

ParikshaPath: Online Examination and Evaluation System

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An online exam system software platform called ParikshaPath was created to help businesses or educational institutions organize, conduct, and monitor exams in a virtual setting. It makes it possible to conduct tests via intranets, local area networks, or the Internet. Traditional manual examination techniques sometimes face problems such as difficult record filtering, filing barriers, and processing result delays. Additionally, there is a significant chance of data loss, and retrieving records can be difficult. These kinds of systems take a lot of time and work to maintain. One essential element of contemporary e-learning systems is online testing. They offer speed, and efficiency, and significantly reduce the use of physical resources. The examination system discussed here is web-based. This paper outlines the core principles of the system, highlights its main features, explores the algorithm for auto-generating test papers, and examines the system's security aspects.

Keywords— Online Examination and Evaluation system, Mutual Authentication, Client Server Architecture, Browser Server Architecture

I. INTRODUCTION

Many academic establishments and corporations have visible massive increase in e-studying withinside the contemporary-day era. The number one gain of on line studying is that it is able to be accessed with the aid of using all and sundry of all ages, no matter their location, time, or age [1]. A digital software is the Online Examination System. This framework will help the university or organization in comparing the inquiry and offer numerous alternatives with a unmarried accurate reaction. The on line check may be administered with the aid of using the university or organization, and the consequences may be said in some days. The inquiry paper is created with the aid of using the exam office, and it's miles absolutely secure [2].

Students can get right of entry to the net exam framework remotely. It enables the inspector with the aid of using lessening the workload related to administering assessments, reviewing reaction sheets, and producing consequences. The device completes all of those tasks. Every piece of statistics is saved at the server.

Additionally, Clients can get right of entry to those databases and take assessments. In this case, a customer-server technique is employed. Executives offer understudies and teachers with get right of entry to. Understudies with understanding of the framework could be capable of

administer assessments. Exam segments are available in varieties: exercise and real assessments. Both assessments may be administered with the aid of using understudies. The accurate reaction could be indicated with a number of shades. Following take a look at submission, the consequences could be generated, tested primarily based totally at the findings, and despatched to each understudy.

The conventional approach of e-examination desires devoted exam facilities along side computer systems for undertaking the tests. Moreover, to offer security features in the course of the examination, safety regulations want to be framed for undertaking the examination. Here, the scholars use the configured gadget setup for writing their examination, which makes use of the safety coverage that in no way adjustments for the duration of the examination. Rather dynamic safety coverage have to be enforced for undertaking the e-tests if the student writes the examination via a tool which include a computer.

II. LITERATURE REVIEWS

The transition from conventional pen-and-paper examinations to on-line exam structures has turn out to be an increasing number of applicable in instructional institutions, pushed with the aid of using improvements in data and conversation technologies. This literature overview synthesizes key studies findings associated with the development, implementation, and assessment of stable on-line exam structures. E-learning to know has received sizable traction because of its potential to offer bendy getting to know possibilities throughout diverse demographics.

The PraikshaPath serves as a vital platform for gaining access to instructional content, allowing college students to research at their very own tempo and convenience. However, the effectiveness of e-learning to know hinges on strong evaluation mechanisms, which necessitate stable on-line exam structures to assess pupil overall performance accurately.

MTestM [10], a cellular utility is broadly used for developing query papers after which sharing it to applicants for examination. However, there's no time restriction at the exams, no report of ways the candidate is giving examination and no authenticity whether or not the appropriate candidate has submitted examination.

Traditional strategies frequently require devoted exam centers, which may be bulky and inflexible. Recent research endorse dynamic protection rules that adapt primarily based totally at the tool utilized by college students, making sure stable get admission to and integrity for the duration of assessments. Various authentication strategies had been explored, consisting of QR-code primarily based totally structures, NFC-enabled identification cards, and biometric verification which includes fingerprint scanning and face detection[7],[8],[9].

III. METHODOLOGY

A. System Architecture

Three stages make up the proposed work: the registration phase, the authentication phase, and the online exam phase. Students are given the opportunity to finish the registration process in order to receive a user name, password, and unique secret key. Students can participate in the online exam system during the authentication phase by completing the mutual authentication process. Each student receives a set of questions from the server during the online exam phase, completes them, and sends their responses back to the server. Fig. 1 depicts the communication flow for mutual authentication between the student and the server.

1. Registration

Each university or organization will establish a registration center. Students intending to take the exam must visit the registration center in person to obtain a QR code-based hall ticket and a device required for participating in the online examination system. The hall ticket, secured with a QR code, includes essential details such as the student's registration number, name, device ID, subject and a unique secret key(private key).

2. Authentication

During the authentication process, students use the device provided by the registration center to scan their QR code-based hall ticket. The student ID (S_i), device ID (D_i), and unique secret key (K_i) are retrieved from the QR code once it has been scanned. The $\{S_i, D_i\}$ is then encrypted using the secret key (K_i) and a time stamp (TS).

Each student's unique secret key (K_i), listed in Table 1, is stored in the server's database. To decrypt the message sent from the student's side, the server retrieves the corresponding secret key (K_i) from the table.

The student ID (S_i) inside the decrypted message and the student ID (S_i) outside the message are compared by the server once the contents have been dumped. In the event that both student IDs are the same, the server creates a session key (K_s), encrypts it with a special secret key (K_i), and transmits it to the student together with the server IDs (ID_s) and the updated Time Stamp (TS_2).

Upon receiving the message from the server, the student decrypts it using K_i and verifies the server ID along with the incremented timestamp. After successfully obtaining the session key from the server, the student responds with an acknowledgment by encrypting the timestamp (TS_3).

3. Online Examination

In this stage, the server uses the session key provided in the equation to encrypt the exam question paper when mutual authentication is finished.

E K_s {Exam question paper}

The session key (K_s), which the students are aware of, can be used to decrypt the encrypted question paper they received. The students will now use the interactive and customized device to write their tests. The gadget is simple to use and intuitive. Students can write their responses using various colors and highlight their words using the graphics tool. This improves the responses that the student has written in terms of appearance.

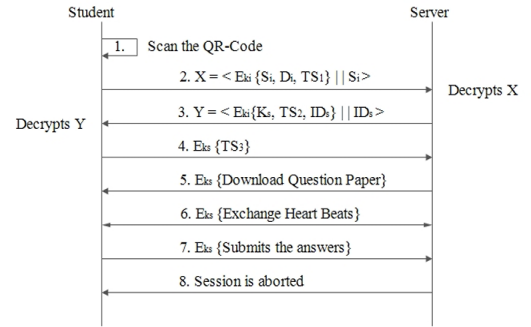


Fig. 1. Mutual verification during the online test

Students know the session key (K_s), which they can use to decrypt the encrypted the question paper they found. Students will now use the interactive and customized device to write their tests. The gadget is simple to use and intuitive. Students can write their responses using various colors and highlight their words using the graphics tool. This makes the student's responses more aesthetically pleasing.

Enforcing security regulations is necessary to stop students from acting inappropriately when taking exams. Following the download of the question paper, the server disables Wi-Fi by enforcing particular security rules, as explained in [6]. This is done to stop pupils from acting inappropriately during the online test. To make sure the student doesn't break the rules or act inappropriately during the test, the server and the student now exchange the heartbeat signal. Each student's system has an agent program that runs in order to exchange the heartbeat signal at regular intervals in the order of seconds. The student system sends the server a heartbeat signal to indicate that it is "alive."

After completing the exam, the student's responses are encrypted with the session key and transmitted to the server, as shown in Figure 1.

Following the submission of the answers, the student logs out of the online exam system and the session is closed. Ontology generation is performed for the instructor-provided answer keys and the student-submitted answers during the online exam in order to evaluate the students' performance. In order to evaluate the student's performance, ontology alignment between the two ontologies is then carried out, as described in our earlier work [11]. The actual evaluation, as described in our work, will also be carried out based on this assessment.

B. Annotation Process

In fig.2, titled "Online Examination Homepage", illustrates the main page of an online examination system. It highlights the system's mission and vision, emphasizing the reduction of paperwork and ensuring quick, accurate results. The top navigation bar provides access to key sections, including Admin, Sign In, Sign Up, Teacher, Services, and more. The mission statement focuses on the system's goal of using a single platform for examinations, while the vision emphasizes its role in promoting eco-friendliness, cost efficiency, and modern technology adoption.

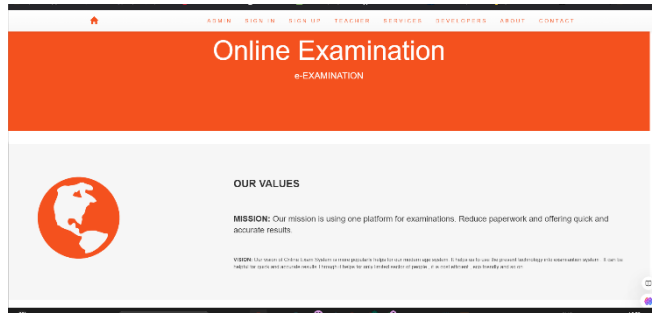


Fig. 2. Online Examination Homepage

In Fig.3, titled "Student Dashboard Overview", displays the dashboard interface for a logged-in student. The figure contains a structured table listing various quiz topics, along with relevant details such as the total number of questions, marks, positive and negative scores, and time limits. Each row represents a unique quiz, and a green "Start" button is provided for beginning the selected quiz. Additionally, completed topics are marked with a checkmark for user convenience, such as Topic Q1, which is highlighted.

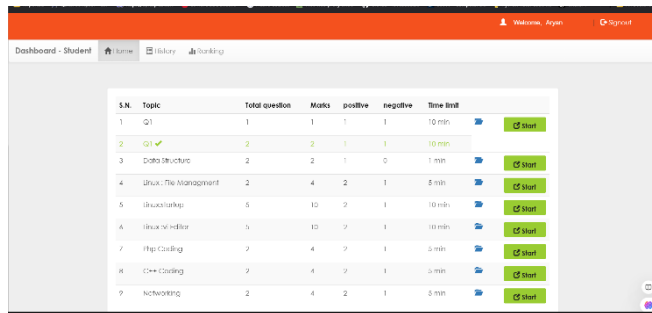


Fig. 3. Student Dashboard Overview

In Fig.4, titled "Question Window During Examination", presents the examination interface where candidates are prompted with questions. In this example, the question asks, "What is the command for changing user information?" The interface includes multiple-choice options, such as Usermod, Useradd, Useralter, and Groupmod, along with a "Submit" button for answer submission. This figure demonstrates the seamless functionality of the examination system, focusing on user-friendly navigation and a clean design to facilitate smooth exam completion.

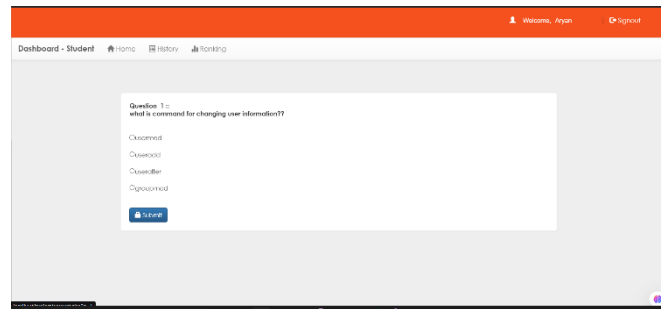


Fig. 4. Question Window During Examination

C. Experimental analysis

Survey questions were designed separately for students and faculty to evaluate the experiments with the online testing system. These questions were posed to ten instructors from the Department of Computer Science at the KIET Group Of Institution, Ghaziabad, as well as 60 students studying in the same department. The questions were scored on a five-point scale: strongly agree (5), agree (4), neutral (3), disagree (2), strongly disagree (1). Tables 1 and 2 contain survey questions for students and faculty members [12].

Q. No	Questions
1.	I prefer taking exams online instead of writing them on paper.
2.	I feel at ease with taking exams online.
3.	Online exams provide a more effective way to assess performance.
4.	Online exams are effective in preventing malpractice.

TABLE 1. FEEDBACK QUESTIONS FOR STUDENT

Q. No	Question
1.	I prefer conducting exams online instead of having students write them on paper.
2.	Conducting exams online helps save time effectively.
3.	Online exams improve the process of evaluating students' answers.
4.	Students are likely to provide favorable feedback for the examination system.
5.	The Examination System is user-friendly.

TABLE 2. FEEDBACK QUESTIONS FOR INSTRUCTORS

D. ER diagram

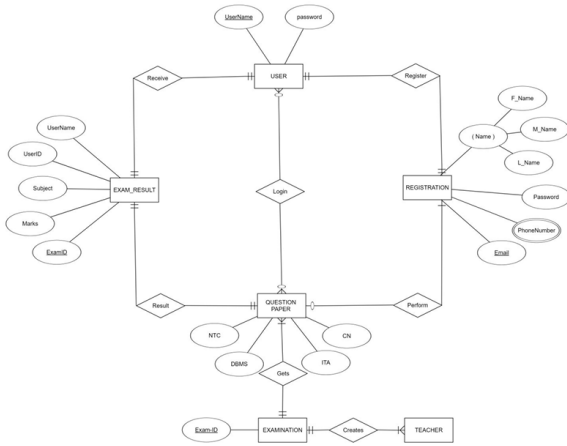


Fig. 5. ER diagram of online examination and evaluation system

E. Security and Privacy Outcomes

Data Privacy: Online examination systems are designed with a strong emphasis on preserving candidate privacy while ensuring the integrity of the examination process. The system collects only minimal personally identifiable information (PII)—typically the candidate's email address and unique roll number. The possibility of privacy violations is reduced by this restricted data acquisition.

Crucially, absolute secrecy is maintained as only the candidate is aware of this PII. Only after completing the appropriate authentication procedures and using the candidate's unique roll number can evaluators access streaming data pertaining to that particular candidate. The audio and video recordings made during the test are safely kept and used only to confirm the legitimacy and identity of the candidates. In keeping with ethical data practices and protecting candidate privacy, these recordings are never used again.[14]

Data Security: Advanced security measures are put in place at several levels to safeguard private data and guarantee system integrity. All transferred and stored data is protected by encryption algorithms, which effectively exclude the possibility of unauthorized parties accessing or altering the data. Only authorized staff members, like administrators and assessors, are able to view particular data pertinent to their positions thanks to role-based access restriction.

Recorded and live streaming data cannot be intercepted when secure transmission channels are used. Audit trails also keep an eye on system interactions and access, guaranteeing transparency and accountability in data processing. In order to comply with strict data retention policies and privacy regulations, backup systems are used to guard against data loss.

By combining these robust privacy and security measures, online examination systems provide a reliable and secure environment that maintains the confidentiality, integrity, and ethical use of candidate data, fostering trust among users and stakeholders. This comprehensive approach makes these

systems a credible alternative to traditional examination processes.

F. Challenges and Improvements

- **Flexibility in Exam Location:** Candidates can take the exam from any location, and evaluators can monitor them either live or post-exam.
- **Adaptability for Academic Uncertainty:** This system could become a widely-used standard for online examinations, reducing logistical complexities in exam administration.
- **Handling Interruptions:** The system is designed to manage disruptions from both the candidate's side (e.g., device issues, power failure) and the evaluator's side (e.g., server issues), ensuring a more reliable and trustworthy examination process.
- **User Engagement:** Engaging users for feedback remained a challenge initially. Implementing gamification elements and periodic check-ins improved user response rates and engagement.
- **Data Privacy Concerns:** Addressed user concerns about data privacy through transparent communication and robust security measures, leading to increased trust in the platform.

G. Future Trends in Online Examination Technologies

By improving security, scalability, and interaction, emerging technologies like blockchain and virtual reality (VR) have the potential to completely change how online exams are administered in the future.

Smart contracts may automate crucial tasks like result posting and verification, while blockchain provides transparent record-keeping and tamper-proof storage, allowing for immutable recording of examination results and procedures. In disciplines like engineering and medicine, virtual reality (VR) can help with practical skill evaluations and replicate authentic testing conditions. These systems are further enhanced by artificial intelligence (AI) through automated grading through Natural Language Processing (NLP), adaptive testing, and sophisticated fraud detection.

Biometric authentication techniques, such as speech analysis and facial recognition, improve identity verification and stop imitation. Scalability offered by cloud-based technologies allows for extensive analyses with little interruption.

When combined with VR and AI, gamification can increase test engagement without sacrificing rigor. Quantum encryption has the potential to protect examination data from future cyber threats, while blockchain-based authentication guarantees instantaneous and forgery-proof certificate verification.

In order to meet changing institutional and educational needs, these technologies—along with developments in edge computing and data analytics—are forming a future in which online exam systems are more immersive, flexible, and safe.

IV. CONCLUSION

This research proposes a simple interaction to enable mutual authentication between students and the server. Furthermore, the online examination system securely distributes question papers and collects answers from students. Future enhancements could include implementing dynamic network policies within the system to prevent cheating during online exams.

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