BlockChain Project - Report

Title: Decentralised Lending and Borrowing system

Team: CryptoCred

Team Members:-

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1. Introduction:-

This is a Decentralized Lending System DApp built on Ethereum that allows users to lend and borrow funds through smart contracts. The system features a fixed interest rate model (2 ETH per loan) and includes functionalities for requesting loans, funding loans, and repayment. The project uses Truffle for smart contract development, React for the frontend, and MetaMask for wallet integration, with Ganache serving as the local Ethereum test network.

2. Problem Statement:-

Traditional lending systems are centralized, limiting borrowers' access to funds and lenders' control over their investments. Borrowers often face high interest rates and complex approval processes, while lenders struggle with trust issues and lack of transparency. Our project addresses these issues by implementing a decentralized lending system on Ethereum, where:

- ❖ Lenders can add funds to the contract and approve loan requests.
- ❖ Borrowers can request loans directly from the lending pool.
- ❖ Interest rates are fixed and transparent (2 ETH per loan).
- ❖ Loan states and transactions are securely recorded on the blockchain.
- ❖ Smart contracts automatically manage loan lifecycle (request, funding, repayment).
- ❖ All transactions are transparent and verifiable on the blockchain.
- ❖ MetaMask integration ensures secure wallet management and transaction signing.
- ❖ The system operates without intermediaries, reducing costs and increasing efficiency.

3. Blockchain Implementation Details:-

Smart Contract Architecture:-

TheDApp consists of two Solidity contracts:

A) SimpleLendingContract.sol

- ❖ Defines a loan structure: borrower address, requested amount, repay amount, interest rate, state, and timestamp.
- ❖ Implements fixed interest rate model (2 ETH per loan).
- ❖ Tracks available balance and loan status.
- ❖ Includes functions like requestLoan, fundLoan, repayLoan, getLoanDetails, and getRepayAmount.

B) SafeMath.sol

- ❖ Provides secure mathematical operations for the lending contract.
- ❖ Prevents overflow and underflow vulnerabilities.
- ❖ Ensures safe arithmetic operations for loan calculations.
- ❖ Used for balance management and interest calculations.

Key Functions Implementation:

❖ Loan Management:

- requestLoan: Allows borrowers to request new loans
- fundLoan: Enables lenders to fund approved loans
- repayLoan: Handles loan repayment process
- getLoanDetails: Retrieves complete loan information

❖ Fund Management:

- addFunds: Allows lenders to add funds to the contract
- calculateRepayAmount: Computes total repayment amount
- getRepayAmount: Returns specific repayment amount

❖ State Management:

- Loan state tracking (Requested, Funded, Repaid, Defaulted)
- Balance management
- Transaction verification

❖ Security Features:

- Input validation
- State verification
- Balance checks
- Safe mathematical operations

4. Frontend and Storage Integration:-

Frontend Stack

- Framework: React (with Create React App for development)
- Styling: CSS (custom component styling)
- Wallet: Integrated with MetaMask for blockchain interactions
- Web3 Integration: Web3.js for smart contract interaction

Smart Contract Integration

- Truffle for contract compilation and deployment
- Ganache for local Ethereum network testing
- Contract artifacts stored in client directory for frontend access

Features

- Wallet Connection Interface
    - MetaMask integration
    - Account selection
    - Network verification
    - Connection status display

● Loan Management Interface

- Lender Operations:
- Add funds to contract
- Approve loan requests
- View available balance
- Borrower Operations:
- Request new loans
- Repay existing loans
- View loan status

● User Interface Components

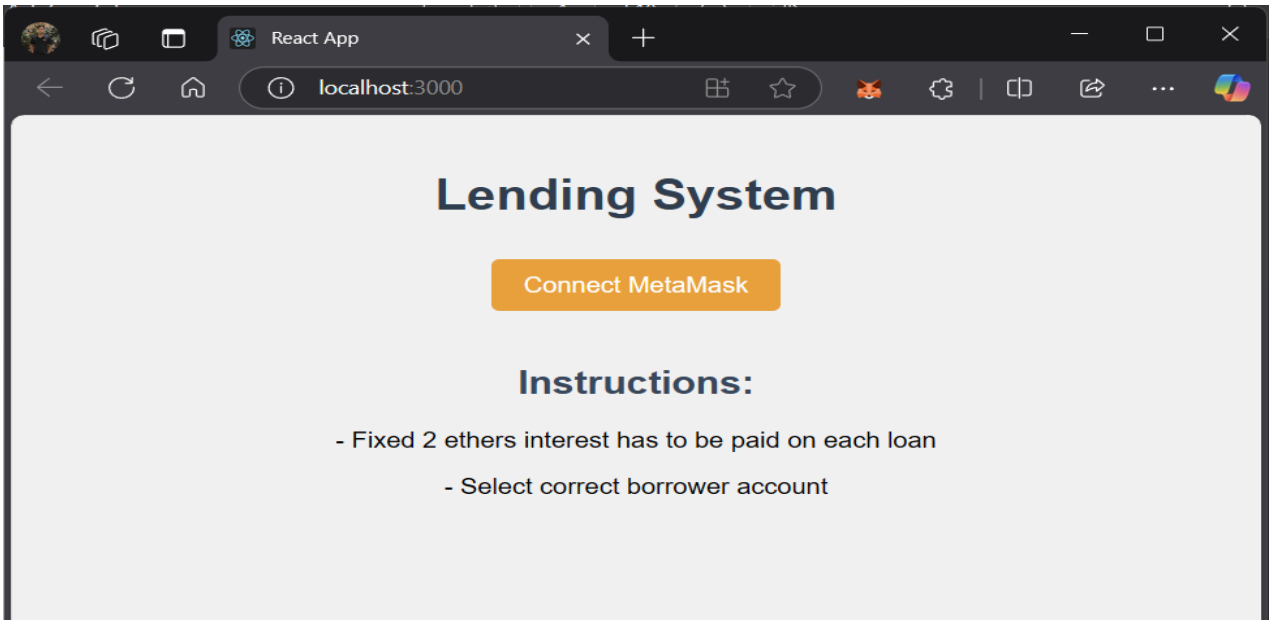
- Account selection dropdown
- Operation selection menu
- Amount input field
- Transaction status display
- Error and success messages

● Responsive Design

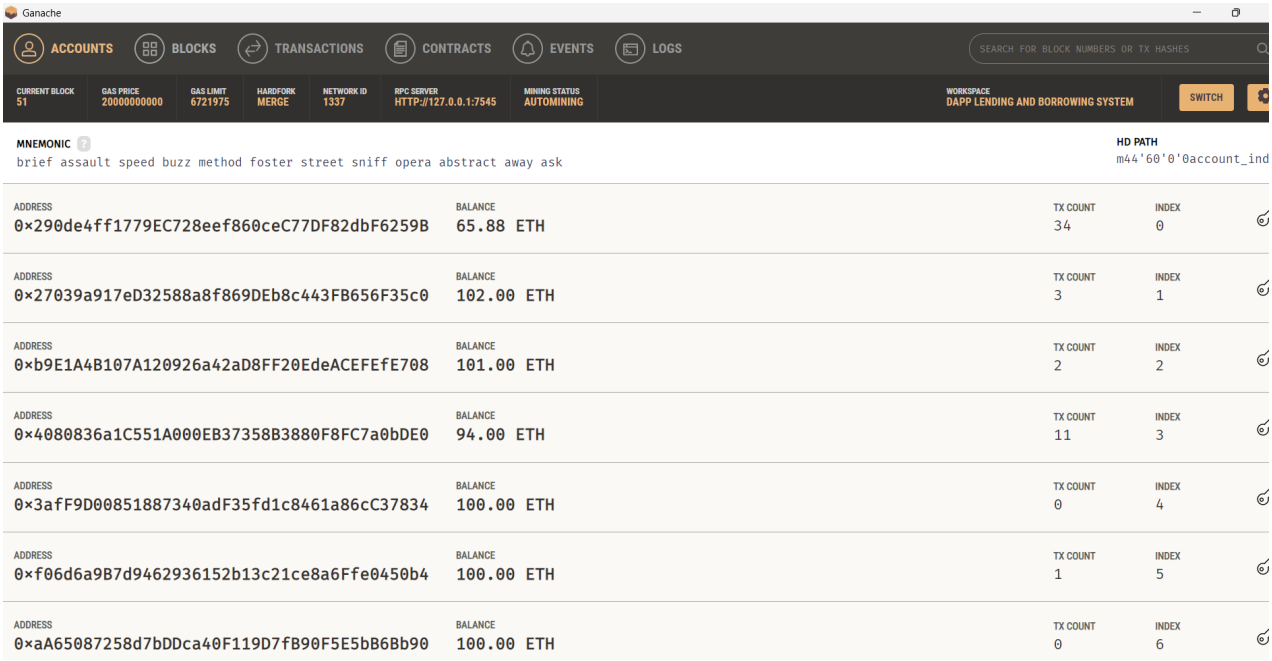
- Desktop and mobile compatibility
- Clean and intuitive layout
- Clear operation instructions
- Transaction feedback system

5. Screenshots of the Working Application:-

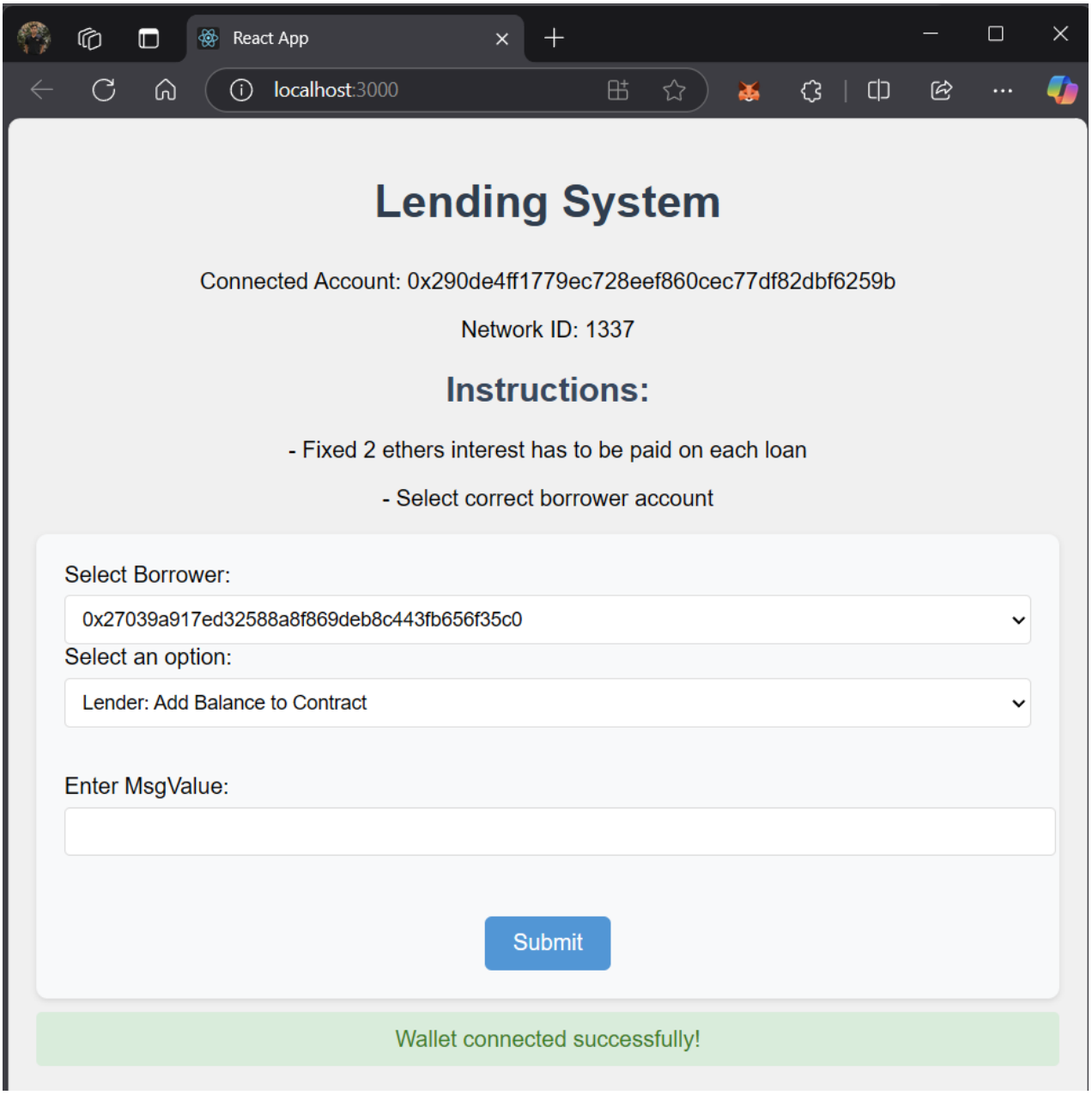
i) Connect wallet page:-



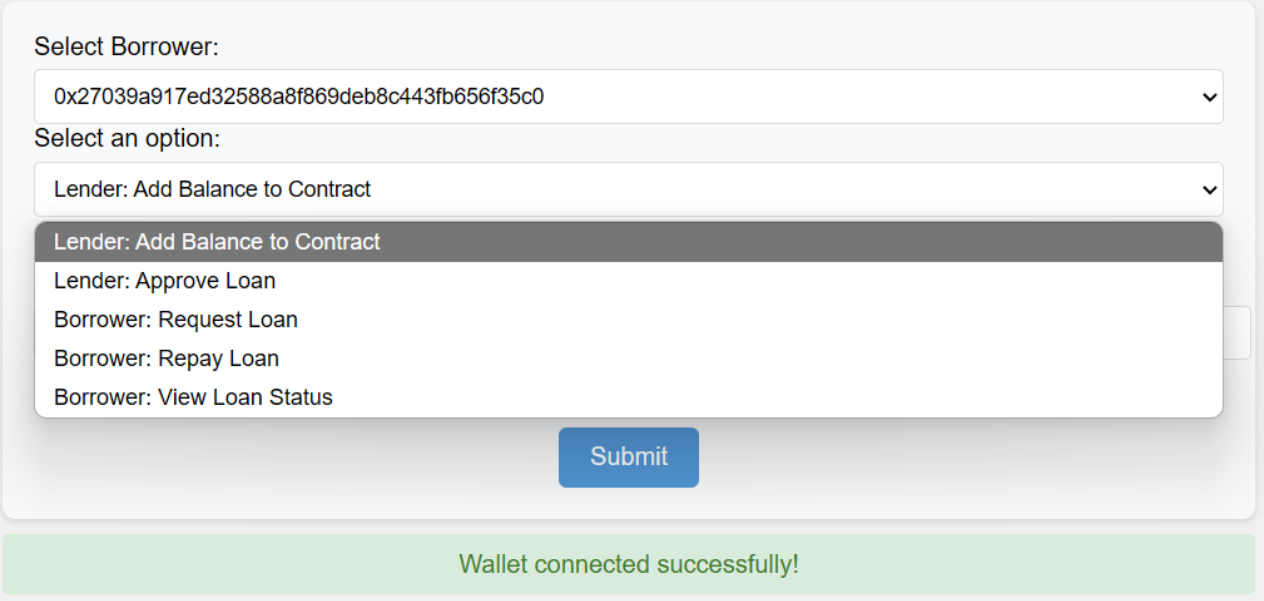
Ganache accounts:


Ganache
ACCOUNTS
BLOCKS
TRANSACTIONS
CONTRACTS
EVENTS
LOGS
SEARCH FOR BLOCK NUMBERS OR TX HASHES
CURRENT BLOCK 51
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MERGE
NETWORK ID 1337
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING
WORKSPACE DAPP LENDING AND BORROWING SYSTEM
SWITCH
MNEMONIC
brief assault speed buzz method foster street sniff opera abstract away ask
HD PATH
m44'60'0'0account_ind
ADDRESS 0x290de4ff1779EC728eef860ceC77DF82dbF6259B BALANCE 65.88 ETH TX COUNT 34 INDEX 0
ADDRESS 0x27039a917eD32588a8f869DEb8c443FB656F35c0 BALANCE 102.00 ETH TX COUNT 3 INDEX 1
ADDRESS 0xb9E1A4B107A120926a42aD8FF20EdeACEFEfE708 BALANCE 101.00 ETH TX COUNT 2 INDEX 2
ADDRESS 0x4080836a1C551A000EB37358B3880F8FC7a0bDE0 BALANCE 94.00 ETH TX COUNT 11 INDEX 3
ADDRESS 0x3afF9D00851887340adF35fd1c8461a86cC37834 BALANCE 100.00 ETH TX COUNT 0 INDEX 4
ADDRESS 0xf06d6a9B7d9462936152b13c21ce8a6Ffe0450b4 BALANCE 100.00 ETH TX COUNT 1 INDEX 5
ADDRESS 0xaA65087258d7bDDca40F119D7fB90F5E5bB6Bb90 BALANCE 100.00 ETH TX COUNT 0 INDEX 6

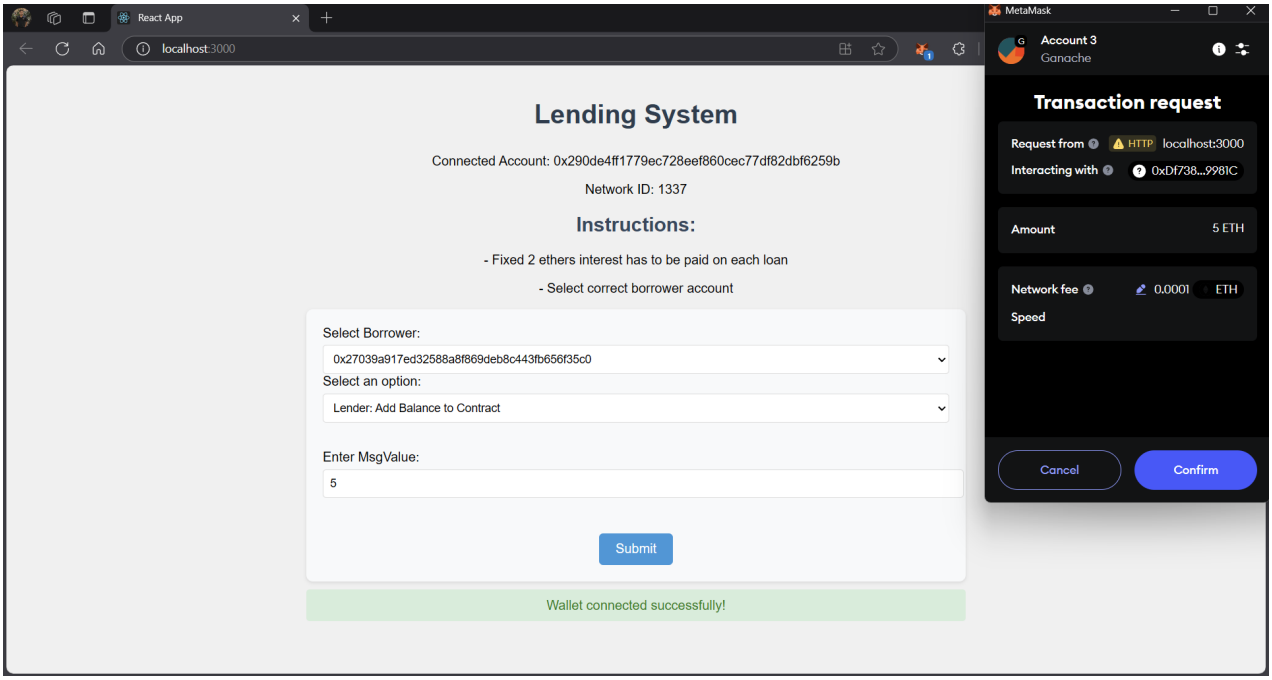
iii)after MetaMask connection:



iv)all frontend features:



v)after adding balance to contract:



Lending System

Connected Account: 0x290de4ff1779ec728eef860cec77df82dbf6259b

Network ID: 1337

Instructions:

- Fixed 2 ethers interest has to be paid on each loan

- Select correct borrower account

Select Borrower:

0x27039a917ed32588a8f869deb8c443fb656f35c0

Select an option:

Lender: Add Balance to Contract

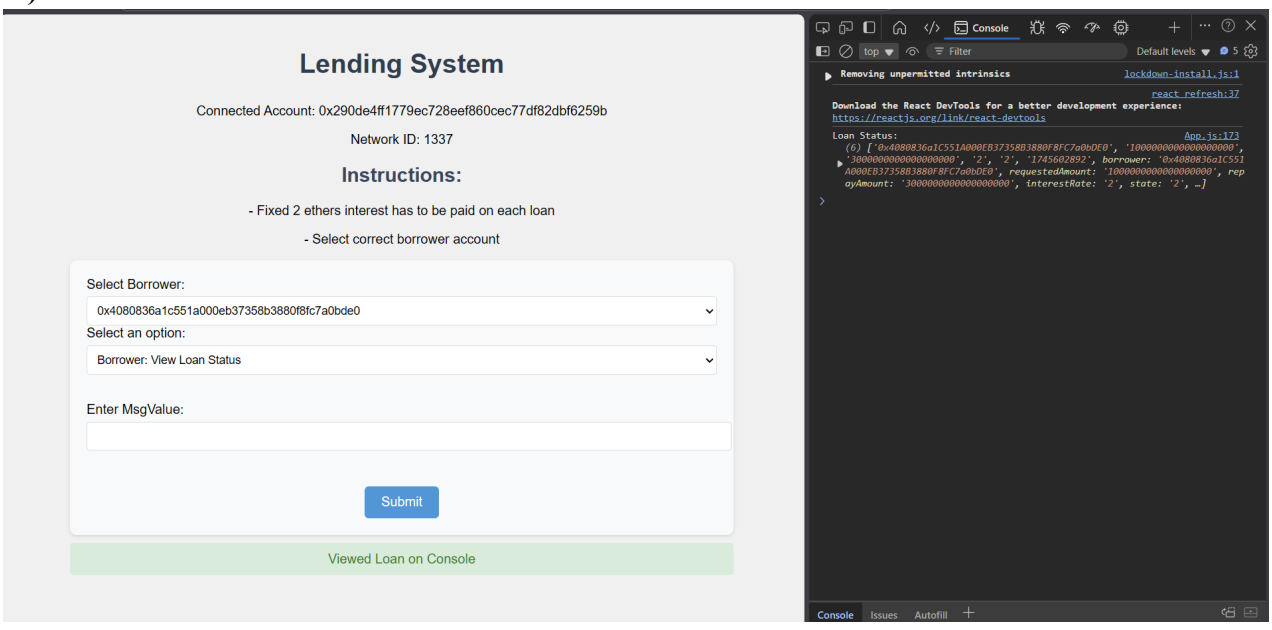
Enter MsgValue:

5

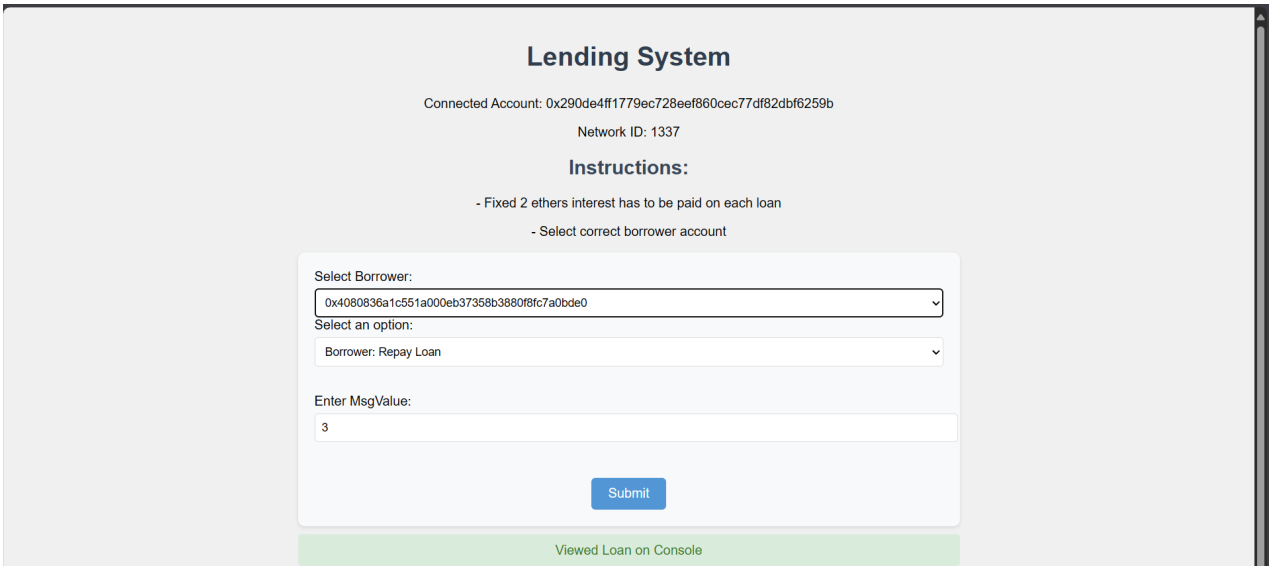
Submit

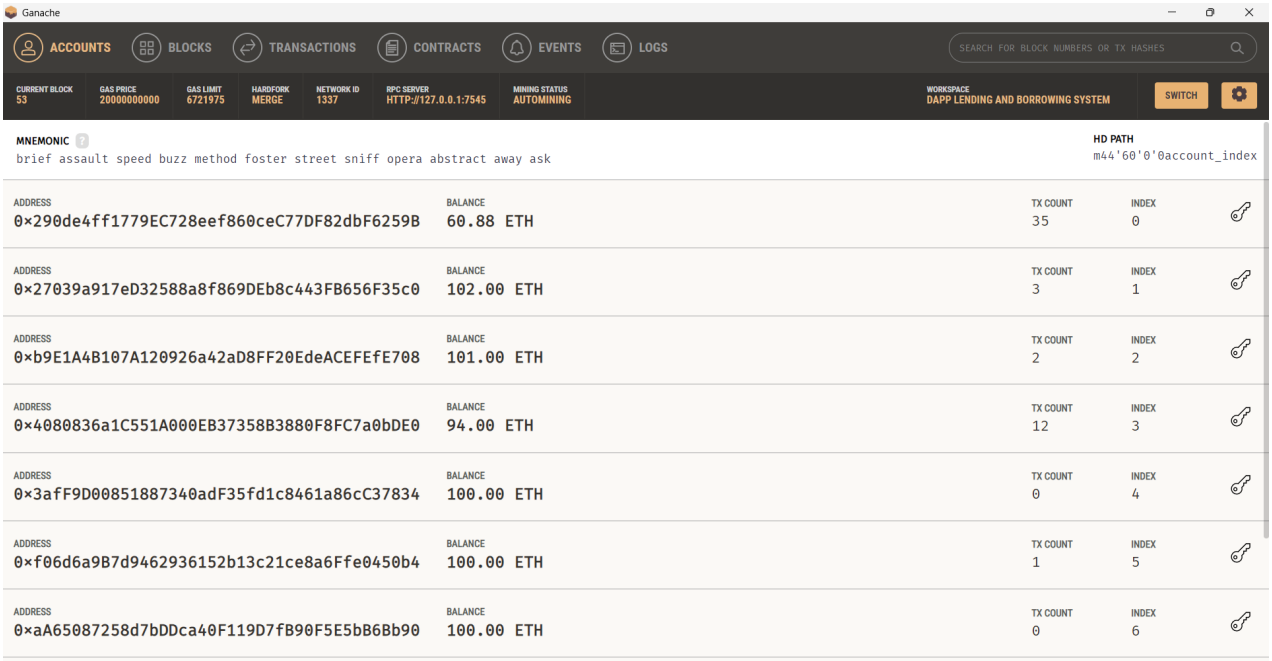
Funds added to the contract

vi) after lender funds loan:



vii)after repay loan





6. Future Enhancements:-

Enhanced Wallet Support:

- Integration with additional wallet providers
- Improved wallet connection experience
- Better cross-platform compatibility

● **Advanced Analytics:**

- Loan performance tracking
- Interest earnings monitoring
- Borrower repayment history
- Financial insights dashboard

● **Multi-Chain Expansion:**

- Support for additional blockchain networks
- Cross-chain loan management
- Chain-specific lending features

● **Credit System:**

- Decentralized credit scoring
- Borrower reputation tracking
- Risk assessment tools
- Trust-based lending options

7.Conclusion:-

The Decentralized Lending System demonstrates the transformative potential of blockchain technology in revolutionizing traditional lending practices. By leveraging Ethereum smart contracts, MetaMask integration, and a user-friendly frontend, the platform delivers transparency, efficiency, and accessibility in financial transactions. The system's fixed interest model and automated loan management provide a fair and predictable environment for both lenders and borrowers. With continued development and the implementation of planned enhancements, this platform has the potential to evolve into a comprehensive decentralized finance (DeFi) solution, offering secure and efficient lending services while maintaining the core principles of blockchain technology.

8. GitHub Repository Link:-

https://github.com/Amit-sr08/Decentralized-lending-and-borrowing-system

9. Video drive Link:-

https://drive.google.com/file/d/1JoRARbbvJOK-7b71OdwaU-zk4uyu8TbU/view?usp=sharing