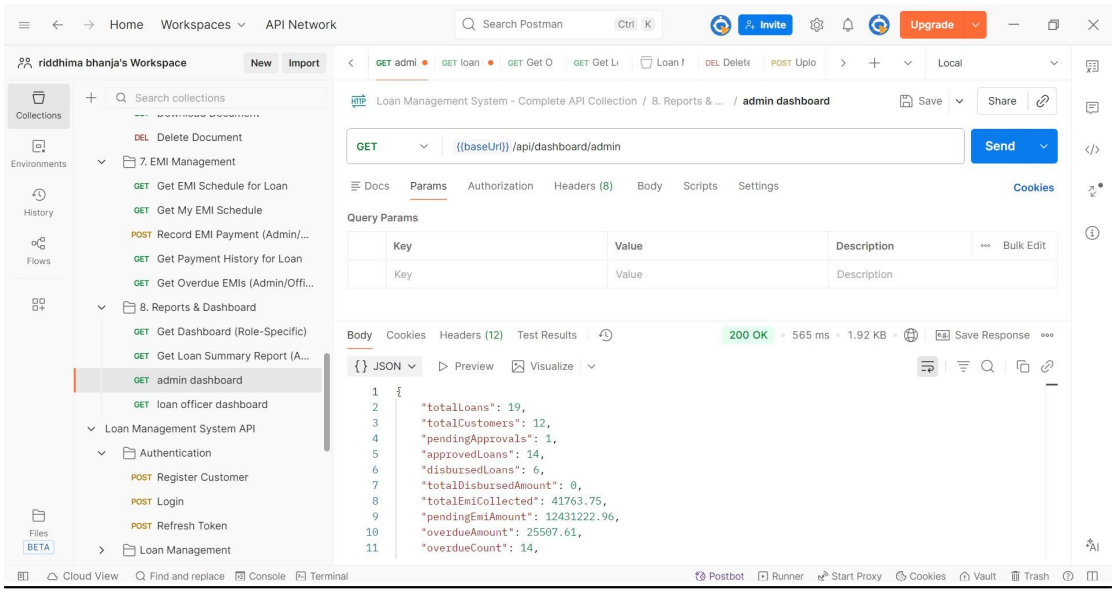
6.1 User Service

Responsibilities

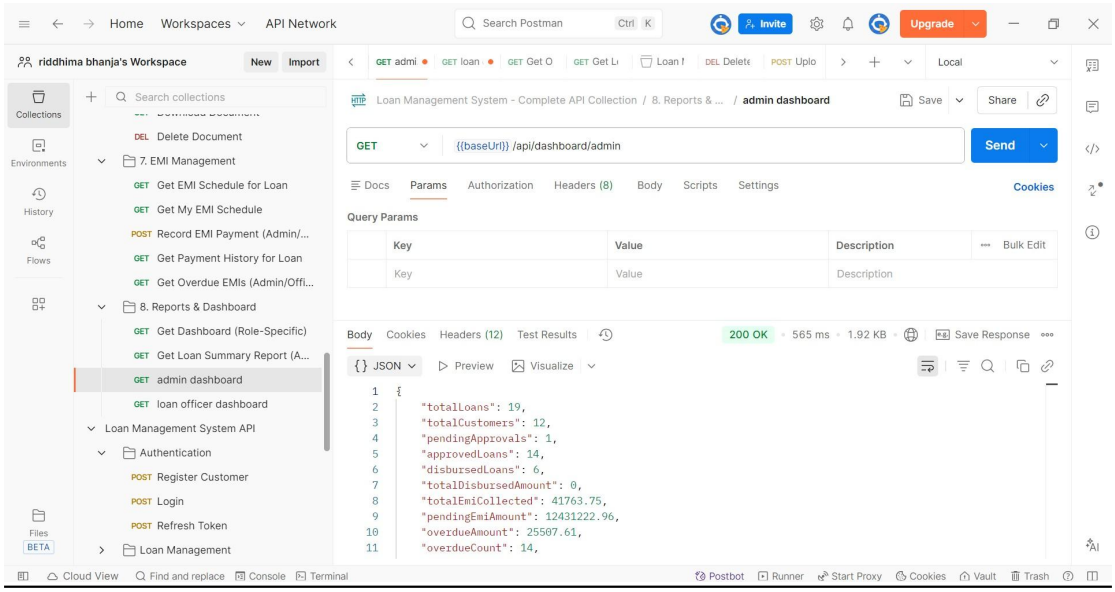
- User registration and authentication
- Role and permission management
- JWT generation and validation
- Password hashing and security policies

APIs

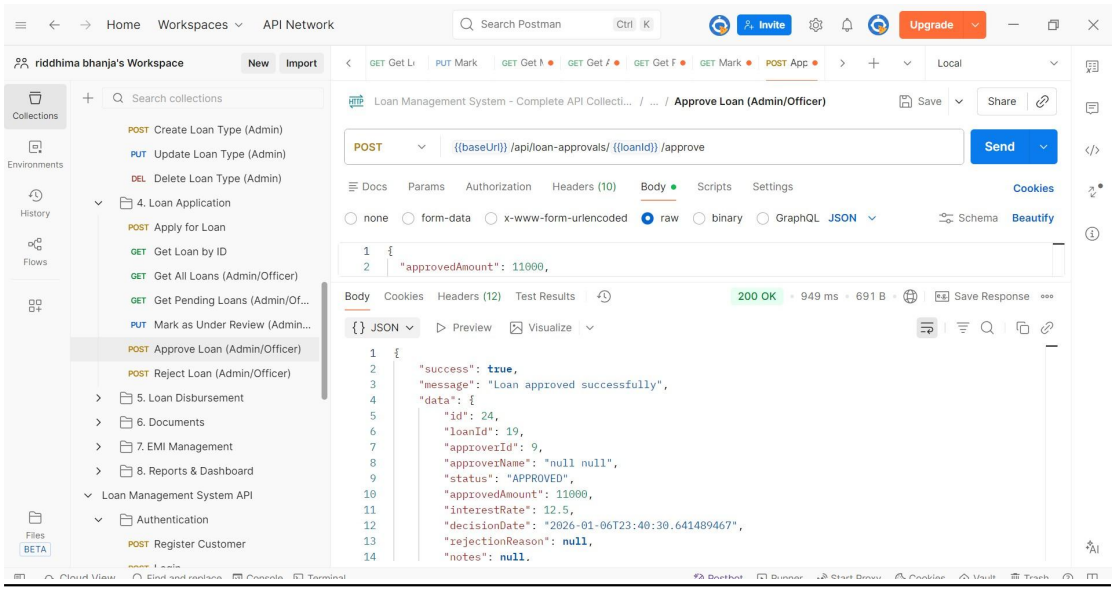
ADMIN DASHBOARD



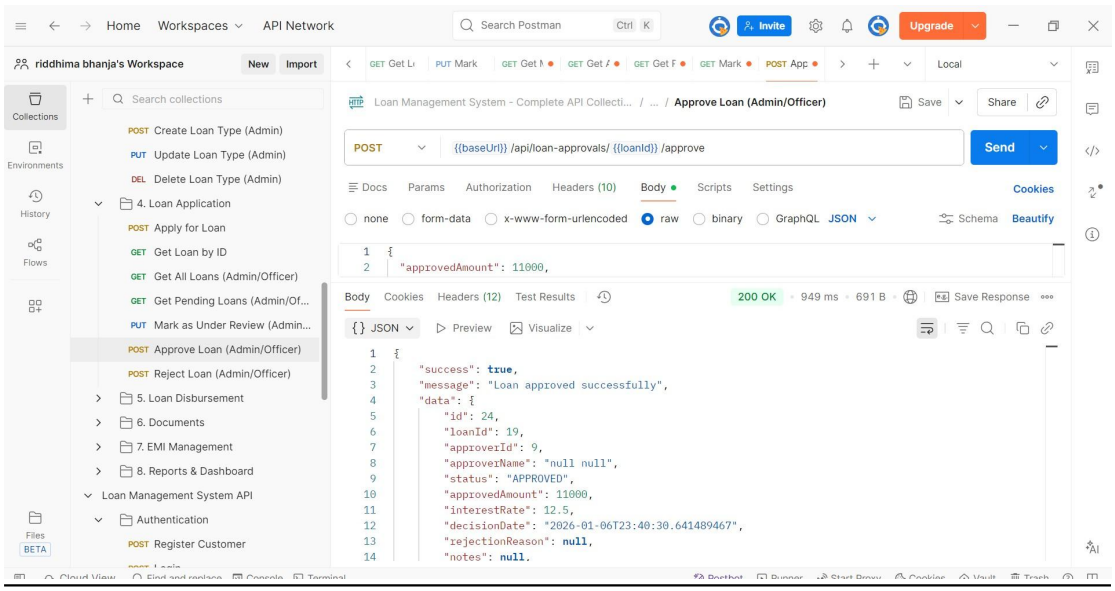
APPLY FOR LOAN



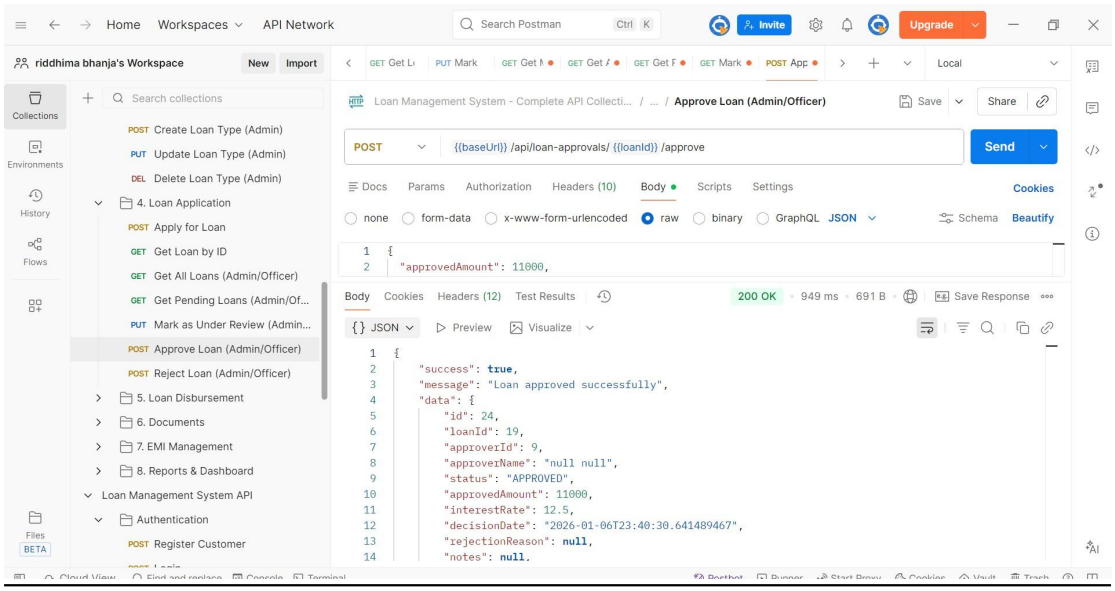
APPROVE LOAN



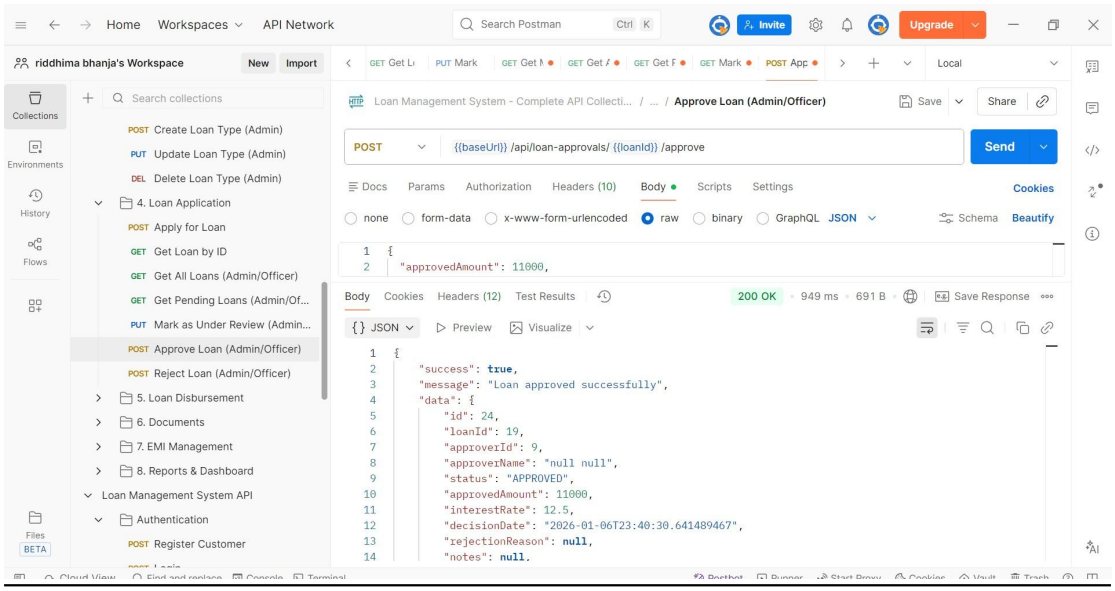
CREATE LOAN



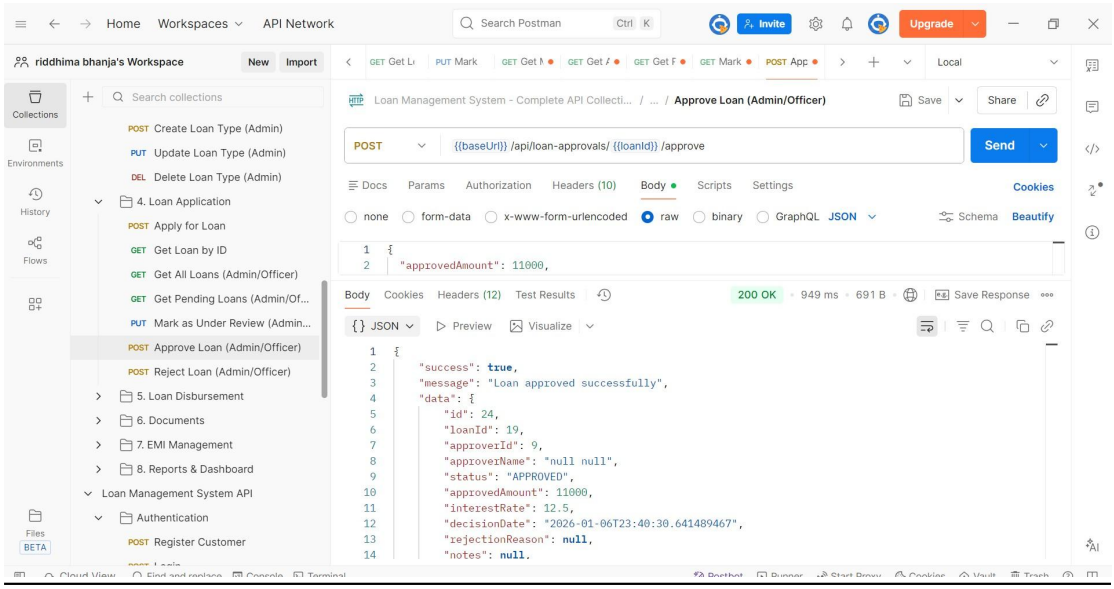
DELETE LOAN



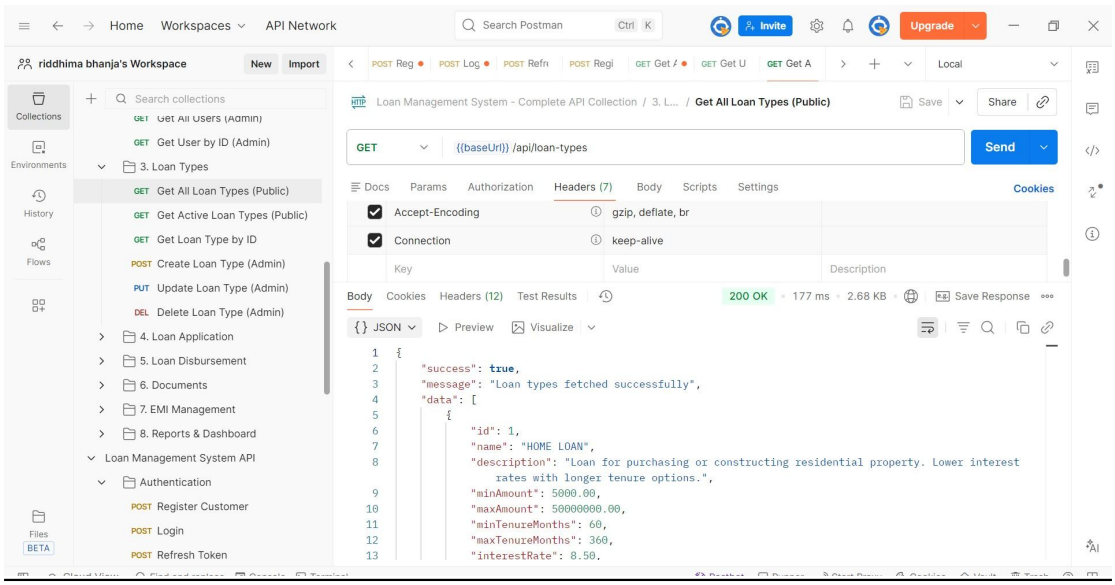
DISBURSE LOAN



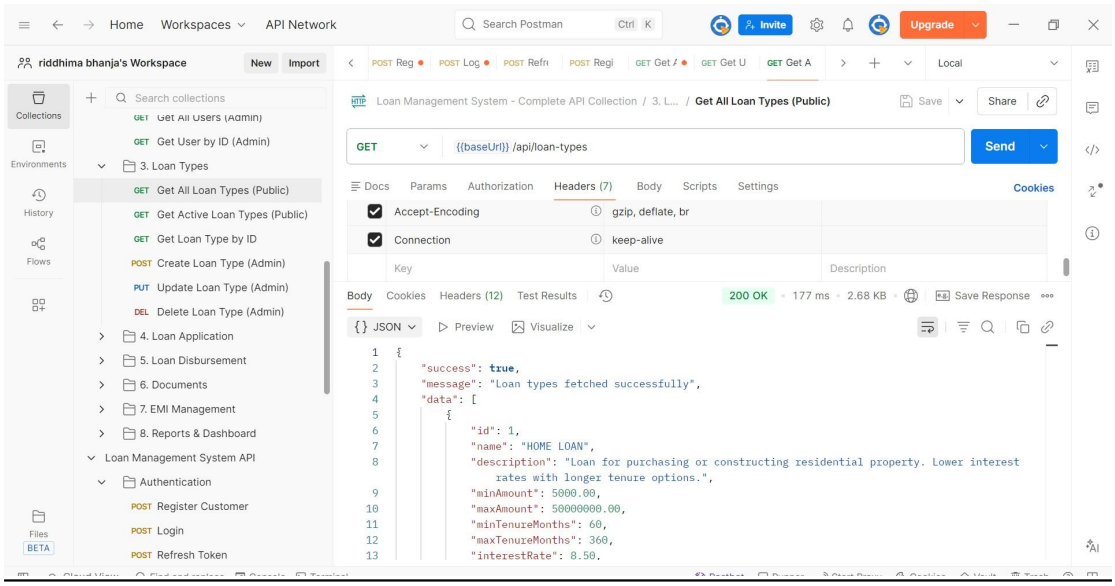
GET ACTIVE LOAN TYPES



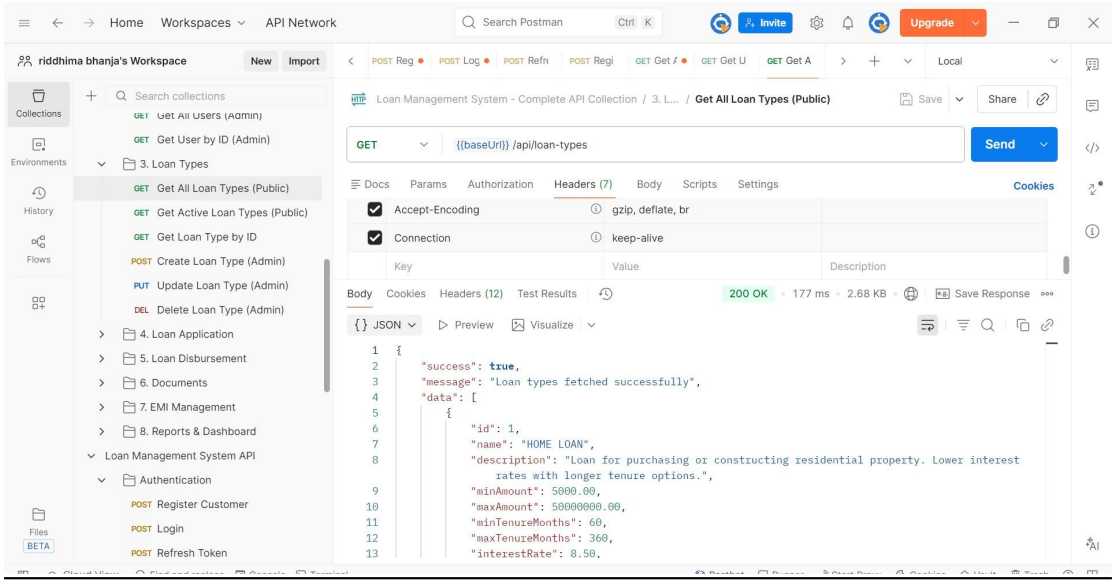
GET ALL LOAN TYPES



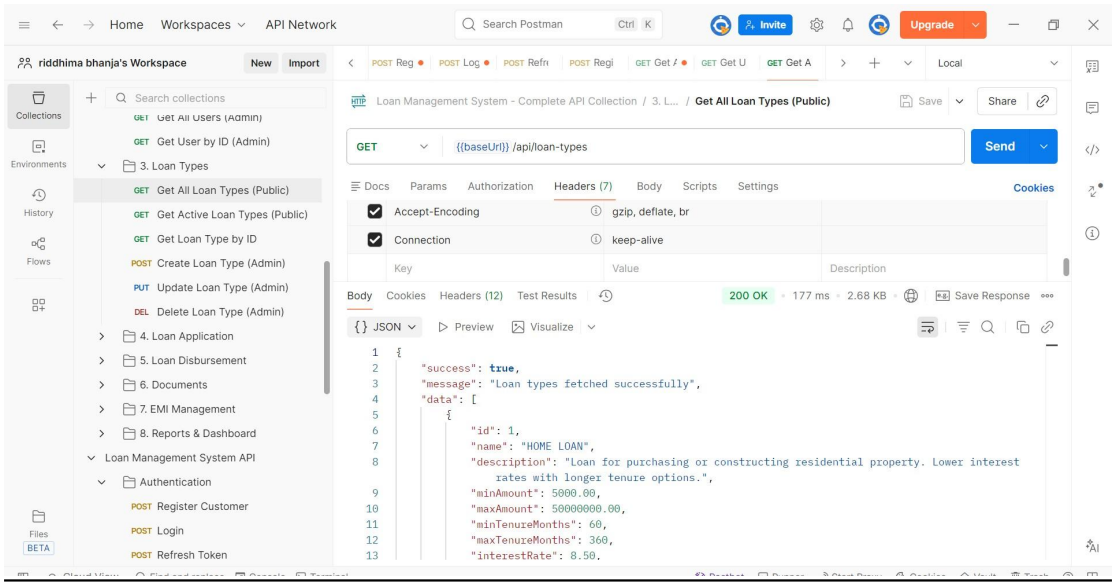
GET ALL LOANS



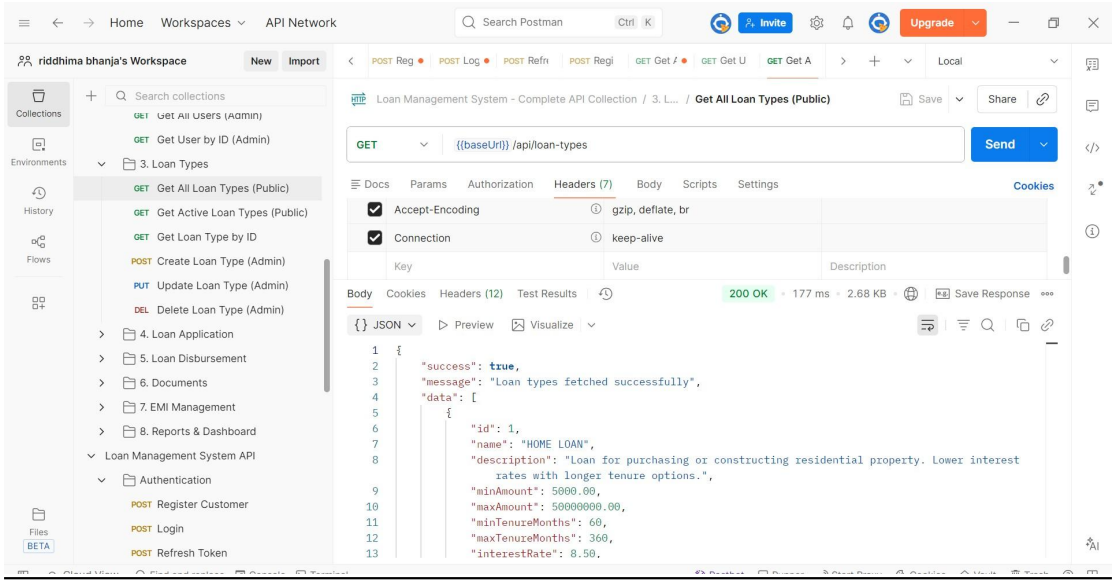
GET ALL USERS



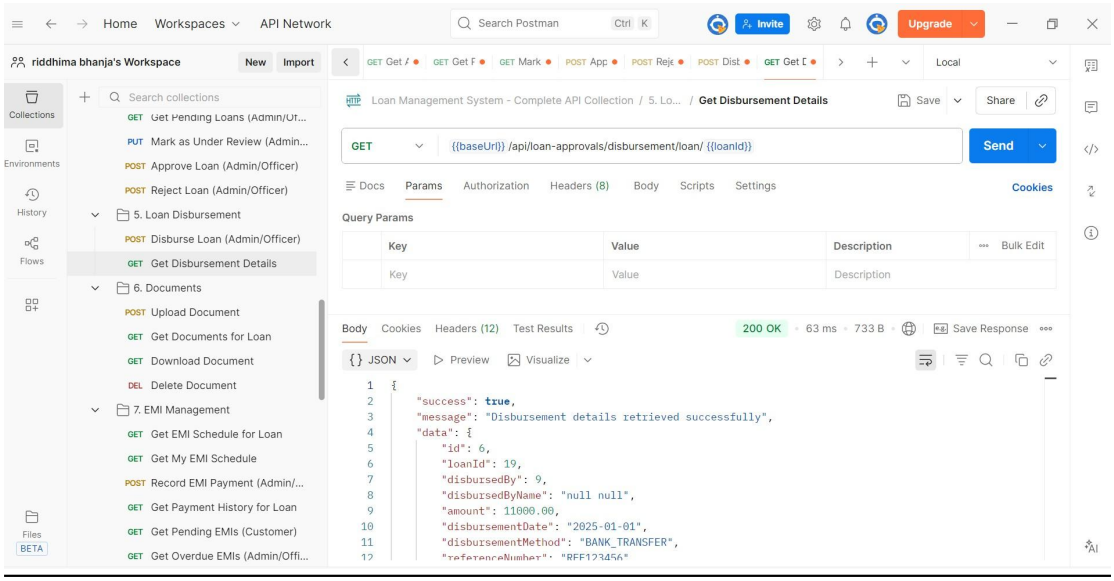
GET CURRENT USER PROFILE



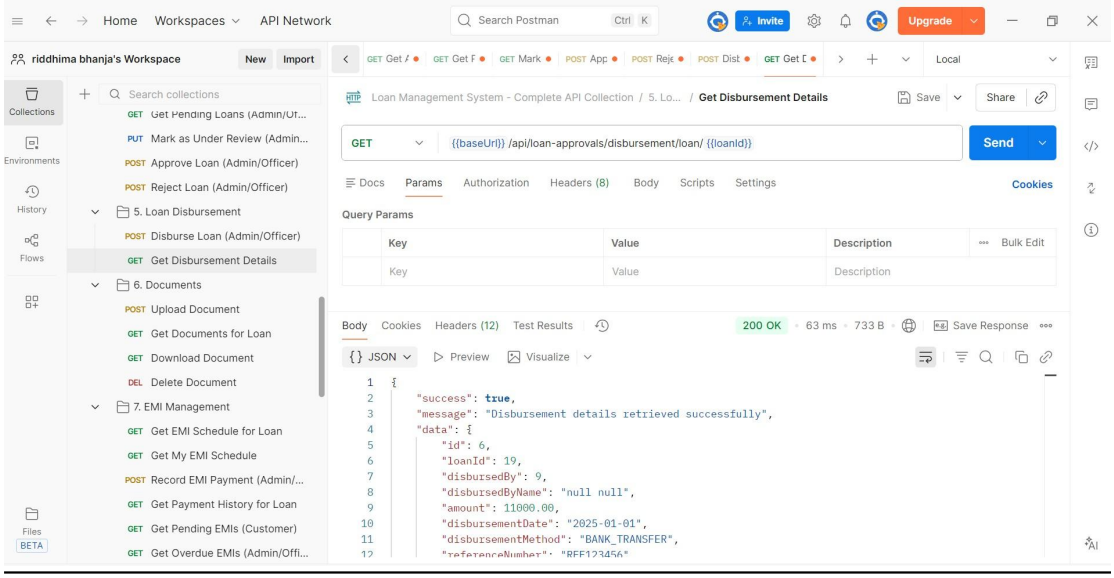
GET DASHBOARD ROLE BASED



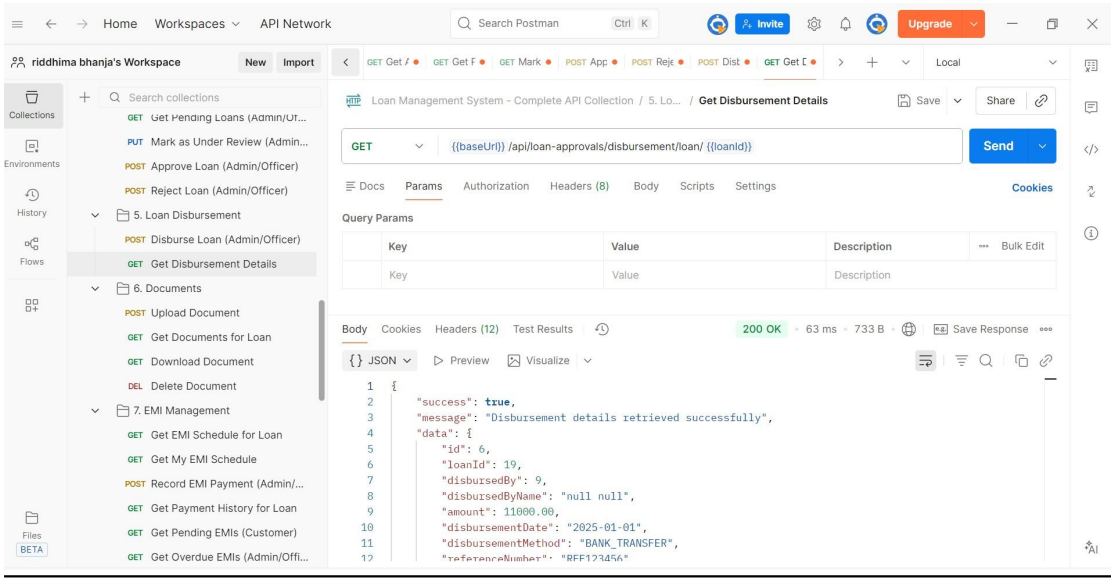
GET DISBURSEMENT DETAILS



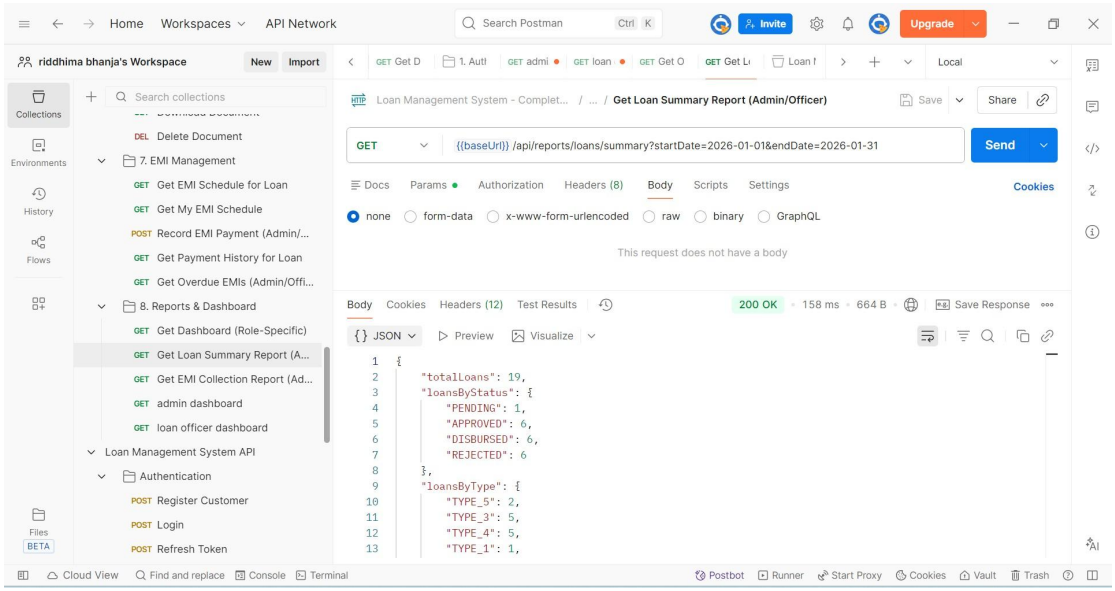
GET DOCUMENTS FOR LOAN



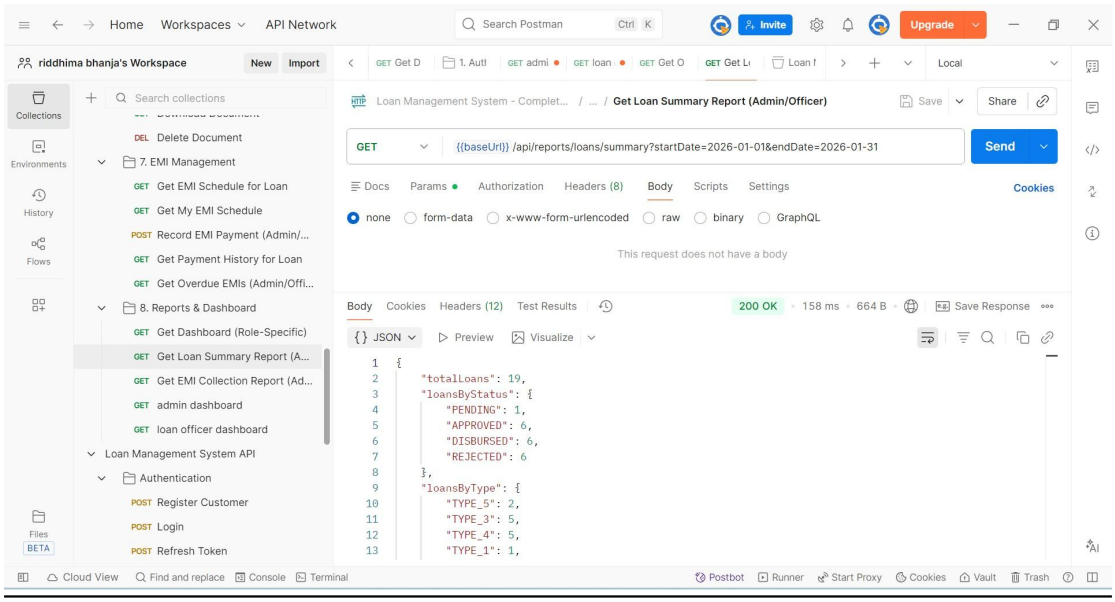
GET EMI SCHEDULE



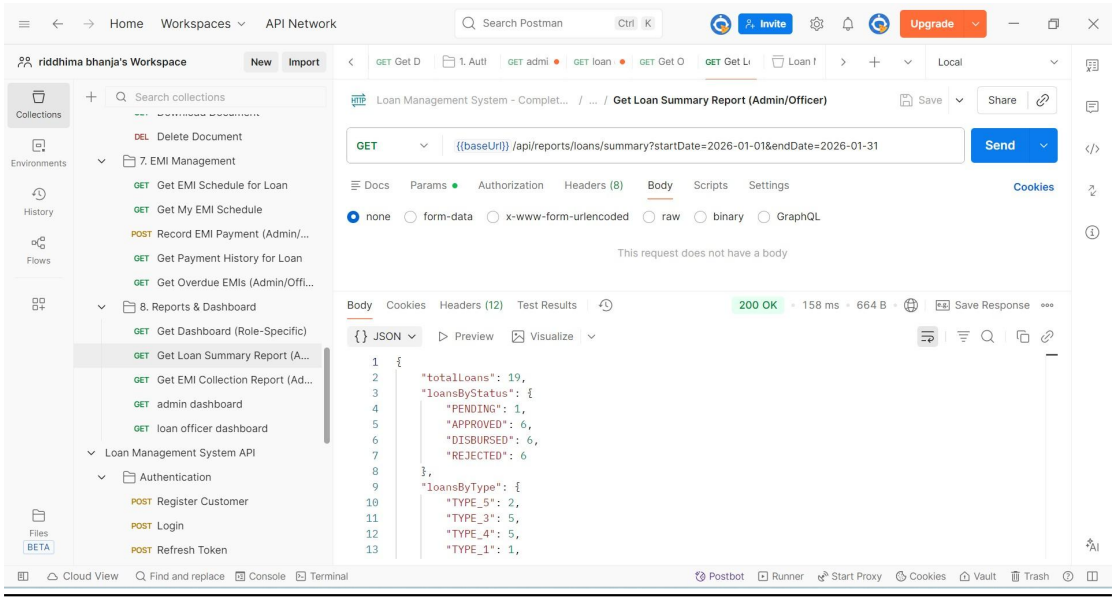
GET LOAN SUMMARY REPORT



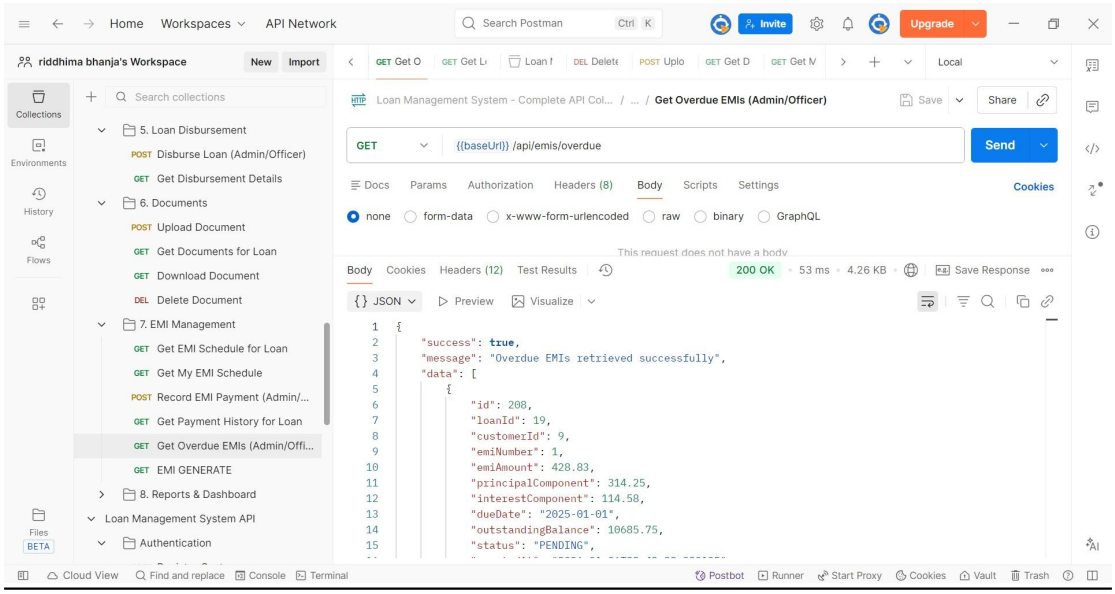
GET LOAN TYPE BY ID



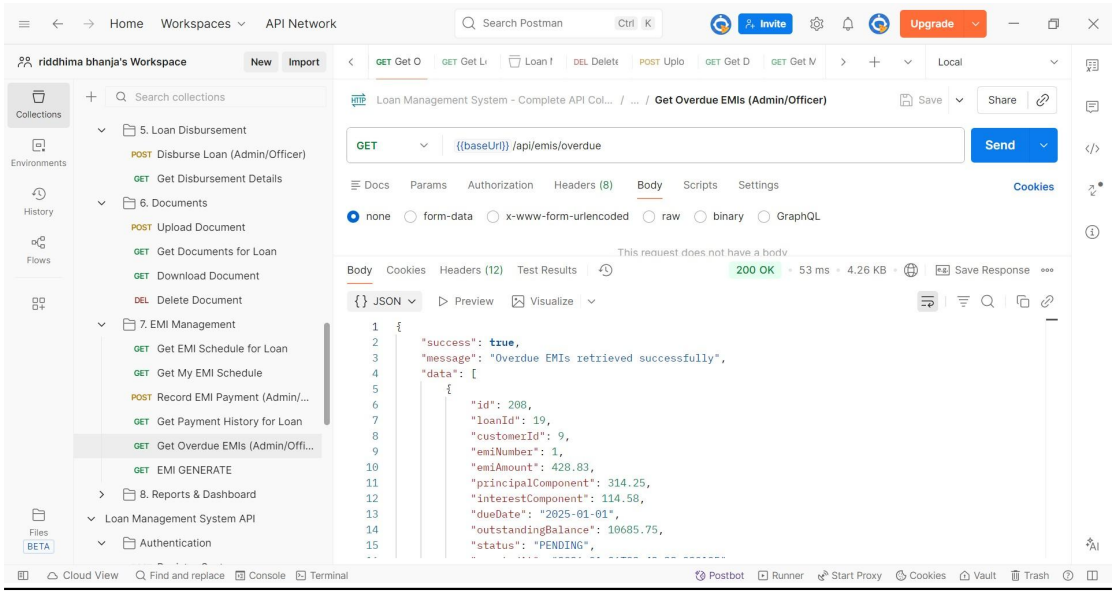
GET LOANS BY ID



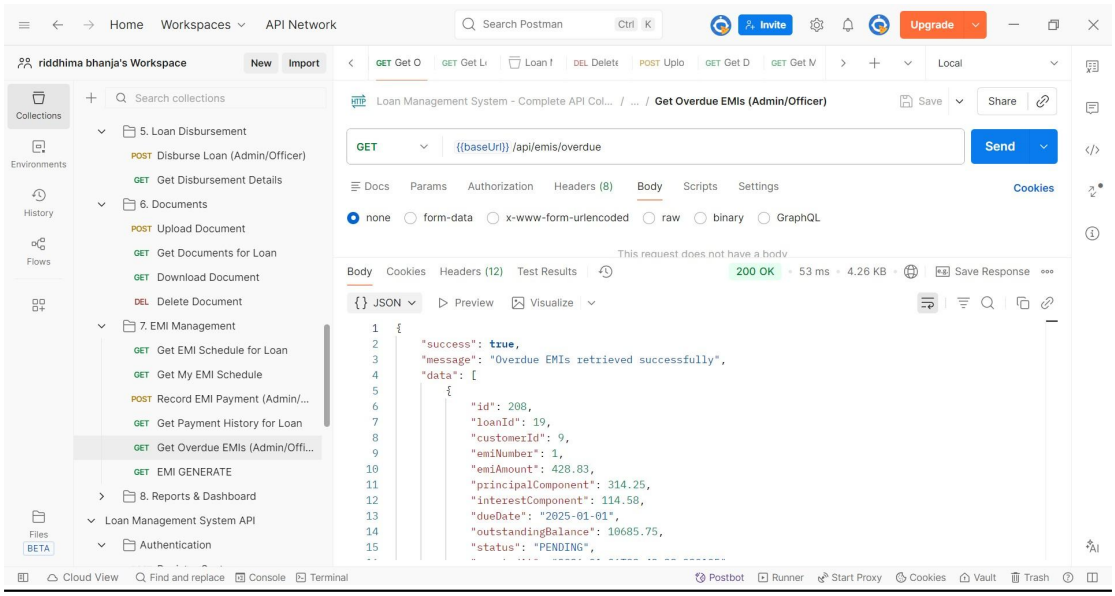
GET OVERDUE EMI



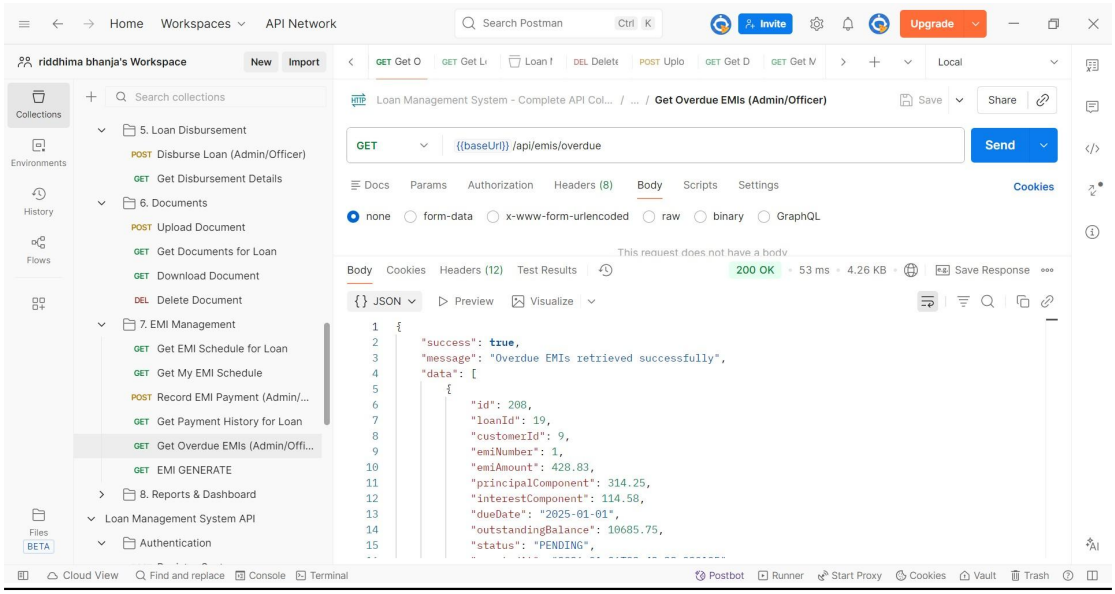
GET PAYMENT HISTORY



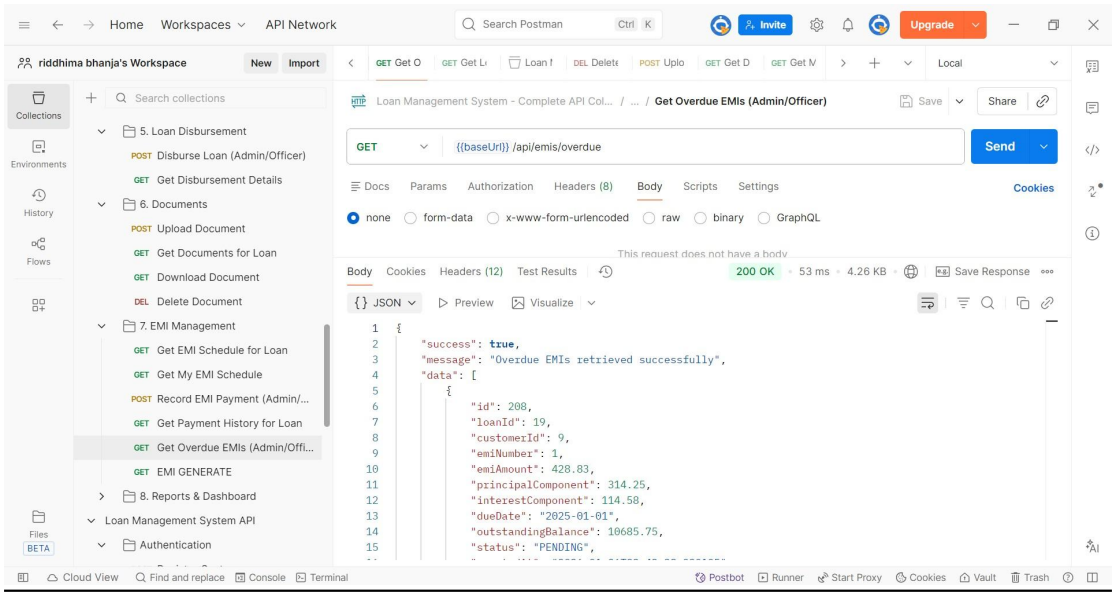
GET PENDING LOANS



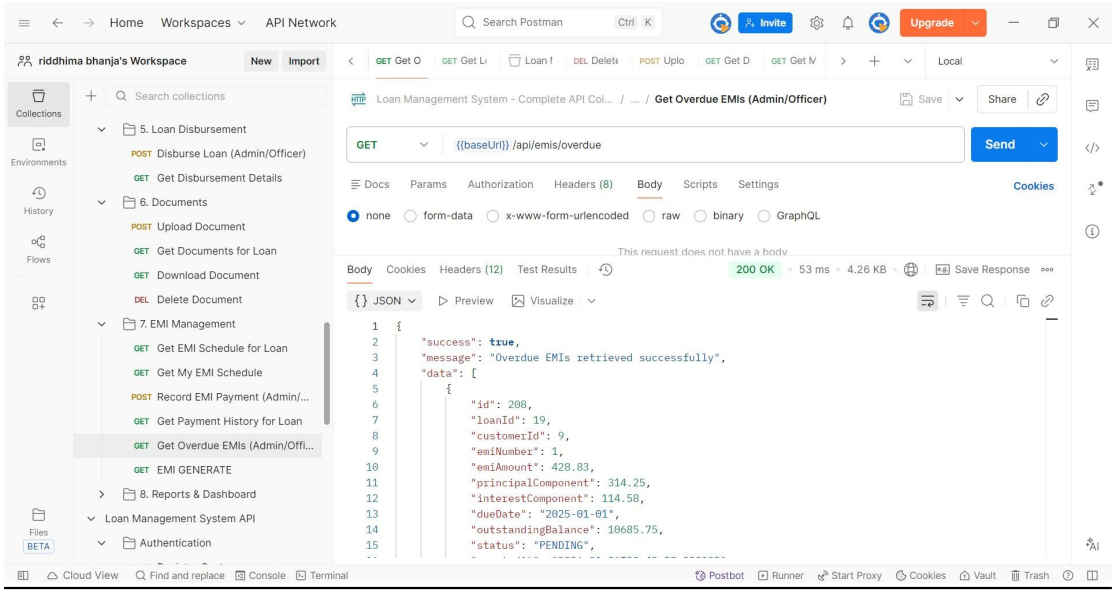
GET USER BY ID



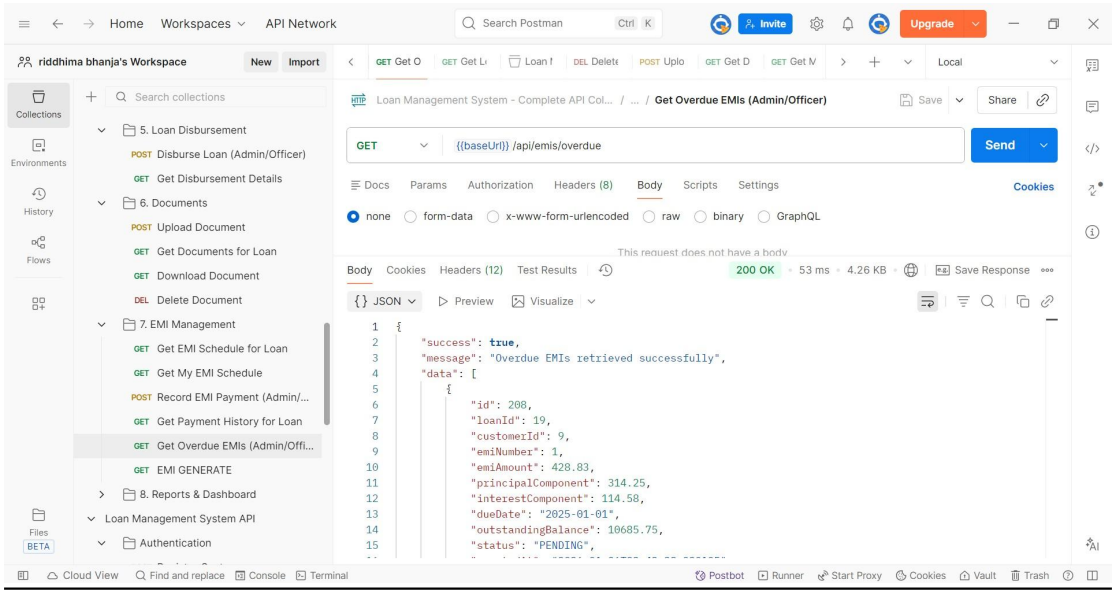
LOAN OFFICER DASHBOARD



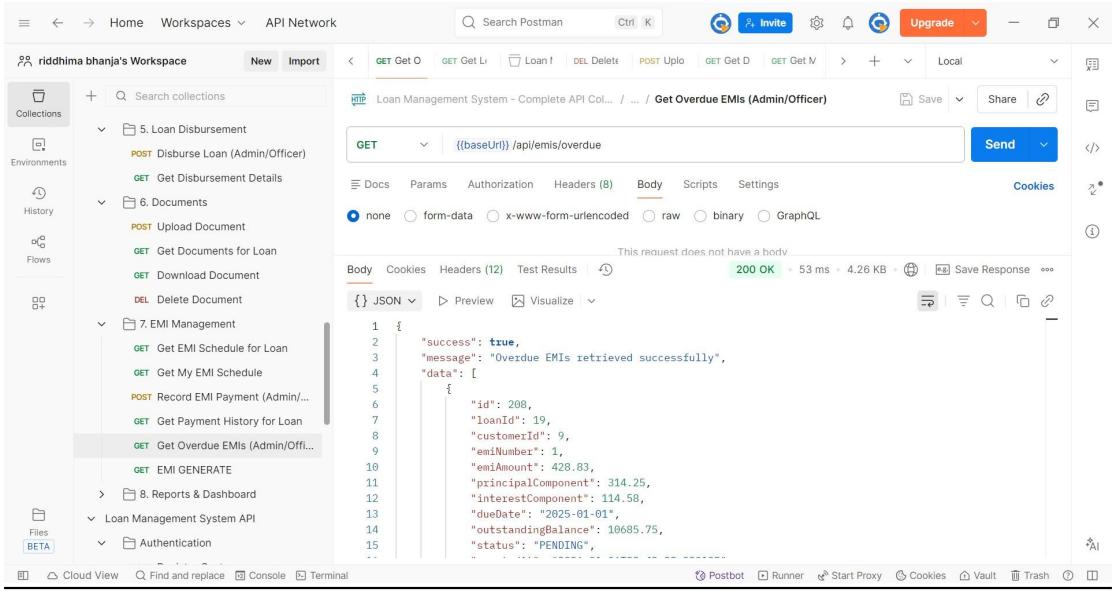
LOGIN



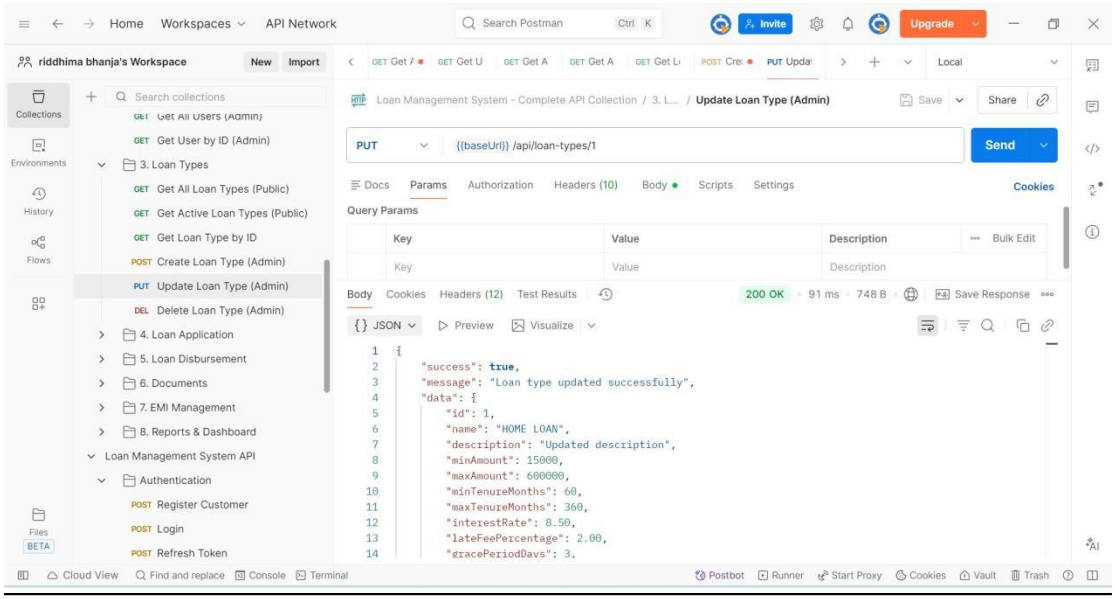
MARK AS UNDER REVIEW



REGISTER CUSTOMER



UPDATE LOAN TYPE



6.2 Product Service (Loan Service)

Responsibilities

- Loan type management
- Interest rate and tenure rules
- Loan application submission
- Loan status lifecycle management

APIs

- POST /loans/apply
- GET /loans/{id}
- GET /loans/customer/{customerId}
- PUT /loans/{id}/approve
- PUT /loans/{id}/reject

Database

- Loan table
- Loan type table
- Loan status history table

6.3 Order Service (EMI & Repayment Service)

Responsibilities

- EMI calculation
- EMI schedule generation
- Repayment tracking
- Outstanding balance computation
- Automatic loan closure

APIs

- · GET /emis/loan/{loanId}
- · POST /emis/pay
- · GET /repayments/customer/{customerId}

Database

- · EMI schedule table
- · Repayment table
- · Loan balance table

7. Data Design (Low-Level Design)

7.1 User Document

- userId
- name
- email
- password (hashed)
- role
- status
- createdAt

7.2 Product (Loan) Document

- · loanId

- · customerId
- · loanType
- · principalAmount
- · interestRate
- · tenure
- · status
- · approvalRemarks

7.3 Order (EMI) Document

- · emiId
- · loanId
- · dueDate
- · emiAmount
- · paidAmount
- · outstandingBalance
- · paymentStatus

8. API Design & Validation

- RESTful conventions followed
- DTOs used for request/response
- Input validation using @Valid
- Custom validators for:
- Loan amount limits
- Tenure constraints
- · EMI payment rules

9. Error Handling Strategy

9.1 Global Exception Handling

- Centralized exception management using @ControllerAdvice
- Custom exceptions:
- ResourceNotFoundException
- ValidationException
- UnauthorizedAccessException
- Standardized error response format:
- timestamp
- status
- errorCode

- message
- Pat

10. Security Design

- JWT-based authentication
- Stateless session management
- Role-based access control
- Password hashing using BCrypt
- Secured endpoints with method-level authorization
- HTTP interceptors for token propagation

11. Non-Functional Requirements

- Scalability: Horizontally scalable services
- Security: Encrypted credentials and secure APIs
- Performance: Optimized queries and pagination
- Maintainability: Clean layered architecture
- Availability: Fault-tolerant stateless services
- Auditability: Complete loan lifecycle traceability

12. Testing Strategy

12.1 Unit Testing

- Service-layer tests using JUnit and Mockito
- Mocked repositories and external dependencies

12.2 API Testing

- Postman collections for all endpoints
- Authentication and authorization test cases

12.3 Validation & Security Testing

- **Input validation tests**
- **Unauthorized access tests**
- **Token expiry handling**

Conclusion

The Loan Management System demonstrates enterprise-level system design, secure full-stack development, and real-world financial workflows.
It is production-ready, cloud-deployable, and built using industry best practices, making it a strong representation of modern backend and frontend engineering capabilities.