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## DECENTRALIZED EXAMINATION PLATFORM FOR SECURE QUESTION PAPERS

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### ABSTRACT

The increasing incidents of examination paper leakage and unauthorized data manipulation in centralized systems pose a serious threat to the integrity of academic assessments. Traditional centralized databases are vulnerable to hacking, insider threats, and tampering by privileged users, making them unreliable for secure question paper management. To address these challenges, this project proposes a decentralized examination platform using blockchain technology for secure and tamper-proof storage of question papers. The system leverages blockchain's inherent features such as immutability, transparency, and cryptographic security to ensure that once data is stored, it cannot be altered without detection. Smart contracts developed using Solidity are utilized to manage user authentication, question storage, and student performance tracking. Due to blockchain's storage limitations, the system integrates the InterPlanetary File System (IPFS) to store question papers, while only the corresponding hash values are stored on the blockchain, ensuring efficient and secure data

handling. The platform supports multiple user roles including admin, teacher, and student, each with specific functionalities such as user management, question uploading, exam

participation, and result evaluation. Any attempt to tamper with stored data results in hash mismatches, enabling immediate detection of unauthorized changes. Experimental implementation demonstrates that the proposed system ensures secure, transparent, and reliable examination management. This approach significantly enhances data integrity, prevents question leakage, and builds trust in digital examination systems, making it highly suitable for modern educational institutions.

**Keywords :** *Blockchain, Decentralized System, Examination Security, Smart Contracts, IPFS, Data Integrity, Tamper Detection, Ethereum, Secure Question Paper, E-Learning System*

### I. INTRODUCTION

The integrity of examination systems is a critical aspect of the education sector, as it directly impacts the credibility of academic institutions and the fairness of assessments. In recent years, there have been numerous incidents of question paper leakage and unauthorized access due to vulnerabilities in centralized systems. Traditional examination management systems rely on centralized databases, which are prone to hacking, insider threats, and data manipulation by privileged administrators. These limitations highlight the need for a more secure and transparent system that can ensure the confidentiality and integrity of question papers.

With the emergence of blockchain technology, new possibilities have arisen for building secure and decentralized applications. Blockchain provides a distributed ledger system where data is stored in blocks linked through cryptographic hash functions. Once data is recorded on the blockchain, it becomes immutable and tamper-proof, making it highly suitable for applications requiring high security and transparency. Additionally, blockchain allows only authorized users to access the system, ensuring controlled and secure data sharing. Smart contracts further enhance

functionality by automating processes such as user authentication, data storage, and retrieval without the need for intermediaries.

In this project, a decentralized examination platform is proposed to securely manage question papers using blockchain and IPFS technologies. The system integrates Ethereum-based smart contracts for managing users, storing hash values, and tracking student performance, while IPFS is used to store actual question data. The platform includes modules for admin, teacher, and student roles, ensuring proper access control and functionality. This approach not only prevents data tampering and leakage but also enhances transparency and trust in the examination process, making it a robust solution for modern digital education systems.

## II SURVEY OF RESEARCH

### 1. Centralized Examination Systems and Their Limitations

Traditional examination systems are primarily based on centralized architectures where question papers and student data are stored in a single database. Research indicates that such systems are highly vulnerable to cyber-attacks, insider threats, and unauthorized data manipulation. Administrators with high-level

access can alter or leak sensitive information, compromising the integrity of examinations. Additionally, centralized systems suffer from single points of failure, where system crashes or attacks can disrupt the entire process. These limitations have driven the need for more secure and decentralized solutions to ensure data integrity and prevent malpractice.

## **2. Blockchain Technology in Data Security**

Blockchain technology has emerged as a powerful solution for secure data management due to its decentralized and immutable nature. Research shows that blockchain stores data in blocks linked through cryptographic hashes, making it nearly impossible to alter data without detection. Each transaction is verified and recorded across multiple nodes, ensuring transparency and security. Blockchain has been successfully applied in areas such as finance, healthcare, and supply chain management. Its ability to provide tamper-proof storage makes it highly suitable for applications like examination systems where data integrity is critical.

## **3. Smart Contracts for Automation**

Smart contracts are self-executing programs deployed on blockchain networks that automate processes without human intervention.

Research highlights that smart contracts improve efficiency, reduce errors, and enhance security by eliminating intermediaries. In the context of examination systems, smart contracts can be used to manage user authentication, store question metadata, and record student performance. They ensure that all operations are executed according to predefined rules, preventing unauthorized actions. This project utilizes smart contracts to manage system functionalities securely and efficiently.

## **4. InterPlanetary File System (IPFS) for Data Storage**

IPFS is a decentralized storage system designed to store and share large amounts of data efficiently. Research indicates that IPFS uses content-based addressing, where each file is identified by a unique hash value. This ensures data integrity and prevents duplication. Blockchain systems have limited storage capacity, making IPFS an ideal solution for storing large files such as question papers. By storing only the hash value on the blockchain and the actual data on IPFS, systems can achieve both efficiency and security. This project integrates IPFS with blockchain for optimized data storage.

## 5. Blockchain in Education Systems

Recent studies have explored the use of blockchain technology in education for applications such as certificate verification, student records management, and online examinations. Blockchain ensures transparency, authenticity, and security in academic processes. Research shows that blockchain-based systems can prevent fraud and unauthorized modifications, making them suitable for secure examination platforms. However, challenges such as scalability and implementation complexity need to be addressed. This project contributes to this domain by proposing a blockchain-based solution specifically for secure question paper management.

## 6. Security and Privacy Challenges in Blockchain Systems

While blockchain provides strong security features, research highlights certain challenges such as scalability, transaction speed, and privacy concerns. Public blockchains may expose transaction details, raising privacy issues. Additionally, integrating blockchain with existing systems can be complex. Various solutions such as private blockchains and hybrid architectures have been proposed to address these challenges. This project adopts a

practical approach by combining blockchain with IPFS and role-based access control to ensure both security and usability in the examination system.

## III. WORKING METHODOLOGY

The proposed decentralized examination platform begins with user registration and authentication, where different roles such as admin, teacher, and student are created and managed securely. The admin is responsible for adding authorized users into the system, and all user details are stored on the blockchain using smart contracts. Each transaction is recorded as a block with a unique hash, ensuring data integrity and transparency. Once users are registered, teachers can log in to the system and upload question papers. Due to the storage limitations of blockchain, the actual question data is stored in the InterPlanetary File System (IPFS), while the generated hash value of the stored data is recorded on the blockchain. This ensures secure and efficient storage of question papers.

In the next phase, smart contracts developed using Solidity are deployed on the Ethereum blockchain to manage all system operations. These contracts define functions for adding users, storing question metadata, retrieving

question papers, and recording student performance. When a teacher uploads a question paper, the system stores it in IPFS and records the corresponding hash on the blockchain. During retrieval, the system verifies the hash to ensure that the data has not been tampered with. Students can log in to the system, access the exam, and submit their answers. The system automatically evaluates responses and records marks on the blockchain, ensuring transparency and immutability.

Finally, the system provides result analysis and monitoring features for all users. Students can view their scores along with correct and incorrect answers, while teachers and admins can monitor overall performance and question details. Any attempt to alter stored data results in a mismatch of hash values, immediately detecting tampering. The integration of blockchain, IPFS, and smart contracts ensures a secure, transparent, and decentralized examination system. This methodology eliminates the risks associated with centralized systems and provides a reliable solution for managing digital examinations.

#### IV RESULTS EXPLANATIONS

Across nation many states are suffering from issues of exam paper leakage because of

centralized server paper management.

Centralized server database can be easily hacked, leaked or tamper by experienced database administrator and currently no tool exists to detect such database manipulation.

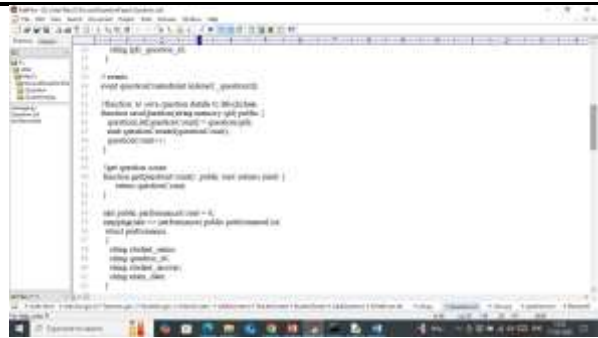
To overcome from above issue we are proposing concept of managing exam paper in Blockchain server. Blockchain has inbuilt support for data security, tamper proof and secured data storage. Blockchain store each record as transaction/block and associate each block with unique hashcode and this hashcode will get verify for subsequent block storage, if any block tamper then result into mismatch hashcode and data tamper will get detected. Blockchain allow only authenticated user to access or view data. Currently no way exists to hacked or alter Blockchain data.

To manage MCQ question paper in Blockchain we have designed following modules which can run by different users such as Admin, Teacher and Student

- 1) Admin: admin can login to system using username and password as 'admin and admin'. After login admin can Add New users such as Teachers and students. Admin can view all questions added to Blockchain and can view marks obtained by each student

- 2) Teacher: teacher can login to systems and then store questions in Blockchain. Blockchain designed to store small amount of data so we are saving all questions to IPFS and its storage hashcode address will get saved in Blockchain. Later we can retrieve questions from IPFS by getting its hashcode from Blockchain. Teacher can view all students marks
- 3) Student: student can login to system and then write exam and can view obtained marks along with correct answer and his given answer.

Blockchain can store and retrieve data using SMART CONTRACTS which can be designed using SOLIDITY programming. This contract contacts functions which can be called from any programming language to save and get data from Blockchain. To manage question paper we have designed following smart contract



In above smart contract code we define functions to manage students and teacher details along with question paper and student performance. Now we need to deployed above contract to Ethereum using below steps

First go inside 'hello-eth/node-modules/bin' folder and then look and double click on 'runBlockchain.bat' file to start Ethereum and then will get below page



In above screen Ethereum started with default account and private keys and now type command as 'migrate' and then press enter key to get below page



In above screen in white text can see ‘Question’ contract deployed and got contract address and this address can be specified in Python code to call above contract. In below screen showing python code calling above contract



In above screen read red colour comments to know about contract calling using contract address. In above black console we have seen contract deployed and running successfully and let it run till you execute code.

Now double click on ‘Start\_IPFS.bat’ file to start IPFS server and then will get below page

In above screen IPFS server started and let it run till execute code.



In above screen student will select correct answer radio button and then press ‘Submit’ button to get below page



In above screen in exam student got 66% marks and now click on ‘View Marks’ link to get below page



In above screen student can see question along with correct answer and his answer and if both answers are correct then student will get 1 mark else 0. Now logout and login as 'admin' to view question and marks

## V. CONCLUSION

The proposed decentralized examination platform provides a robust and secure solution to address the challenges of question paper leakage and data tampering in traditional centralized systems. By leveraging blockchain technology, the system ensures immutability, transparency, and tamper-proof storage of critical examination data. The integration of smart contracts automates key functionalities such as user management, question storage, and result evaluation, reducing human intervention and minimizing errors. Additionally, the use of IPFS for storing question papers enhances efficiency while

maintaining data integrity through hash-based verification. The system successfully supports multiple user roles, including admin, teacher, and student, ensuring controlled access and smooth operation. Experimental results demonstrate that the platform effectively prevents unauthorized modifications and detects any tampering attempts instantly. Overall, this project highlights the potential of blockchain in enhancing the security and reliability of examination systems, making it a suitable solution for modern digital education environments.

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