# Blockchain-Assisted System for Confidential Question Paper Management

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***Abstract*— This project uses blockchain technology to propose a safe, decentralized method of stopping question paper leaks. Exam question papers are stored and disseminated over a tamper-proof blockchain network, which guarantees their integrity, confidentiality, and traceability. Through the use of smart contracts and cryptographic techniques, this system ensures that only authorized personnel have access to the documents at predetermined times by providing an unchangeable audit trail. By reducing the possibility of human error, illegal access, and leaks, the platform improves security and confidence in the assessment procedures. The system has role-based access control in addition to its fundamental capabilities, which enables permissions to be given according to user roles and responsibilities within the examination authority. Transparency and traceability are ensured by recording all access requests and transaction pertaining to the question paper on the blockchain. Time-based smart contracts guard against early disclosure by guaranteeing that test questions are only available at predetermined times. The architecture can be implemented in a variety of educational institutions and testing organizations because it is made to facilitate scalability and interoperability. The system's resilience and reactivity to possible threats are enhanced via audit logs, encrypted question paper storage, and real-time alarm systems. In addition to improving the examination process's security and accountability, this blockchain-enabled system gives stakeholders more confidence by guaranteeing that academic assessments continue to be transparent, equitable, and impenetrable. The suggested approach lays the groundwork for safe, technologically advanced educational innovations.**

**keywords—smart contracts, blockchain, cryptography, and examination security**

## I. INTRODUCTION

Frequent instances of question paper leaks have posed a serious threat to the credibility of academic exams in recent years. These violations seriously harm educational institutions' reputations in addition to jeopardizing the impartiality of assessments. Conventional systems, whether centralized digital platforms or paper-based systems, frequently have insufficient security safeguard to guard against internal threats, unwanted access, and content manipulation. For the management and distribution of question papers, this necessitates a more open, safe, and impenetrable system. Given its decentralized, unchangeable, and transparent characteristics, blockchain technology presents a viable way to deal with this pressing problem. Educational authorities can make sure that question papers are only available to authorized persons at specific times by storing the data on a blockchain and controlling access with smart contracts. To further ensure accountability and traceability, every activity taken on the system is recorded in a distributed ledger. This study introduces a blockchain-based architecture that uses time-restricted smart contracts, role-based access restriction, and cryptographic approaches to stop question paper leaks. The solution uses programmable blockchain logic to automate access control, reduce human intervention, and remove single points of failure. The suggested solution, which was created and tested using Ganache on a private Ethereum network, guarantees high levels of security, transparency, and scalability.

## II. LITERATURE REVIEW

Blockchain-based solutions are becoming more and more popular as a result of the increased demand for security, transparency, and scalability in online exam systems. Numerous research have looked into how blockchain technology can help with important issues including preventing unwanted access, ensuring result integrity, and storing question papers in a way that is impossible to tamper with.The use of blockchain technology combined with zero-knowledge proofs to safeguard private data, including student identities and exam answers, was examined by Wang et al. [1]. This method maintains result transparency while protecting data privacy. Researchers such as Patel et al. [2] expanded on blockchain's fundamental advantages by introducing consortium blockchain networks, which prioritized inter-

institution collaboration and lower gas costs while preserving high throughput and security.The significance of smart contracts in automating processes such as exam rollout and result

confirmation was highlighted by Kumar and Sharma [3]. Chen, Hong, and Wu, L., "Decentralized identity systems in blockchain for online examination authentication," IEEE Transactions on Learning Technologies, vol. 15, no. 2, pp. 105–113, 2023 [4].In a similar vein, Gupta and Nair [5] emphasized how blockchain technology may protect academic documents from alteration and unwanted access, increasing academic credibility. Scalability issues have been brought up by a number of researchers, especially in light of Ethereum's large transaction volume and gas expenses. Tapas [6] suggested Layer 2 methods like zk-Rollups and off-chain storage techniques like IPFS to get around these restrictions. In high-traffic settings like mass exams, these guarantee the scalability of blockchain systems. SCPKI, a smart contract-based PKI and identity system, was suggested by Al-Bassam [7] and can be modified to handle secure user IDs in educational platforms. A secure online exam system was developed on Ethereum by Sharma and Mahajan [8], who verified its viability through real-time deployment. Tripathi et al. [9] addressed latency and throughput concerns by concentrating on performance improvement techniques for blockchain-based inspection systems. Parallel processing approaches were presented by Hasib and Ahsan [10] to increase the effectiveness of blockchain academic applications. A performance analysis of consensus algorithms employed in academic blockchain systems was presented by Khurana et al. [11], who emphasized the trade-offs between speed and decentralization. The fundamental ideas of blockchain and smart contracts, namely for Internet of Things systems, were covered by Christidis and Devetsikiotis [12]. These ideas can be used to educational infrastructures. In order to tackle the fundamental problem of paper leakage, Saini et al. [13] created a secure question paper distribution mechanism utilizing blockchain technology and access control techniques. In a paper published by the European Commission, Grech and Camilleri [14] looked at the wider application of blockchain in education, describing possible use cases such academic integrity, identity management, and certificate issuance. Lastly, Singh and Tripathi [15] investigated the use of smart contracts to automate certification and assessment procedures in learning settings.

**A..Login Information:**
Admins and faculty, start the procedure by entering their login credentials into system. Before any blockchain-related operations can be carried out, this serves as the authentication.

**B. Import the Private key:**
The user is prompted to import their Ethereum private key by the system after logging in. Verifying the user's identity and safely signing transactions on the blockchain require this key.

**C. Private Key Validation:**
The Ethereum network is used to verify the imported private key. Only authorized users are permitted to move on to the following stages of question paper handling thanks to this validation.

**D. Solidity Transaction (Deployment of Smart Contracts):**
A transaction defined in Solidity, Ethereum's smart contract language, gets started as soon as the private key has been verified. This smart contract will specify the guidelines for viewing and editing the test questions, including role-based permissions, audit logging, and time-locking access.

**E. Execution of Smart Contracts:**
The Ethereum network is used to deploy and run the Solidity-based smart contract. This agreement guarantees security, transparency, and immutability and regulates all ensuing communications pertaining to the question paper.

**F. Use MetaMask for importation:**
The Ethereum network and the user's browser are connected by MetaMask. At this point, the user signs and authorizes transactions that the smart contract has started by connecting their Ethereum wallet using MetaMask.

**G. Include a blockchain appendix:**
The question paper metadata and hashes—not the actual file due to privacy and size restrictions—are added to the blockchain when the smart contract interaction has been verified. This guards against manipulation and guarantees data integrity.

**H. Verification via Blockchain:**
The blockchain validates and completes the transaction after it has been successfully appended. The information on the question paper is then unchangeable and subject to audit by authorized parties.

## III. METHODOLOGY

**SYSTEM ARCHITECTURE:**
The suggested system's technique is made to guarantee that exam question papers are handled in a way that is safe, traceable, and impenetrable. The system creates a decentralized framework for question paper management by utilizing blockchain technologies, particularly Ethereum, smart contracts, MetaMask, and cryptographic techniques. The solution lowers the risk of internal data breaches and removes single points of failure by decentralizing the transaction and storage process. Strict access controls, time-based locks, and automated workflows are defined using smart contracts, which are built in Solidity, to guarantee that question papers are only available to authorized users at predetermined times. Private keys are utilized to digitally sign transactions, ensuring non-repudiation, and MetaMask is integrated as a wallet interface for safe user verification and transaction approval.Following are the stages:

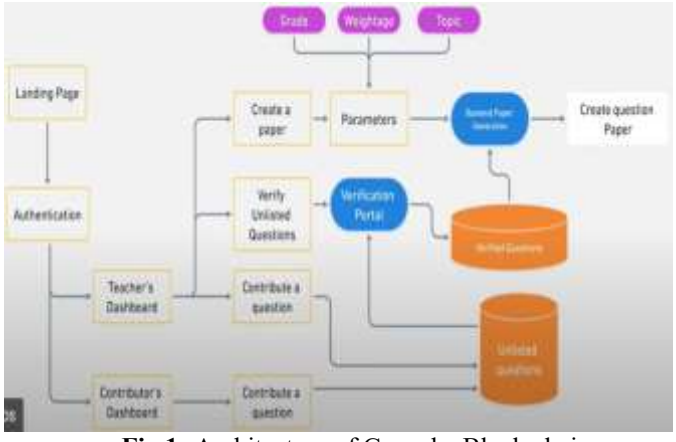


**Fig 1:** Architecture of Ganache Block chain

**A.Overview of the System:**
Teachers, contributors, and administrators are among the several user roles on the platform. After authenticating, users are taken to

their individual dashboards at the Landing Page, where the procedure starts. Grade, topic, and weighting are examples of input parameters that teachers might use to produce question papers. Questions submitted by contributors are initially saved as Unlisted Questions.

**B. Question Pool Management and Verification:**
Through a Verification Portal, submitted questions are validated by subject-matter experts who guarantee their accuracy, relevance, and classification. The questions are added to the Verified Questions pool after they have been validated. In order to preserve the integrity of the exam material, only validated questions can be used to generate paper.

**C.Generation of Backend Papers :**
The Backend Paper Generation engine creates a balanced question paper based on predetermined parameters. Diversity and conformity to academic norms are guaranteed by the selection algorithm. After that, the created paper is hashed and encrypted, and the hash is permanently saved on a private Ethereum blockchain (via Ganache). This guarantees that after generation, the paper cannot be altered.

**D.Integration of Blockchain and Smart Contracts**
The system defines time-based release controls and access privileges using Solidity smart contracts. The paper is only accessible by authorized personnel at predetermined times. A permanent audit trail is created on the blockchain by recording every action, including the generation of papers, access logs, and question verifications.

**E. Diagram of the System Flow:**
The system's whole flow, from user contact to the creation of secure papers, is shown in Fig. 1. Modularity, security, and verification prior to final paper deployment are prioritized in the framework.

## IV. RESULTS AND ANALYSIS

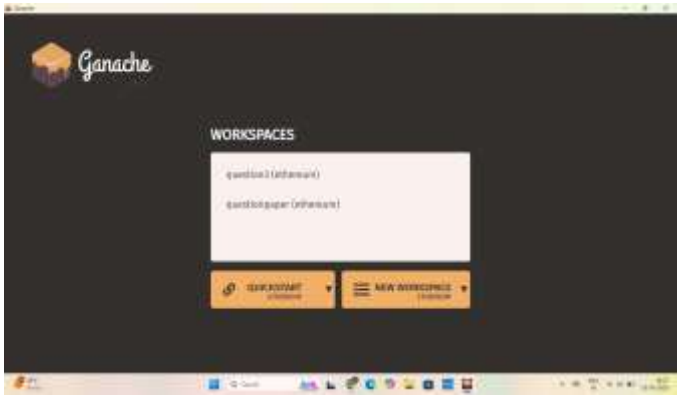


**Fig 2:** Dashboard of the Ganache Workspace

The implementation and testing of smart contracts pertaining to the distribution and security of question papers was made possible by the creation of a new Ethereum workspace in Ganache that mimics a private blockchain network.

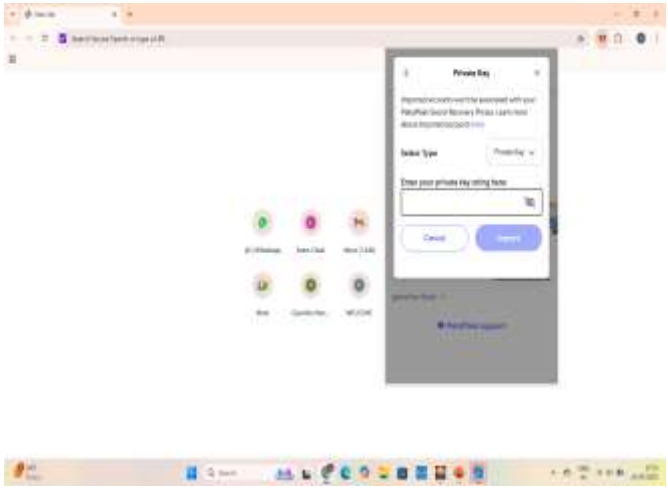

**Fig 3:** Interface for importing Metamask private keys

In order to create a safe link between the MetaMask wallet and the Ganache local blockchain environment for decentralized application testing, the private key of an Ethereum account created by Ganache was input into MetaMask to import the account.


**Fig 4:** Homepage of Exam Chain

A local development server was used to launch the decentralized application "Exam Chain" following the establishment of a connection between MetaMask and the Ganache blockchain. Contributors and administrators could safely handle question paper transactions using the Ethereum blockchain thanks to the frontend interface's role-based access.

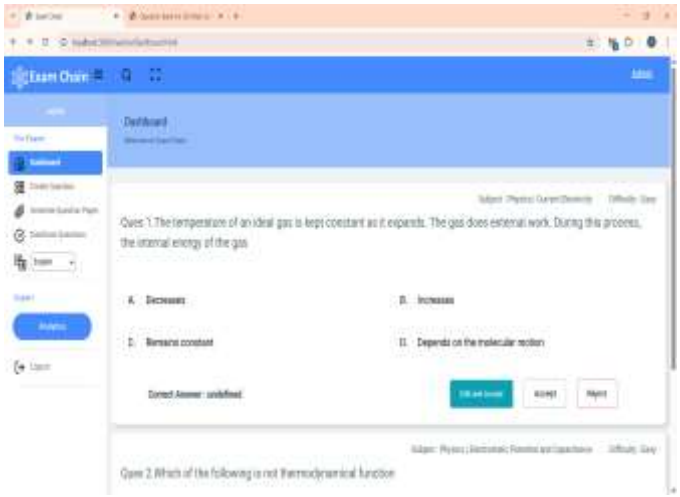

**Fig 5:** The review interface on the teacher's dashboard

After logging in, teachers can use a dashboard interface to control the test question lifecycle. The dashboard offers the following features: Formulate a Question: Teachers can offer discussion starters. Accept/Reject Questions: Submitted questions are reviewed for approval based on their topic matter, degree of difficulty, and relevance. Make a Question Paper: Teachers can select approved questions to make randomized question papers. Share Questions: Completed papers can be securely shared via the smart contracts on the Ethereum blockchain. Analytics: Provides graphical data on question difficulty levels, acceptance rates, and subject-wise distribution.

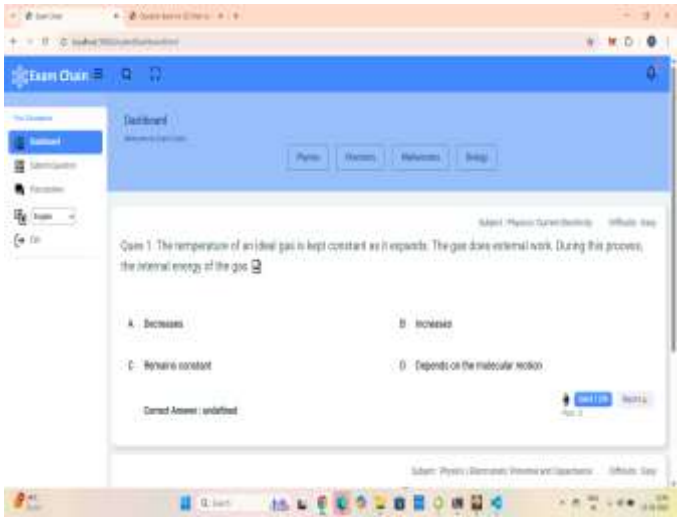

**Fig 6:** Questions displayed on the contributors dashboard

A question is submitted to the Contributor Dashboard for community-level verification after teacher approval. Contributors can: Examine and validate questions that have been accepted.Send one Ethereum equivalent token (a gamified incentive mechanism) to vote on or support high-quality queries. Questions that are confusing or incorrect should be reported for reevaluation. Use subject filters, such physics and chemistry, to efficiently manage question visibility. This collaborative review procedure results in more accurate, transparent, and decentralized exam content. It also discourages erroneous or biased entries, improving the integrity of the exam paper creation process.

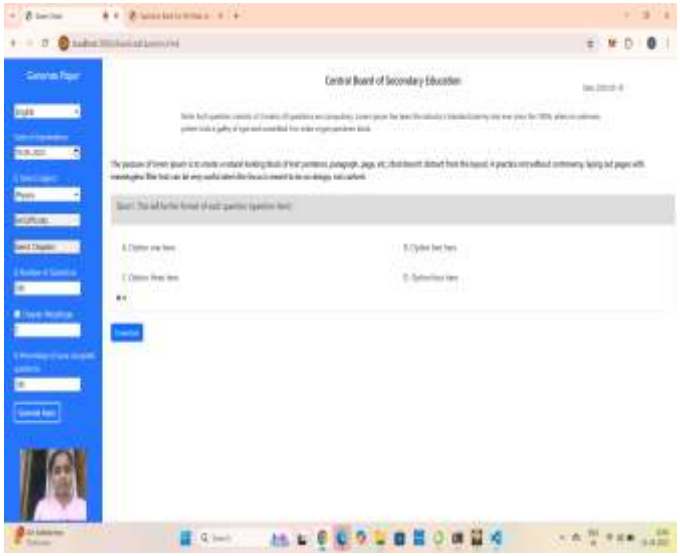

**Fig 7:** Interface for generating question papers

The suggested system is a safe portal for creating exam-specific question papers. Users can choose the language, subject, chapters, difficulty, and weighting to personalize their question papers. The system asks for webcam access during generation to ensure user identity verification and monitoring for increased security and to stop misconduct.

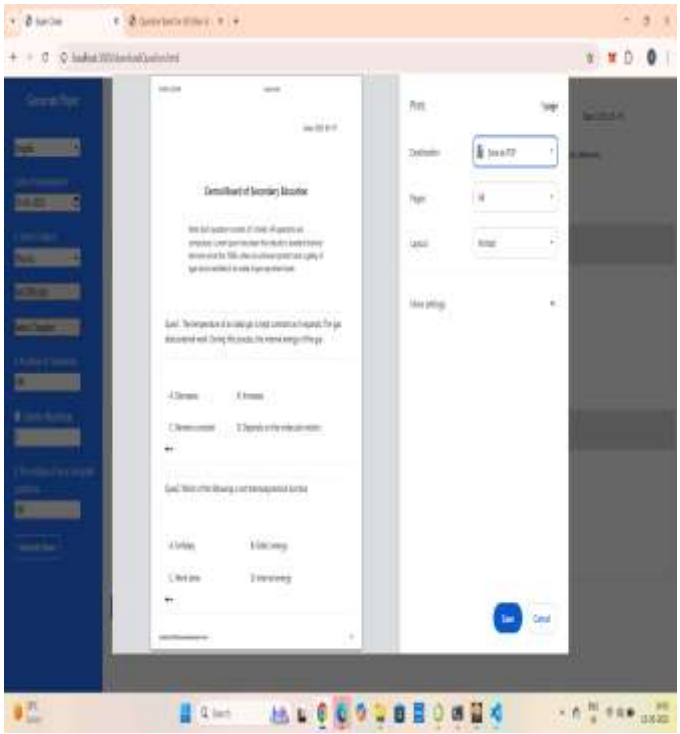

**Fig 8:** Print preview screen to save paper as PDF

For convenient printing and distribution, the system offers the ability to export the created question paper straight as a PDF. In addition to having well-defined multiple-choice alternatives and

metadata like date and subject, the questions are formatted neatly. This feature keeps the layout looking professional while guaranteeing easy offline access.

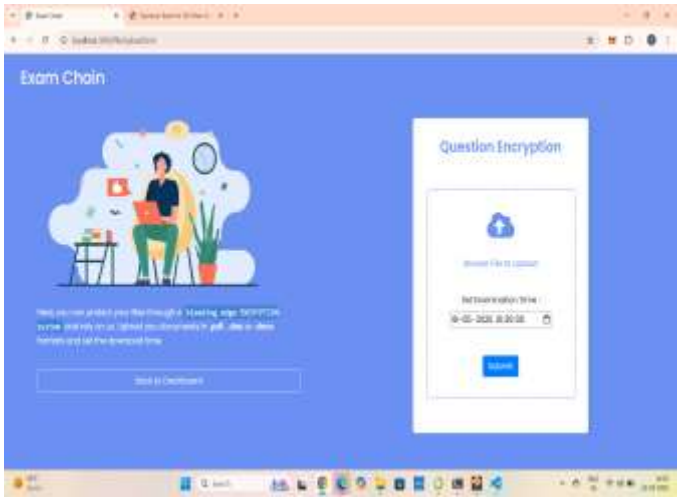


**Fig 9:** Exam time setting for secure upload

By enabling users to upload question papers in encrypted format (.pdf,.doc,.docx), the system guarantees secure document handling. In order to manage access to the uploaded content, users can also plan the examination time.

**Fig 10:** Qshare module functionality

The project's QShare module is integrated with the Ganache blockchain ecosystem and is operated on Django's development server. It makes it possible for the frontend and smart contracts running on the local Ethereum network to communicate securely.

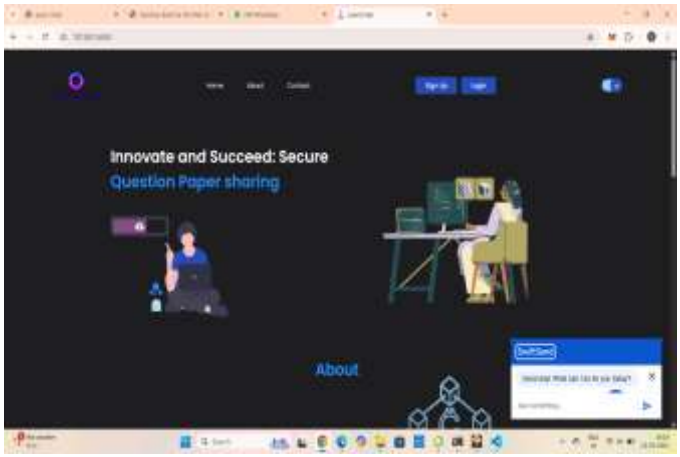


**Fig 11:** Dashboard for sharing question papers

Users are taken to the dashboard with options for safe question paper sharing after starting the QShare module. Features like user sign-up and login as well as a chatbot (SwiftSend) for immediate assistance are available through the interface.

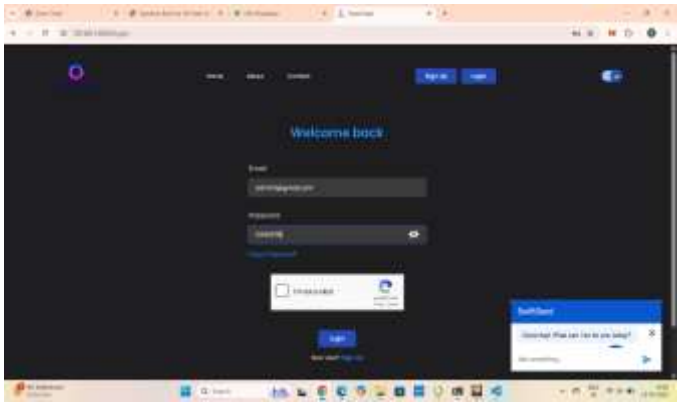


**Fig 12:**Dashboard for registering to receive the question paper

he suggested blockchain-based question paper system's login interface is depicted in the image. Before completing any blockchain transactions, it enables authenticated users—like administrators or faculty—to safely access the platform with their login credentials.

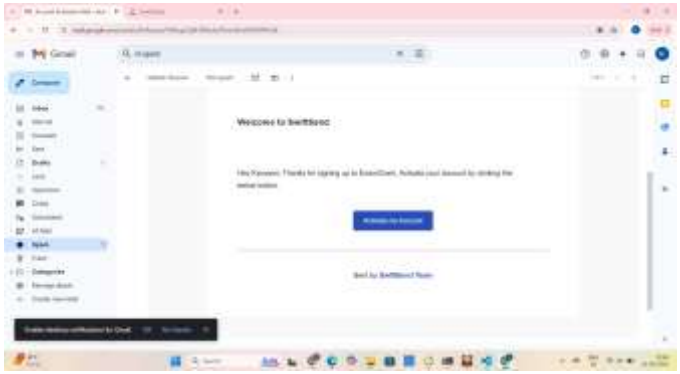

**Fig 13:** Verification email for reCAPTCHA

Authorized workers use this admin login page to verify and approve requests for access from teachers or students. For extra security, the page uses reCAPTCHA verification.

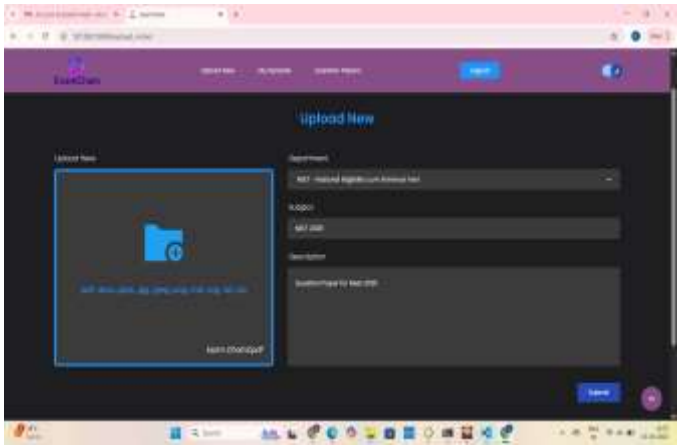

**Fig 14:** Verified papers uploaded by professors

Verified faculty members can upload freshly made question papers to this teacher dashboard. They can upload supported file types like.pdf,.docx,.pptx,.zip, and more, choose the department, and add a subject and description.

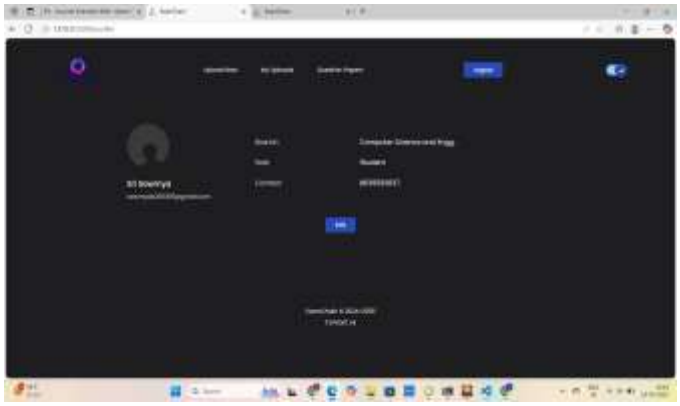

**Fig 15:** The dashboard for students to obtain papers

This is the ExamChain platform's student dashboard. It shows the user's name, email address, role (student), branch (e.g., computer science and engineering), and phone number. Students have the ability to change their profiles, examine their uploads, and access available question papers. With choices for logging out and easy section navigation, the interface offers a clear layout.

## V. CONCLUSION

Using blockchain technology, this article has suggested a thorough and safe method of stopping question paper leaks. Question papers are safely stored, accessible only by authorized individuals, and openly audited at every stage thanks to the blockchain's decentralized and unchangeable structure and smart contracts. The examination administration
system's overall security and effectiveness are improved by the integration of several modules, including user authentication, question paper management, and real-time notification. The suggested method's practical viability and efficacy in preserving the integrity and secrecy of sensitive instructional content are demonstrated by its deployment on the Ganache network.

## VI. FUTURE SCOPE

In the future, the system has a number of chances for improvement. Future research can concentrate on making the blockchain infrastructure more scalable to accommodate more users and transactions, especially for examinations conducted at the state or national level. Advanced cryptographic methods like homomorphic encryption and zero-knowledge proofs could be used to improve data privacy while maintaining verifiability. Furthermore, a better user experience and easier adoption can be achieved by integrating the blockchain system with current administrative and educational platforms. Investigating permissioned blockchain networks may also improve security and performance. Last but not least, improving the user interface and adding more audit trail capabilities can make the system more transparent and user-friendly for administrators and auditors while guaranteeing its stability and dependability in practical implementation.

## VII. REFERENCES

[1] W. Wang, J. Liu, and F. Zhang, "Enhancing privacy and scalability in blockchain-based online examination systems using AI and zero-knowledge proofs," *Proc. Int. Conf. on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)*, pp. 715–716, 2024.
[2] R. Patel, A. Kumar, and S. Shah, "Scalable and cost-efficient online exam system using consortium blockchain and multi-signature smart contracts," *Proc. Int. Conf. on I-SMAC*, 2023.
[3] S. Kumar and V. Sharma, "Smart contract-based automation for secure online examination," *IEEE Access*, vol. 10, pp. 11845–11854, 2022.
[4] L. Chen, H. Zhao, and J. Wu, "Decentralized identity systems in blockchain for online examination authentication," *IEEE Transactions on Learning Technologies*, vol. 15, no. 2, pp. 105–113, 2023.
[5] R. Gupta and R. Nair, "Blockchain-based academic record verification system," *Journal of Blockchain Research*, vol. 7, no. 3, pp. 88–97, 2022.
[6] T. Tapas, "Addressing scalability in blockchain-based online exams using IPFS and Layer-2 solutions," *International Journal of Computer Applications*, vol. 183, no. 25, pp. 33–38, 2021.
[7] K. Al-Bassam, "SCPKI: A smart contract-based PKI and identity system," in *Proceedings of the ACM Workshop on Blockchain, Cryptocurrencies and Contracts (BCC'17)*, pp. 35–40, 2017.
[8] S. Sharma and R. Mahajan, "Design and implementation of a secure online examination system using Ethereum," *Proc. IEEE Int. Conf. on Computing, Communication, and Automation*, pp. 124–129, 2022.
[9] V. Tripathi, A. Mehta, and M. Singh, "Performance optimization in blockchain-based examination systems," *IEEE International Symposium on Smart Education Systems (ISSES)*, pp. 42–47, 2023.
[10] M. Hasib and R. Ahsan, "Parallel processing in blockchain-based academic applications," *IEEE International Conference on*

*Education Technology and Blockchain (ETB)*, pp. 99–104, 2023.
[11] A. Khurana, B. Roy, and R. Jain, "Consensus algorithms in academic blockchain: A performance perspective," *IEEE Communications Surveys & Tutorials*, vol. 24, no. 1, pp. 88–105, 2023.
[12] K. Christidis and M. Devetsikiotis, "Blockchains and smart contracts for the Internet of Things," *IEEE Access*, vol. 4, pp. 2292–2303, 2016.
[13] P. Saini, K. Rathi, and M. Sharma, "Blockchain-based secure question paper distribution and access control mechanism," *Proc. IEEE Conf. on Information Security*, pp. 95–101, 2021.
[14] A. Grech and A. F. Camilleri, "Blockchain in education," *Joint Research Centre (JRC) of the European Commission*, EUR 28778 EN, 2017. [Online]. Available: https://publications.jrc.ec.europa.eu
[15] H. Singh and A. Tripathi, "Smart contracts and blockchain in education: Automating certification and evaluation," *IEEE Transactions on Education Technology*, vol. 14, no. 4, pp. 257–266, 2023.