ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

Secure Banking Transactions Using Blockchain

Dr Shridhar Kabbur[1]; S. Priyanka[2]; Varshini L P[3]; Varun Kumar B.S.[4]

[1,2,3,4] Electronics and Communication Department Global Academy of Technology Bengaluru

Publication Date: 2025/05/20

Abstract: The rapid growth of digital banking has revolutionized the financial sector, offering unprecedented convenience and accessibility. However, this digital transformation has also exposed traditional banking systems to increasing threats such as cyberattacks, data breaches, and transaction fraud. Centralized banking infrastructures are especially vulnerable due to their reliance on singular points of control. This project explores the implementation of blockchain technology as a decentralized, secure, and transparent framework for conducting banking transactions. By leveraging blockchain's immutable ledger and smart contracts, the proposed system aims to reduce operational inefficiencies, cut intermediaries, and ensure transaction integrity. The project involves the development of a prototype using platforms like Ethereum and Hyperledger, integrated with MD5 encryption for added security. It addresses critical challenges such as scalability, regulatory compliance, and integration with legacy systems, aiming to contribute to a safer and more resilient digital banking environment. The outcomes are expected to prove the feasibility and advantages of blockchain-based systems in revolutionizing the future of secure financial transactions

How to Cite: Dr Shridhar Kabbur; S. Priyanka; Varshini L P; Varun Kumar B. S. (2025) Secure Banking Transactions Using Blockchain. *International Journal of Innovative Science and Research Technology*, 10(5), 619-630. https://doi.org/10.38124/ijisrt/25may762

I. INTRODUCTION

The financial sector has undergone significant transformation in recent years, primarily driven by the adoption of digital technologies. The emergence of online banking, mobile payment systems, and fintech services has made financial transactions faster, more efficient, and universally accessible. However, this rapid digitalization has also led to new and complex security challenges. Traditional banking systems, largely built on centralized architectures, have become increasingly vulnerable to a wide range of threats, including cyberattacks, data breaches, fraud, and system failures.

In centralized banking systems, all transaction data is stored and managed by a single authority or entity. While this model offers control and governance, it introduces a critical weakness — a single point of failure. If the central server is compromised or disrupted, the entire system is at risk.

Recent high-profile cyber incidents targeting financial institutions have underscored the inadequacy of existing security frameworks and highlighted the urgent need for innovative solutions that can provide improved protection and transparency.

Blockchain technology presents a groundbreaking alternative to traditional centralized systems. As a decentralized and distributed ledger, blockchain maintains records across multiple nodes in a peer-to-peer network. Each transaction is securely encrypted, timestamped, and linked to the earlier one, making it nearly impossible to alter or tamper with historical data. This immutability, along with the consensus mechanisms used to confirm transactions, ensures an elevated level of integrity and security.

The primary aim of this project, titled "Secure Banking Transaction using Blockchain Technology," is to streamline operations. The project involves the design and implementation of a prototype using blockchain platforms such as Ethereum and Hyperledger, with added security layers such as SHA256 hashing to safeguard sensitive information. The system will simulate real-world banking operations, allowing users to create accounts, perform transactions, and access transaction history, while administrators can check and manage security protocols.

Furthermore, the project will analyze the challenges associated with blockchain adoption in the banking sector, such as scalability, interoperability with existing legacy systems, regulatory compliance, and public trust. While blockchain holds immense promise, its practical implementation requires careful consideration of these factors to ensure successful integration and long-term sustainability. By developing and testing a blockchain-based banking solution, this project aims to contribute valuable insights into the potential of decentralized technologies in modern banking. It looks to prove that blockchain is not only a technological innovation but also a strategic enabler that can redefine how financial transactions are conducted in a secure, transparent, and efficient manner. In a world that is rapidly moving towards cashless economies and digital currencies, understanding and leveraging blockchain technology is essential for building the next generation of financial systems. This research aspires to lay the

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

groundwork for secure banking infrastructure that meets the evolving needs of users while safeguarding their financial data against emerging threats.

II. LITERATURE SURVEY

G Bank and others [1] proposed decentralized banking services using blockchain technology for users to register and log in to start transactions confirmed by miners using the Proof of Stake (POS) mechanism, while smart loan contracts automate loan processes and payments. The proposed decentralized platform may face challenges related to regulatory compliance and security vulnerabilities in blockchain technologies. The authors [2] proposed a blockchain method for secure bank transaction for users to create blocks for approvers, confirm before adding them to the blockchain. This method enhances decentralization, improves security, and reduces the inefficiencies of proof-of- work. The proof-by-approval protocol offers stronger decentralization and security, but it is less efficient than the traditional systems due to its complex validation process and harder setup. In [3] proposed a method that highlights the advantages of using private blockchains for secure transactions, emphasizing the importance of decentralization, transparency, and integrity in financial operations. The authors propose a hybrid blockchain model that combines different consensus mechanisms to mitigate risks associated with traditional banking systems. The authors [4] presented a blockchain technology that reviews the highlights of the growing popularity of blockchain technology due to its decentralized and anonymous characteristics, which enhance transaction security and prevent double spending. It discusses the consensus-based system known as proof of work (POW), which is essential for confirming transactions and keeping the integrity of the blockchain. The review emphasizes the efficiency of blockchain in speeding up transactions by cutting traditional steps, making it particularly beneficial for secure banking transactions. The authors [5] developed a blockchain technology in Banking that uses theoretical and conceptual analysis. They have also used descriptive statistics, thematic analysis, and SWOT analysis. It lacks empirical data, relies heavily on secondary sources, and does not address the practical challenges of large-scale blockchain adoption, such as privacy concerns and regulatory gaps. I. Chandrasekeran and authors [6] proposed a blockchain technology that explores the adoption of blockchain in the banking industry to enhance transaction security. It highlights how blockchain, as a decentralized ledger system, can address risks like privacy breaches in mobile and online banking. By implementing cryptographic features and validation protocols, blockchain provides a solution to the vulnerabilities in traditional banking, enabling secure and traceable transactions. The authors [7] proposed a technology that can be used to capture the attention of central banks due to its significant disruptive potential within the financial sector. The paper provides a thorough analysis of the existing gap between academic research and practical implementation of Distributed Ledger Technology (DLT) in central banking. By employing a systematic mapping study approach, the authors explore trends in peer-reviewed literature concerning various use cases of DLT within central banks, categorizing them thematically. H. Mao and authors [8] developed a multi-blockchain model to capitalize on its decentralization, tamper-resistance, and traceability features. Despite the potential benefits, challenges related to user privacy, regulatory oversight, and transaction speed remain significant obstacles to implementation. This model uses a permissioned blockchain architecture, integrating a multi-blockchain framework and Chain ID to enhance scalability and accelerate payment processing. The authors [9] proposed a blockchain method that mainly focuses on the implementation of blockchain technology for banks. It discusses the use of a custom blockchain for storing transaction records securely, deploying smart contracts for transaction clarity, and addressing security issues in online banking through multi-factor authentication using a blockchain framework. K. J. Yii and authors [10] presented a method that provides a detailed exploration of blockchain technology's impact on the banking sector, capturing historical, current, and future trends. By analyzing 133 articles published in Scopus-indexed journals from 2015 to May 2023, the study finds major themes such as financial technology innovation, decentralized finance, and the integration of artificial intelligence within banking. This comprehensive review aims to bridge the existing research gap by providing a clearer understanding of blockchain's role in advancing the banking industry.

III. METHODOLOGY

The project methodology integrates blockchain technology with secure cryptographic and consensus mechanisms to create a tamper-proof banking transaction system. It uses SHA- 25(Secure Hash Algorithm 256-bit) for encrypting transaction data and Proof of Work (PoW) to confirm and add new blocks to the blockchain. Every transaction—such as deposits, withdrawals, and fund transfers—is converted into a unique 256- bit hash using SHA-256. These hashes are grouped into a Merkle Tree, and the resulting Merkle Root is stored in the block header. Each block also includes the hash of the earlier block, ensuring that all blocks are securely linked. This setup guarantees data integrity, as any modification in one block would invalidate the entire chain. To keep trust and decentralization, the system applies Proof of Work, which requires solving a complex mathematical puzzle. This involves finding a suitable nonce that, when combined with block data and hashed, results in a hash that meets a specified difficulty level (usually beginning with a certain number of zeroes). This process is repeated until a valid hash is found. Once mined, the block is broadcast to the network for verification. If valid, it is added to the blockchain.

The implementation ensures that only verified transactions are recorded, and any invalid or duplicate transaction attempts are rejected during validation. The mining process not only secures the blockchain but also discourages attackers due to the high computational cost needed to alter historical data. Each new block strengthens the chain, making it increasingly difficult to

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

manipulate previously recorded transactions.

Furthermore, the system's design supports scalability and future enhancements, including the integration of smart contracts for automated processes and added layers of user authentication. This robust framework, combining SHA-256 and PoW, provides an elevated level of security, transparency, and fault tolerance, making it ideal for modern banking environments where trust, efficiency, and data protection are critical.

➢ *Design Flow:*

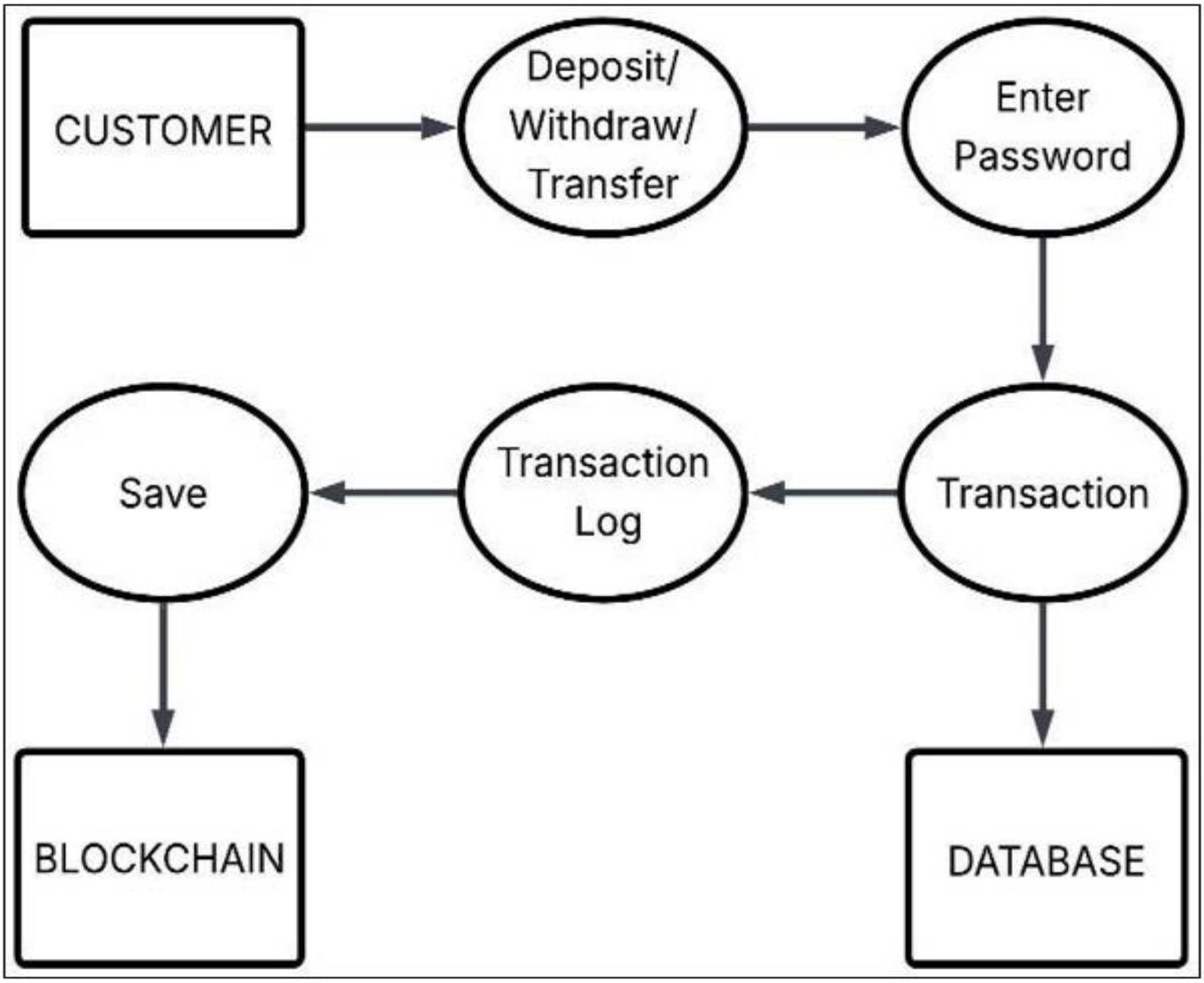

Fig 1 Data Flow Diagram

Fig 1 Illustrates the data flow diagram of the secure banking transaction system. It offers a detailed view of how the system processes various user interactions such as registration, login, and transactions. The diagram breaks down the major processes into sub-processes, showing how data flows between the user, the internal system functions, and the storage components like the database and blockchain. Each user action triggers a specific process, which is confirmed and then securely logged. The blockchain is used for storing transaction logs to ensure tamper- proof records, while the database manages user data. This layered breakdown ensures transparency, security, and efficiency in handling banking operations.

➢ *Use Case Diagram:*

A use case diagram provides a comprehensive and visual overview of the system's functionalities by illustrating the interactions between various actors, such as customers and administrators, and the system itself. It defines the roles and responsibilities of each actor, highlighting the specific features and operations they can access or perform within the system. For customers, it may outline features such as browsing, buying, or tracking orders, while for administrators, it could detail functions like managing users, inventory, or reports. This diagram not only helps in understanding system requirements but also ensures that all user expectations are captured and translated into actionable tasks during development.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

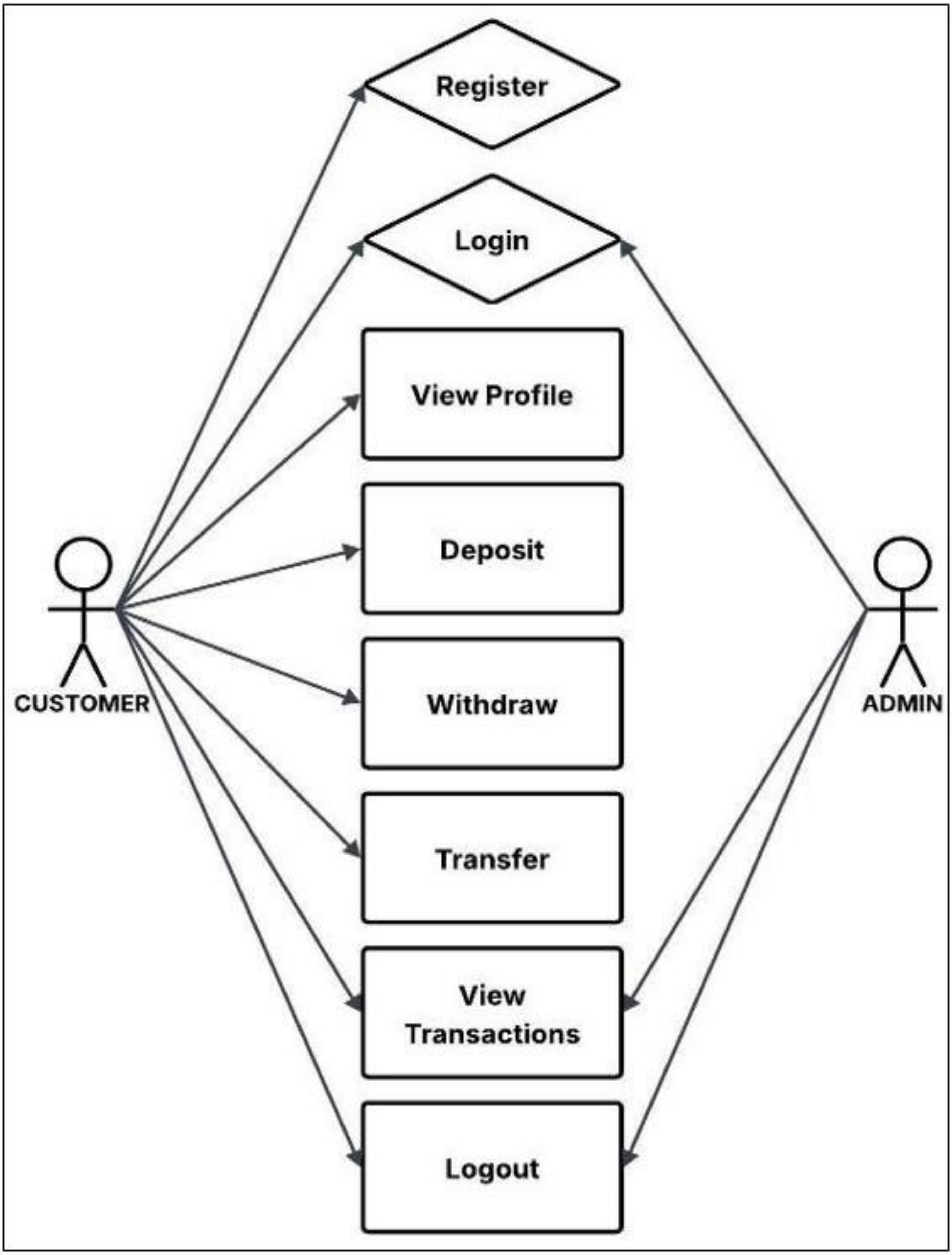

Fig 2 Use Case Diagram

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

➢ *Sequence Diagram:*

The sequence diagram illustrates the step-by-step interaction between the customer, database, and blockchain within the secure banking system. It outlines how users register, log in, and perform transactions such as deposits, withdrawals, and transfers. Each transaction is first processed and confirmed by the database, after which the transaction details are securely stored in the blockchain to ensure transparency and immutability. The diagram highlights the flow of data and the order of operations, emphasizing the integration of blockchain for keeping secure and tamper-proof transaction records.

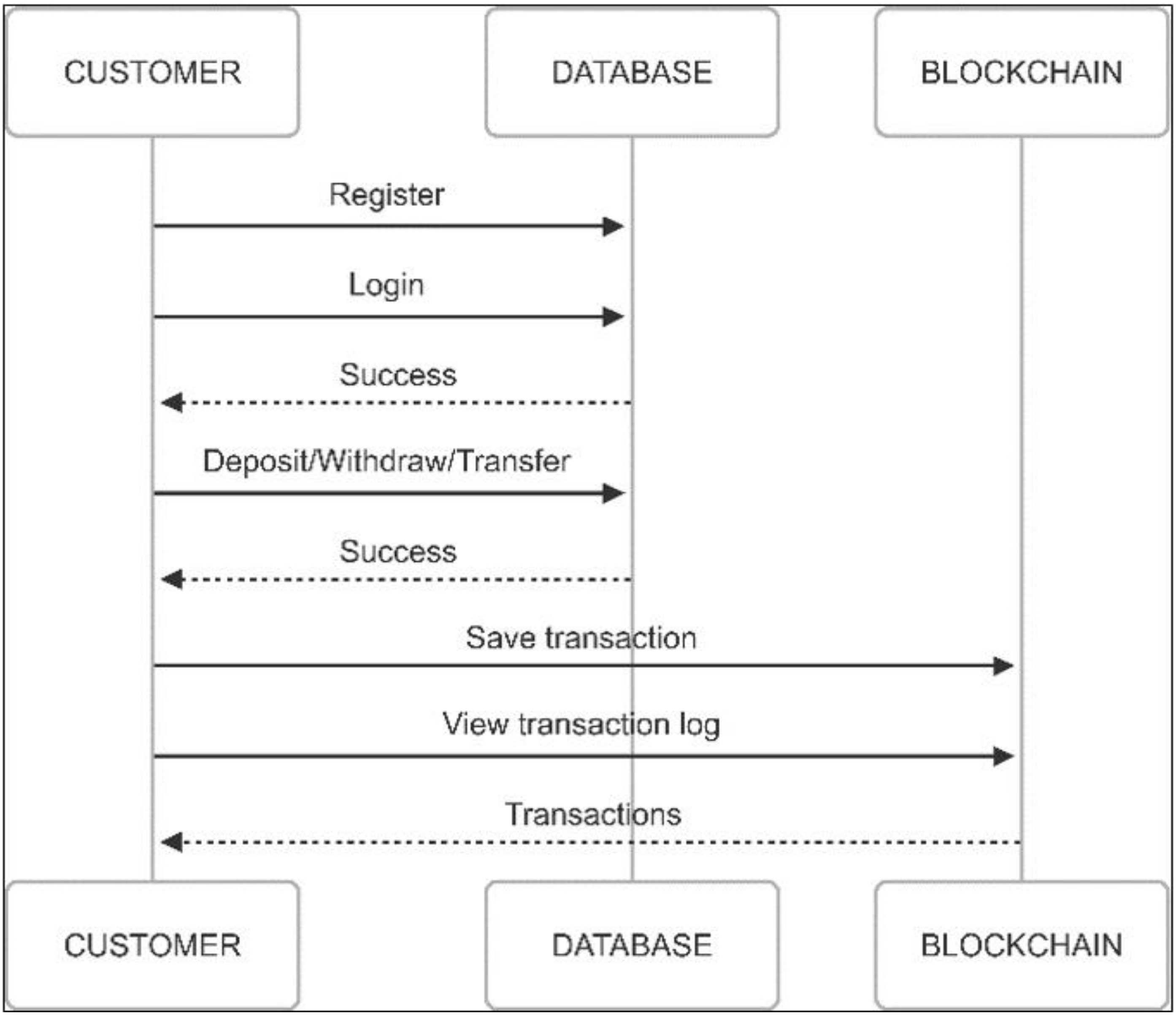

Fig 3 Sequence Diagram

IV. RESULTS AND DISCUSSION

To assess the custom blockchain's functionality, performance, and security, a series of structured tests were conducted in a controlled environment. The primary goal was to verify the system's ability to handle basic blockchain operations, such as block creation, transaction validation, and chain integrity, while evaluating its efficiency under moderate loads and resistance to common threats like tampering and double spending.

Table 1 Functional Test Results

Test Case	Input/ Action	Expected Output	Actual Output	Result
Block Creation	Add 10 transactions	Block created and added to chain	Success	Pass
Transaction Validation (Valid)	Submit a transaction with valid data	Transaction added to the mempool	Success	Pass
Transaction Validation (Invalid)	Submit a transaction with invalid data	Transaction rejected	Success	Pass

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

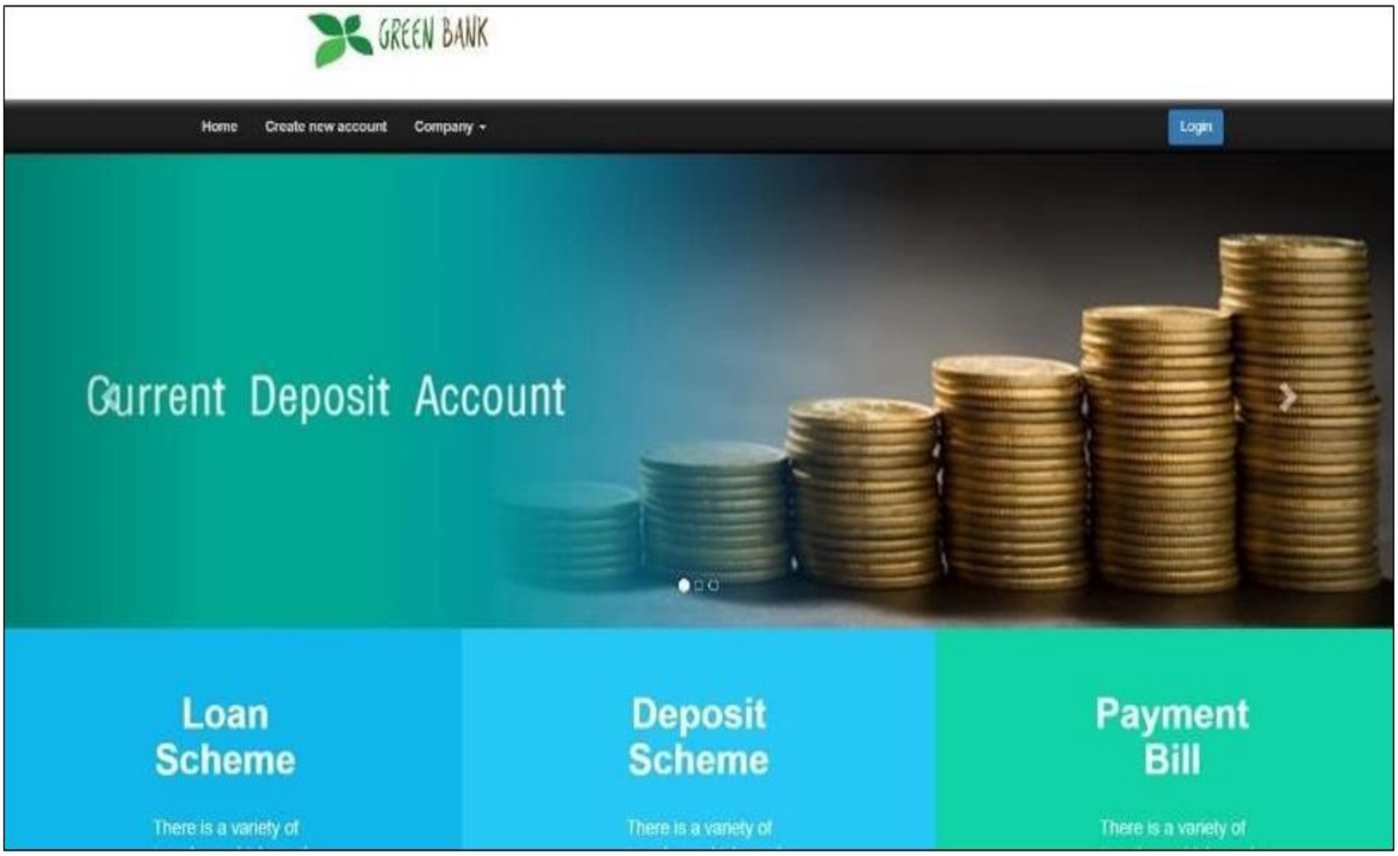

Fig 4 Home Page

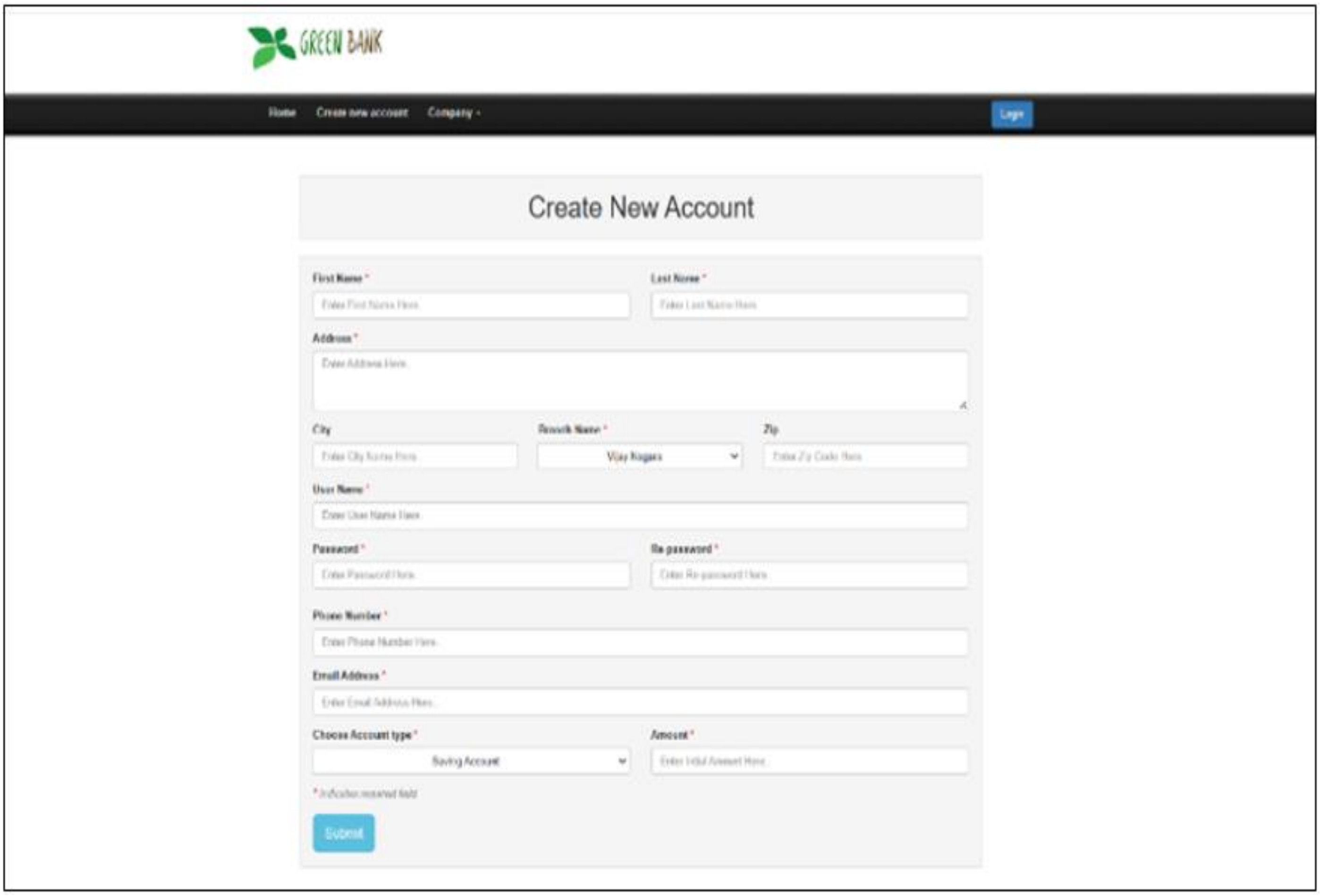

Fig 5 Create New Account Page

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

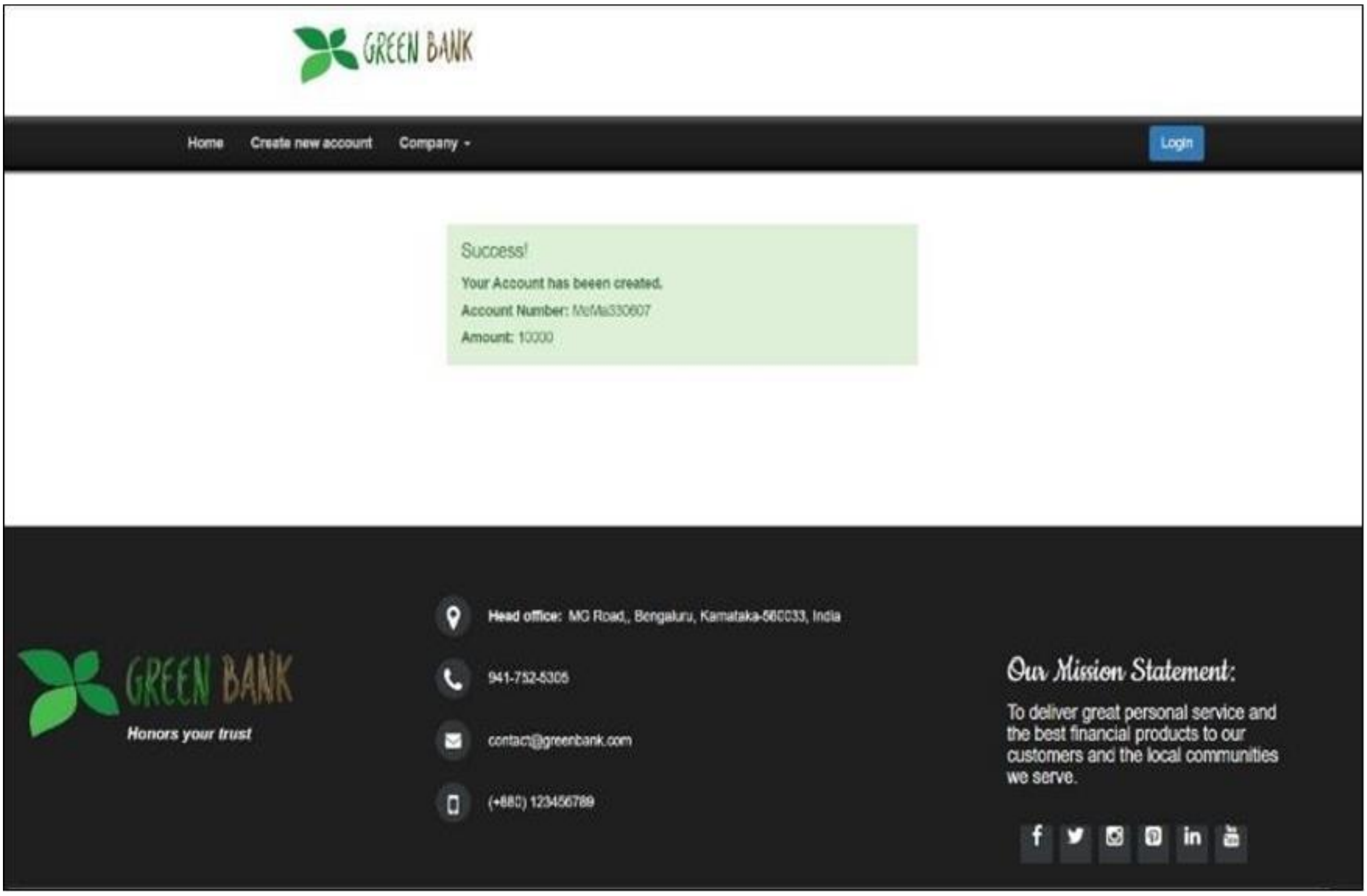

Fig 6 Create new Account Success

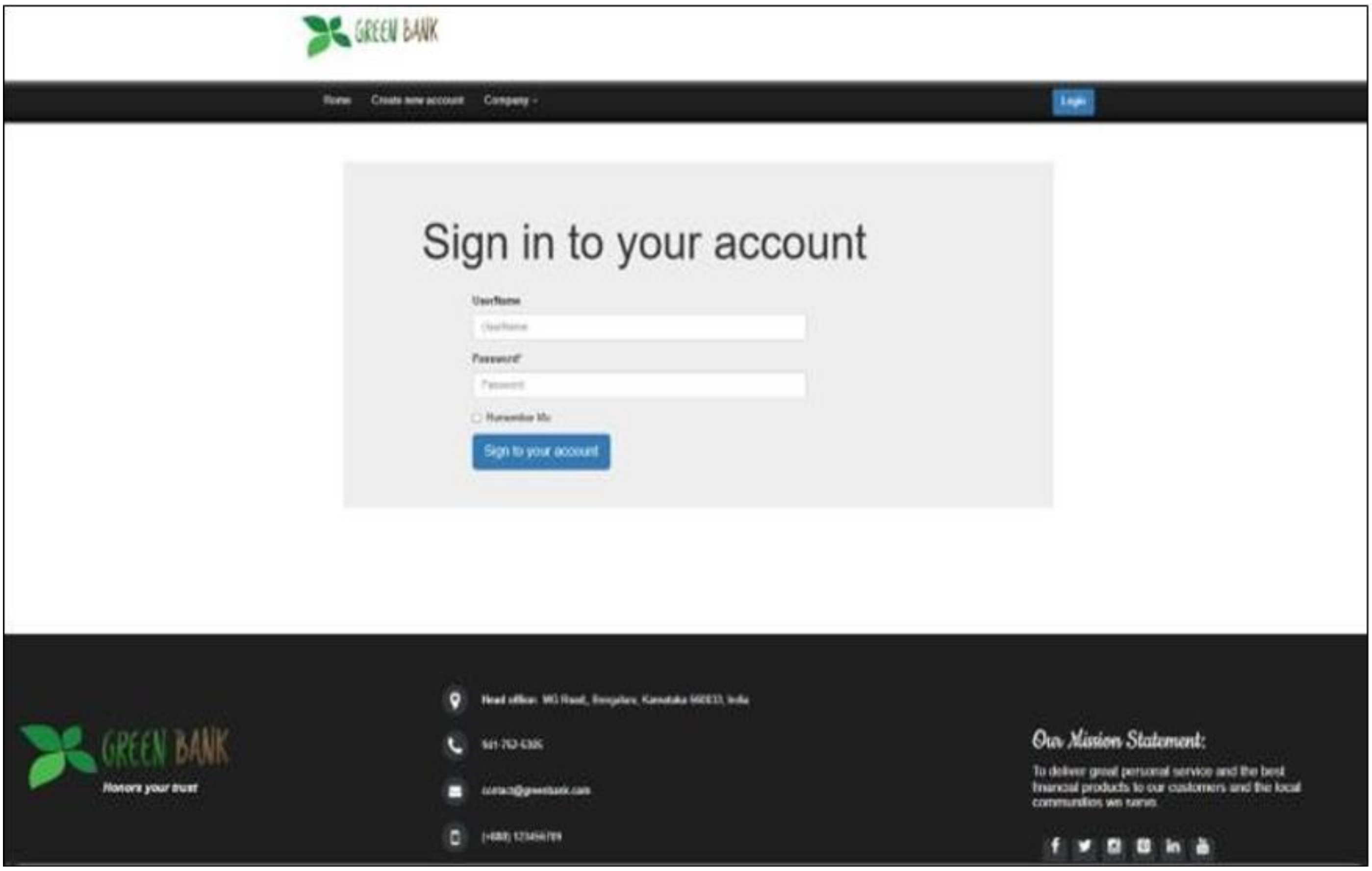

Fig 7 Sign in Page

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

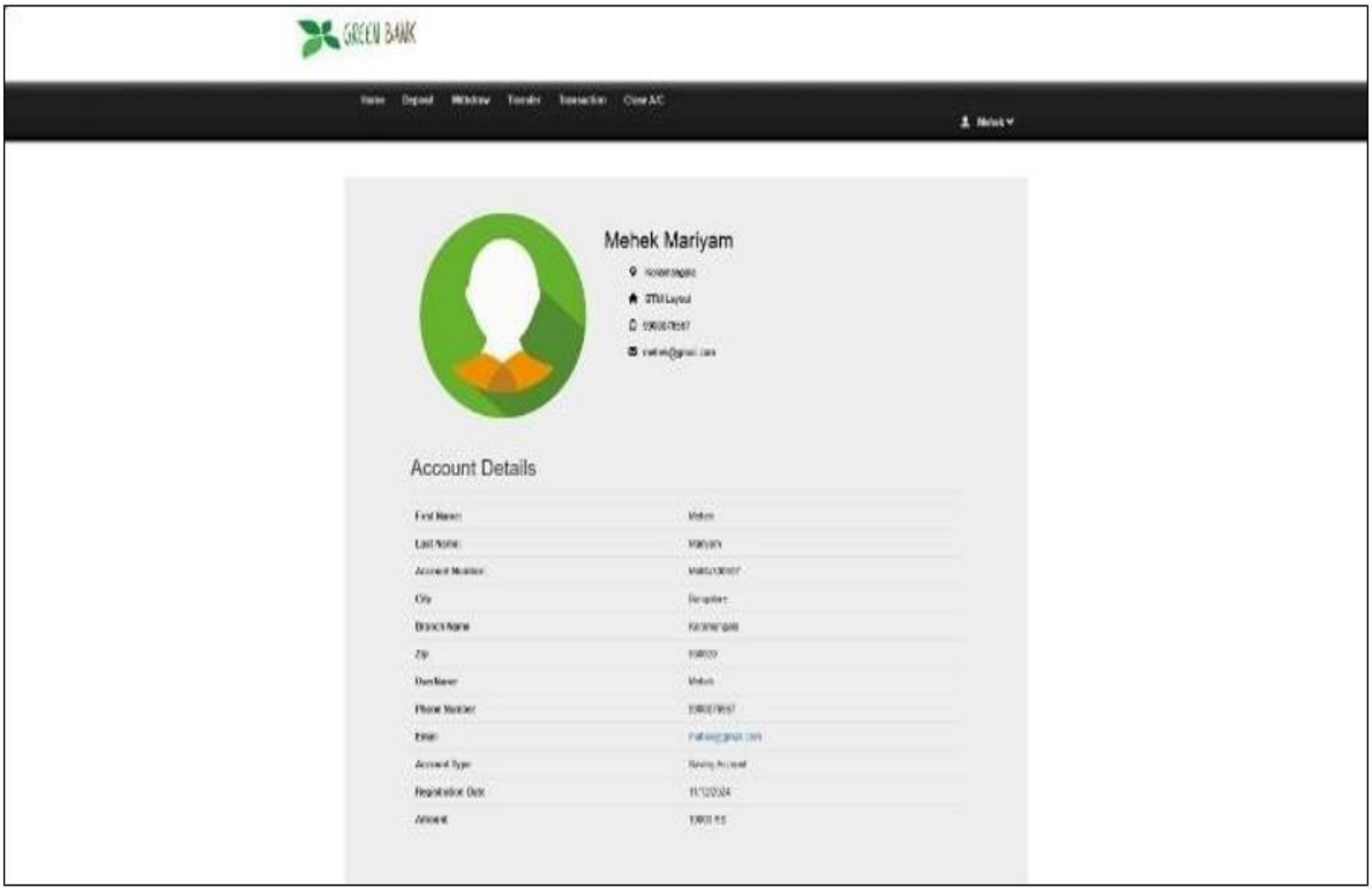

Fig 8 User Account Details

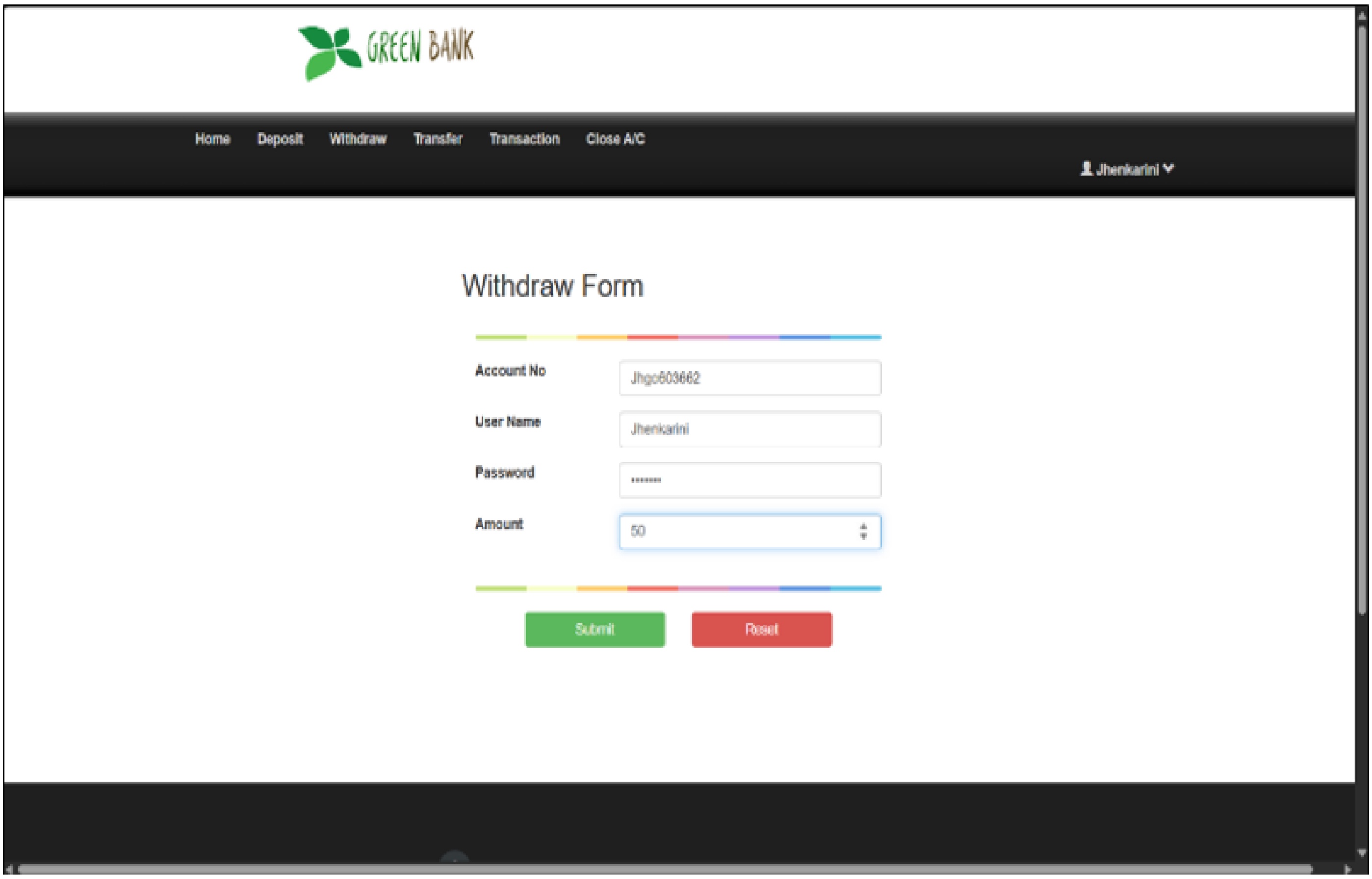

Fig 9 Withdraw form

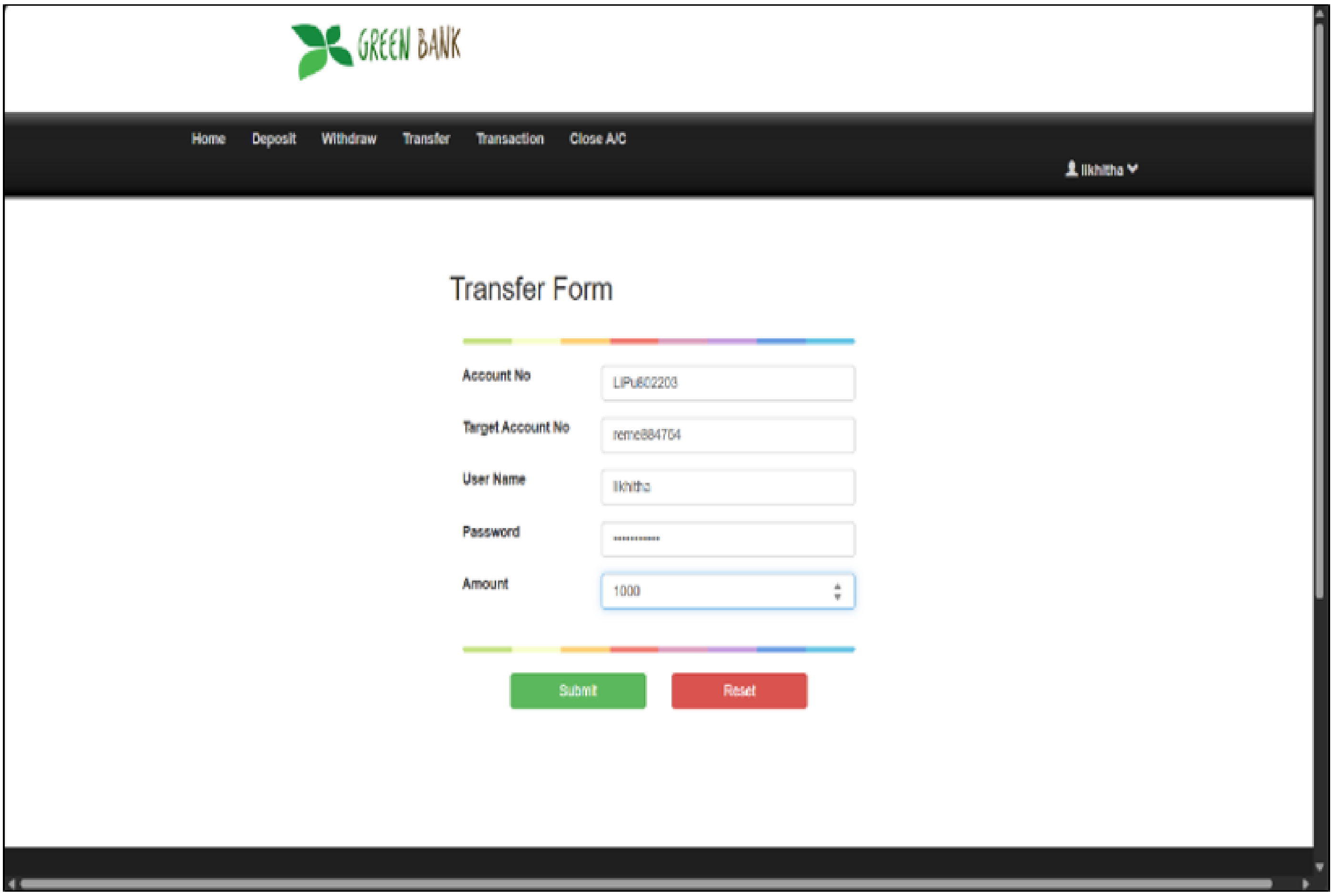

Fig 10 Withdraw Success

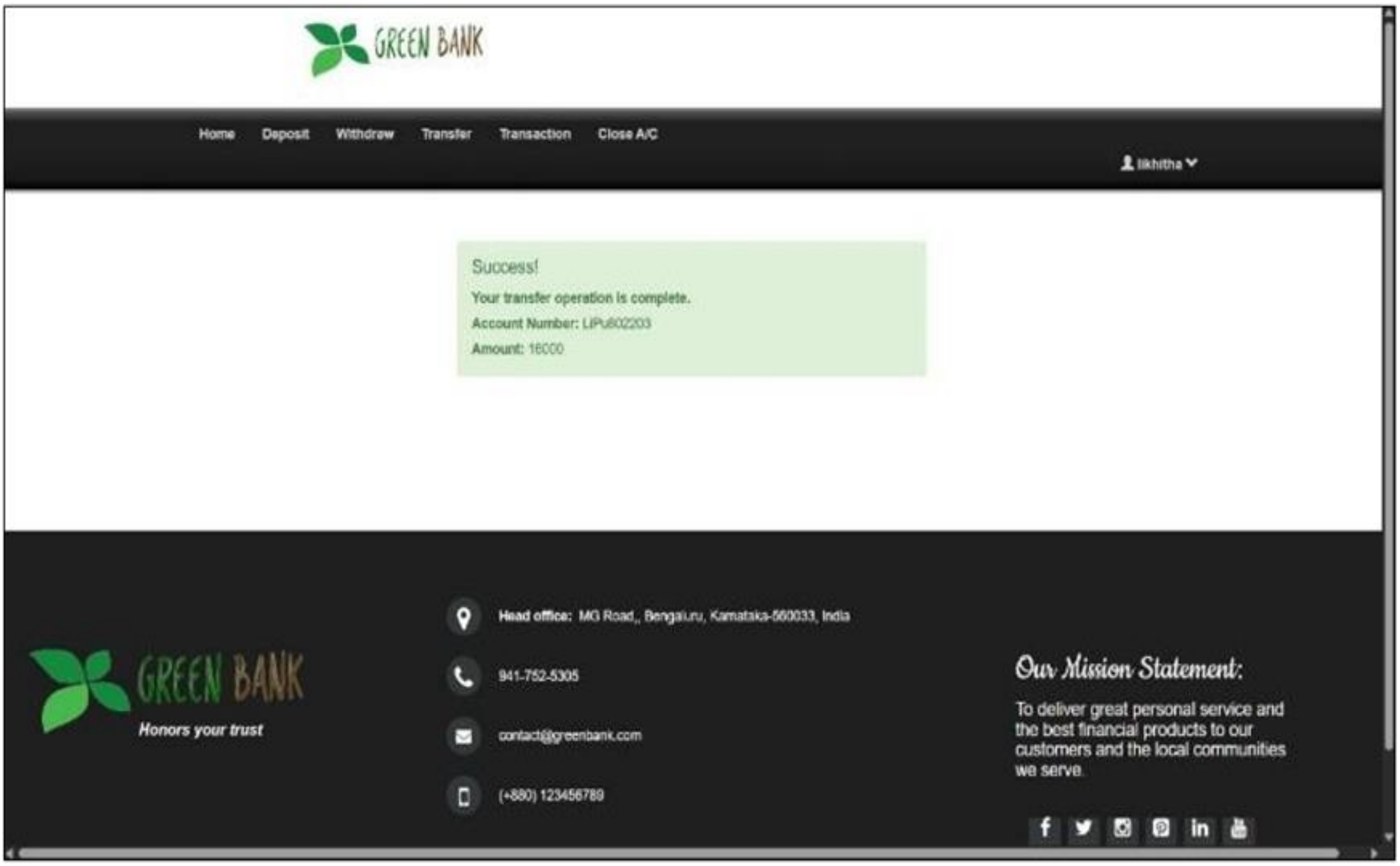

Fig 11 Transfer Form

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

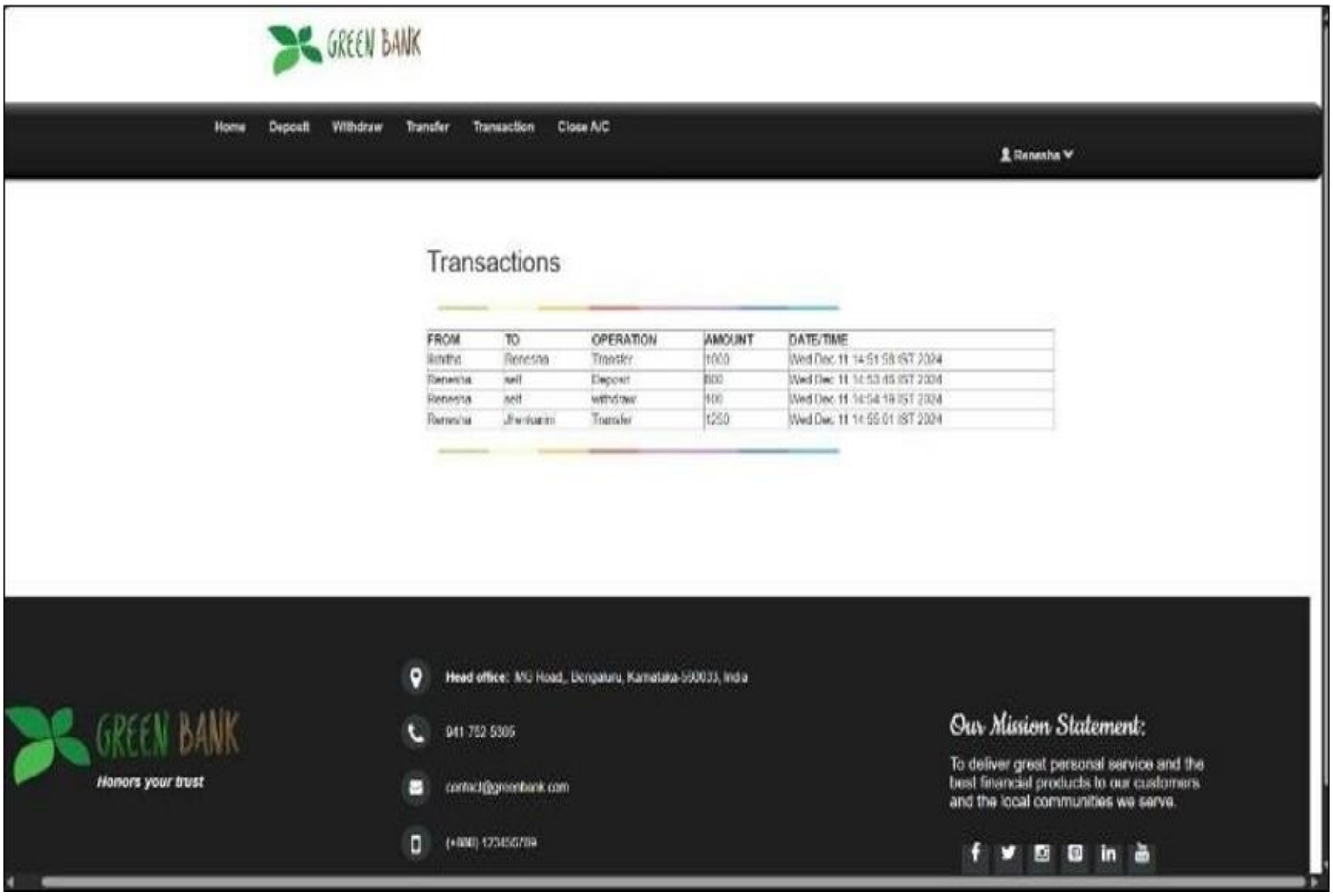

Fig 12 Transactions

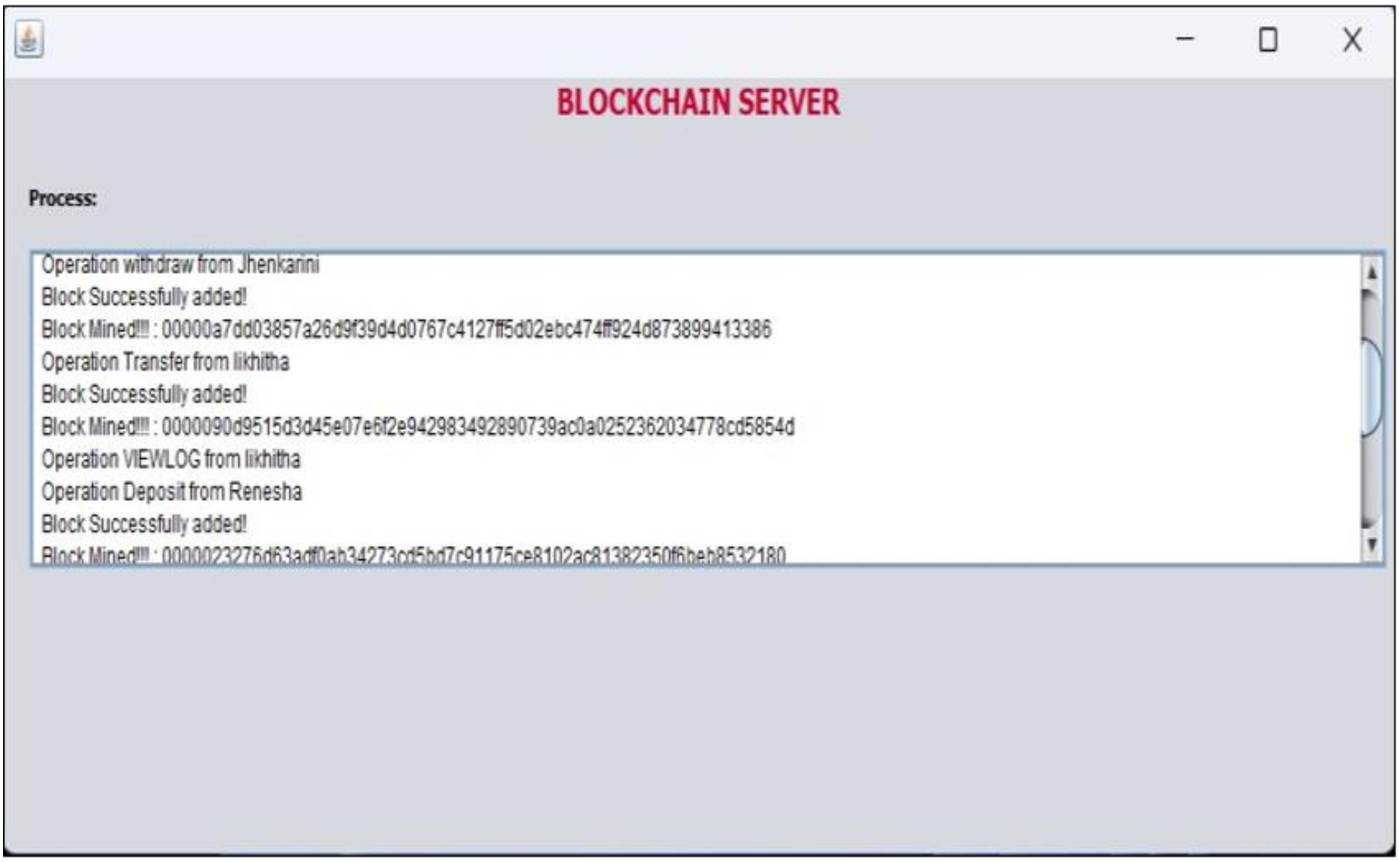

Fig 13 Blockchain Server

Volume 10, Issue 5, May – 2025 International Journal of Innovative Science and Research Technology
ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25may762

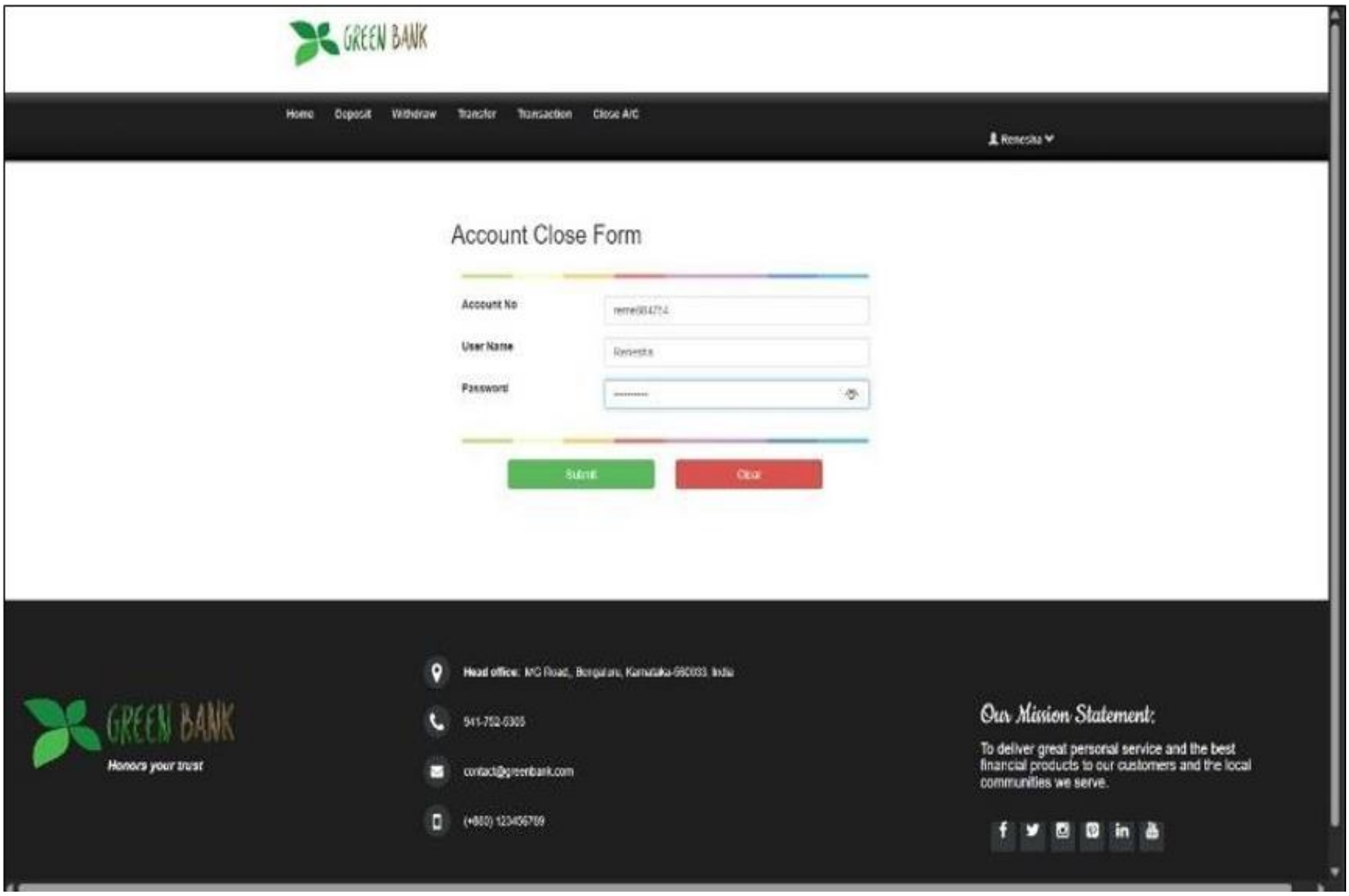

Fig 14 Account close form

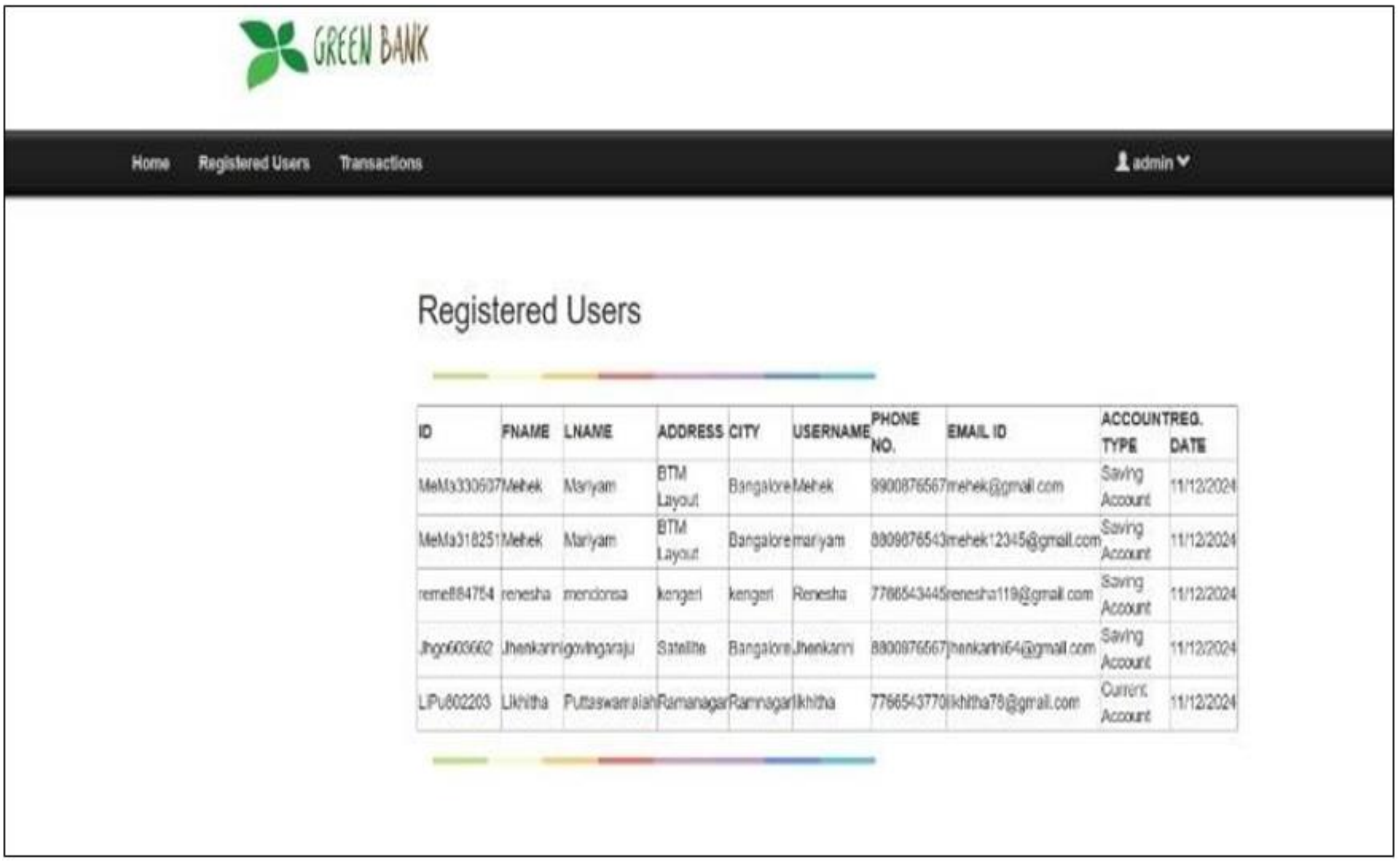

Fig 15 Registered users

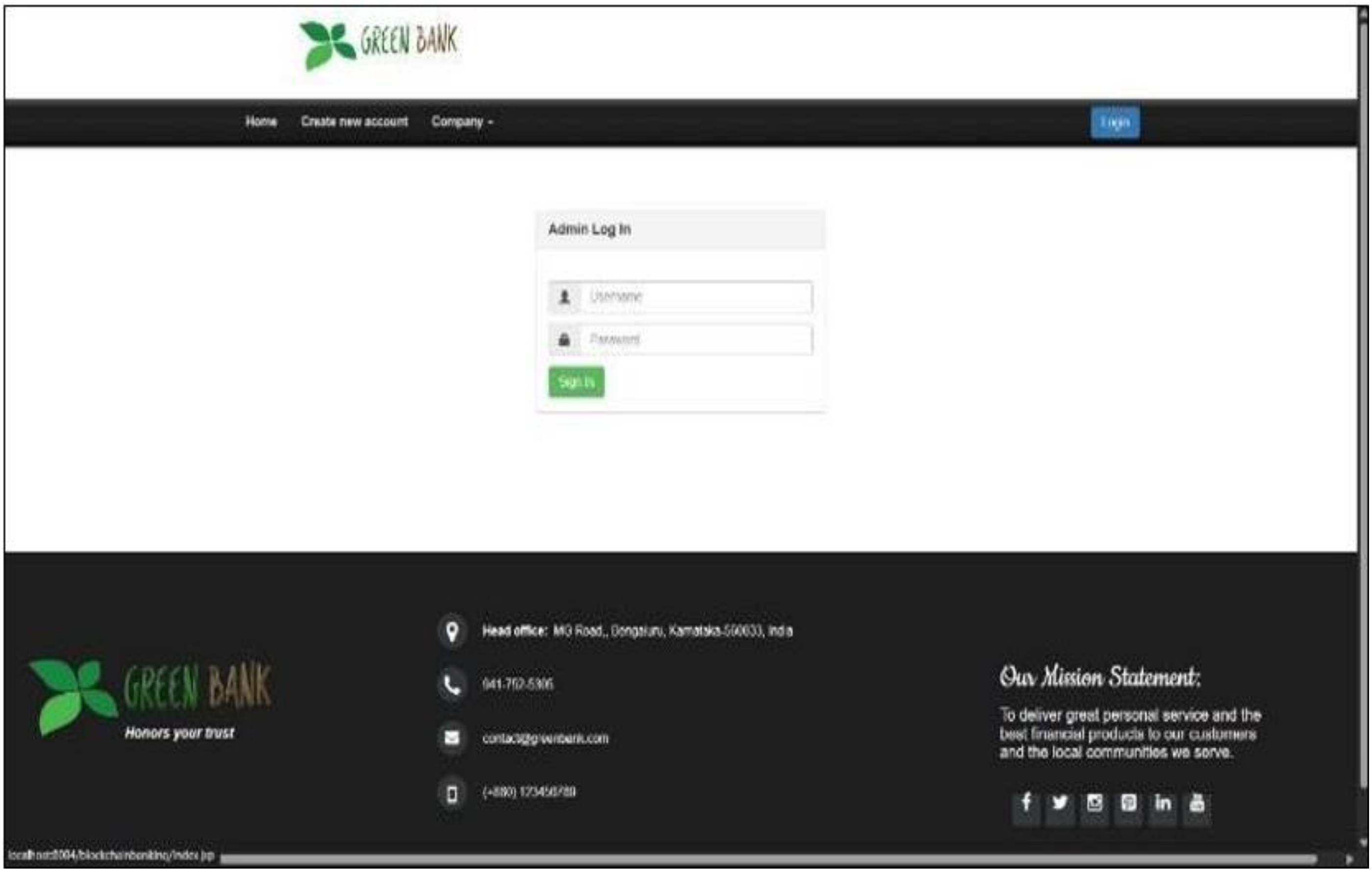

Fig 16 Admin Log in

REFERENCES

[1]. G. Bank, Y. Jawale, R. Wairkar, and S. Mirchandani, "Decentralized Banking Services using Blockchain Technology," 8th International Conference on Communication and Electronics Systems (ICCES), Coimbatore, India, Vol. 515, Pages: 515-521, 2023.

[2]. M. Aniruddha, and K. S. Sowmya, "Implementation of Blockchain for Secure Bank Transactions," Proceedings of the International Conference on Mainstreaming Blockchain Implementation (ICOMBI), Vol. 1, Pages: 1-10, 2020

[3]. Dr. H. P. Mohan Kumar, "Secure Bank Transaction Using Blockchain," Vol. 07, No. 08, Pages: 2395-2397, August 2020

[4]. N. R. Shaikh, K. S. Tarate, and R. R. Rote, "Secure Banking Transaction using Blockchain Technology," International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), Vol. 2, No. 1, 2022

[5]. U. Subramanian, "Blockchain in Banking," International Conference on Information Technology Systems and Innovation (ICITSI), Bandung, Indonesia, Vol. 58, Pages: 58-63, 2022. Chandrasekeran, A. Rana, S. Naredla, W. K. Ibrahim, and.

[6]. M. B. Alazzam, "Blockchain Technology for Secured Transactions in Banking," 3rd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Rajasthan, India, Vol. 655, Pages: 655- 660, 2023

[7]. R. O. Rosca, C. B. F. R. Dima, and M. C. P. R. Dima, "Blockchain Use-Cases for Central Banks: A Systematic Mapping Study," IEEE Access, Vol. 8, Pages: 139918-139952, July 2020.

[8]. H. Mao, X. Bai, Z. Chen, K. Hu, and W. Yu, "Multi-Blockchain Model for Central Bank Digital Currency," 18th International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT), Taipei, Taiwan, Pages: 360-367, 2017.

[9]. R. Swarnamuki, G. Varalakshmi, and K. Sangeetha kalyaniraman, "Secure Banking System Using Blockchain Technology," International Research Journal of Engineering and Technology (IRJET), Vol. 6, No. 3, Pages: 182-187, March 2019

[10]. K. J. Yii, E. K. Masli, and M. L. Voon, "The blockchain in the banking industry: a systematic review and bibliometric analysis," Cogent Business & Management, Vol. 11, No. 1, 2407681, 2024.