International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 12 | Dec - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Design and Implementation of a Secure Web-Based Online Examination System using MVC Architecture

Ritesh Vilas Amrutkar[1], Rutik Bhagwan Bhere[2], Rakesh Nitin Pawar[3], Rohan Yeshwant Patil[4], Dr. Swarupa Wagh(Guide) HOD-AIML[5]

Department of Computer Engineering
Atma Malik Institute of Technology &Research (AMRIT) Mohili -Aghai, Shahapur, India 421601

Abstract - The Online Exam Portal is a comprehensive web-based application developed using the CodeIgniter framework, designed to streamline and automate the entire process of conducting examinations. Traditional examination methods often involve significant manual effort in scheduling, administering, and evaluating tests, which can be time-consuming, error-prone, and lack transparency. This system addresses these challenges by providing a secure platform with multiple functionalities, including user authentication, role-based access control, exam scheduling, question management, automated evaluation, and result generation. Additionally, it supports diverse question formats such as multiple-choice, descriptive, and true/false questions, enabling flexible assessment strategies. By automating routine administrative tasks, the system enhances efficiency, minimizes human errors, and ensures fairness and transparency in the evaluation process. The report elaborates on the motivation behind developing the system, a detailed literature survey, the overall system design, implementation methodologies, experimental results validating system performance, and potential directions for future enhancement, such as integrating AI-based assessment and advanced analytics. This project not only serves educational institutions but can also be adapted for corporate training and certification programs.

Keywords: Online Examination, Web-based Application, CodeIgniter, Automated Evaluation, Exam Scheduling, Question Management, Result Generation, User Authentication, E-learning, Educational Technology.

1. INTRODUCTION

Online exam or testing system has proved to be a necessary component of the existing education system. Due to the ever-escalating growth trend of the uses of information and communication technology, the education sector is witnessing a gradual shift from physical or paper-based tests to online tests. The conventional test or exam system is a time-consuming process, covering numerous activities like preparation, organization, conduct, assessment or evaluation, and declaration of results.

The issue with the conventional examination process is solved by online exam systems. However, the existing online exam systems suffer from certain disadvantages with respect to the issue of scalability, security, effective management for the large number of questions in the question bank, as well as effective assessment. The issue with unauthorised access, impersonation, manipulation, as well as ineffective management of the results also creates a problem for the large-scale exam systems.

Taking into consideration the above-mentioned difficulties, the topic that I wish to address, or rather, the theme of this paper, is the design & development of the Online Examination System using CodeIgniter, which is an open source web framework that follows the Model View Controller design paradigm. The proposed system will provide a controlled and role-based interface wherein administrators will be able to manage the examination process, the faculty members will be able to design the examination, and the students will be able to attempt the examination.

The prime objectives that are intended to be met by conducting this research work are aimed at increasing examination transparency, minimizing human handling, supporting safe user logins, as well as designing a scalable system that can be applied not only to academic environments, but to training environments as well. The system at hand is more interested in modularity; hence, it is quite suitable for implementation based on diverse environments. The system at hand presents a foundation for improvement techniques such as AI-based e-proctoring, analytics, as well as mobile support.

2. Literature Review

Online examination systems have been widely studied to improve efficiency, security, and accessibility in academic assessments. Atoum et al. proposed an automated online proctoring system that utilises multimedia analytics to detect suspicious behaviour during examinations. While effective in enhancing exam integrity, such systems require additional hardware and high computational resources, limiting their applicability in smaller institutions.

Kaiiali et al. introduced a Secure Exam Management System (SEMS) for mobile learning environments, focusing on confidentiality and integrity of examination data. Although the system improved security, its complexity increased deployment and maintenance overhead.
Garg et al. presented a convolutional neural network-based virtual examination controller for real-time monitoring. Despite improved cheating detection, AI-driven approaches often involve privacy concerns and increased implementation costs.

Several web-based examination platforms emphasise automation and result processing; however, many lack modular architecture, role-based access control, or scalability for handling large numbers of users and questions.

Research Gap Identification:

Existing solutions either prioritise advanced security mechanisms with high computational cost or provide basic automation without focusing on system maintainability and scalability. There is a need for a lightweight, modular, and scalable online examination system that balances automation, security, and ease of deployment. The proposed MVC-based Online Examination System addresses this gap by offering role-based access control, automated evaluation, and a maintainable architecture without requiring specialized hardware.

3. System Design and Methodology

3.1 System Overview

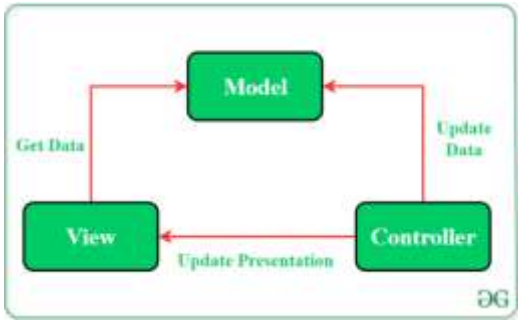
The Online Examination System is a centralized web-based platform designed to automate the complete examination lifecycle. The system allows administrators to manage institutional data, teachers to create and conduct examinations, and students to attempt exams through a secure interface. All examination-related data is stored and processed using a centralized database, ensuring data consistency and integrity.

The system is developed using the CodeIgniter PHP framework due to its lightweight nature, security features, and support for MVC architecture. This design approach improves maintainability and scalability while enabling efficient system upgrades in the future.

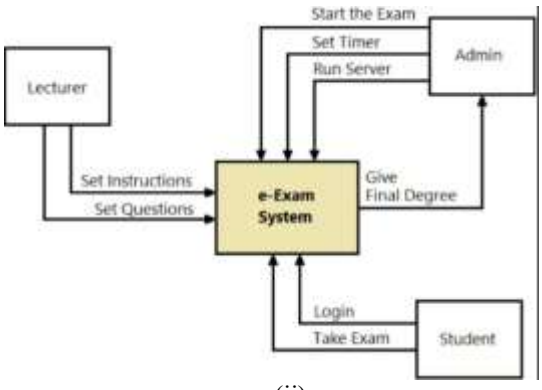
3.2 System Architecture

The proposed system follows the **Model–View–Controller (MVC)** architecture:

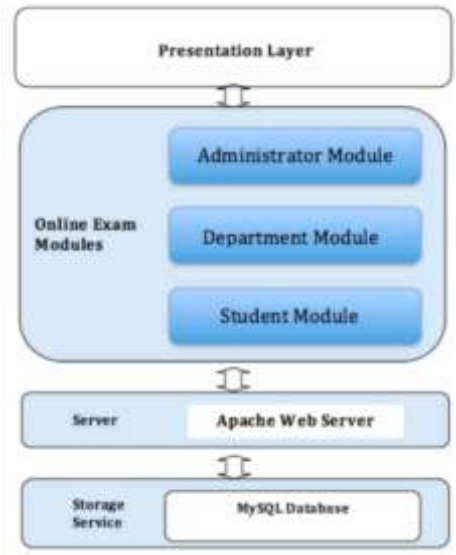
- **Model**: Handles database operations such as user management, question banks, exam schedules, and results.
- **View**: Provides the user interface developed using HTML, CSS, JavaScript, and Bootstrap.
- **Controller**: Manages application logic and user requests, acting as an intermediary between the Model and View.



(i)



(ii)



(iii)

Fig. 1. Architecture of the Proposed Online Examination System (includes all (i), (ii) and (iii))

This architectural approach ensures separation of concerns, making the system modular, secure, and easy to maintain.

3.3 Functional Modules

I. Administrator Module

The administrator module provides complete control over the system. It allows administrators to manage departments, courses, classes, users, examinations, and system settings. Administrators can create exams, assign teachers, and monitor overall system activity to ensure smooth examination operations.

II. Teacher Module

The teacher module enables faculty members to create question banks, design exams, schedule assessments, and analyse student performance. The system supports multiple question types such as multiple-choice and true/false questions, enabling flexible assessment strategies.

III. Student Module

The student module allows students to securely log in, view scheduled examinations, attempt exams within the allocated time, and receive instant results. The user-friendly interface ensures ease of use and transparency throughout the examination process.

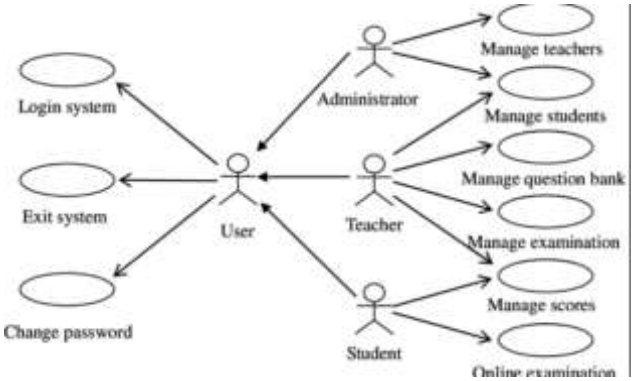


Fig. 2 Use Case Diagram of Online Examination System

3.4 Examination Workflow

The examination workflow follows a structured sequence:

1. Secure user authentication
2. Exam creation and scheduling
3. Student exam participation
4. Automated evaluation
5. Instant result generation

This workflow reduces administrative workload and ensures fair and accurate assessment.

4. Experimental Evaluation and Discussion:

The proposed system was evaluated under multiple user scenarios to assess its performance, reliability, and usability. Administrators, teachers, and students accessed the system concurrently to simulate real-time examination conditions. The system successfully handled simultaneous logins, examination submissions, and result processing without performance degradation.

4.1 Experimental Evaluation and Results

The system was tested under multiple user scenarios to evaluate performance and reliability. Administrators, teachers, and students accessed the system simultaneously to simulate real-time examination conditions. The system successfully handled concurrent users, ensured secure authentication, and generated results instantly.

Comparative Analysis

Table 1. Comparison Between Traditional and Online Examination Systems

Parameter	Traditional Exam	Proposed System
Result Declaration	Days/Weeks	Instant
Human Error	High	Minimal
Scalability	Low	High
Transparency	Limited	High

The results demonstrate that the proposed system significantly improves efficiency and accuracy compared to traditional examination methods.

4.2 Discussion and Remarks

The implementation of the Online Examination System highlights the advantages of web-based assessment platforms in modern education. The use of MVC architecture enhances system modularity and security. While the system efficiently handles objective-type assessments, future enhancements such as AI-based proctoring and descriptive answer evaluation can further improve system robustness.

5. Conclusion and Future Work

This paper presented the design and implementation of a secure web-based Online Examination System developed using MVC architecture. The proposed system automates examination management, reduces administrative effort, minimizes evaluation errors, and ensures transparency in result processing. Experimental results confirm that the system performs efficiently under concurrent user conditions and significantly improves result declaration time compared to traditional examination methods.

The system provides a scalable and cost-effective solution suitable for educational institutions and training organizations. Future enhancements include integration of AI-based proctoring mechanisms, support for descriptive answer evaluation, mobile application development, and implementation of advanced data encryption techniques to further enhance security.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all those who have supported and guided me throughout the development of the Online Examination System. First and foremost, I am deeply thankful to my project guide, **Dr. Swarupa Wagh**, for their invaluable guidance, encouragement, and constructive suggestions at every stage of this project. Their expertise and insights have been instrumental in shaping the design, implementation, and overall quality of this system.

I would also like to extend my appreciation to the faculty members and staff of the Computer Department for providing the necessary resources, technical support, and a conducive learning environment that made the successful completion of this project possible. Their encouragement and motivation played a significant role in overcoming the challenges encountered during the development process.

Special thanks to my peers and colleagues who offered their feedback, shared ideas, and provided assistance whenever needed. Their cooperation and support significantly contributed to the improvement and refinement of the system.

Finally, I am grateful to my family and friends for their constant encouragement, patience, and understanding throughout this project. Their unwavering support has been a source of strength and motivation.

This project has been a valuable learning experience, and I sincerely acknowledge the contribution of everyone who has played a part in its successful completion.

REFERENCES

[1] Y. Atoum, L. Chen, A. X. Liu, S. D. H. Hsu, and X. Liu — "Automated Online Exam Proctoring" — IEEE Transactions on Multimedia, 2017.
A multimedia analytics system for automatic proctoring (webcam + wear-cam, voice/text detection, gaze, phone detection). Semantic Scholar

[2] M. Kaiiali, A. Ozkaya, H. Altun, H. Haddad, M. Alier — "Designing a Secure Exam Management System (SEMS) for M-learning environments" — IEEE Transactions on Learning Technologies (TLT), 2016.
Architecture and security services for secure exam delivery (question distribution, anti-impersonation, integrity). UPCommons

[3] Garg et al. — "Convolutional Neural Network based Virtual Exam Controller", International Conference on Intelligent Computing and Control Systems (ICICCS), 2020 (IEEE conference proceedings).
Uses CNNs for visual monitoring / invigilation in online exams. IJISAE+1

[4] Ganidisastra & Bandung — "Incremental Training on Deep Learning Face Recognition for M-Learning Online Exam Proctoring" — IEEE Asia Pacific Conference on Wireless and Mobile (APWiMob), 2021.
Face-recognition incremental training methods applied to proctoring. IJISAE

[5] T. Potluri et al. — "An automated online proctoring system using attentive-net" (2023) — paper discussing face spoofing, head pose, and attentive-net approaches (published and indexed via PMC / related to IEEE TMM literature).
Practical attentive-net solutions for proctoring and anti-spoofing. PMC

[6] "Designing an advanced & secure blockchain framework for online examinations" — (2022/2023) — blockchain for exam paper confidentiality and audit trail (peer-reviewed article / ScienceDirect). Blockchain-based architectures to secure question distribution and immutability of results. ScienceDirect+1

[7] Haotian Li et al. — "A Visual Analytics Approach to Facilitate the Proctoring of Online Exams" (2021). Visual analytics to help human proctors review flagged video/mouse data; useful for scalable human+AI proctoring. arXiv

[8] Waheeb Yaqub et al. — "Image-Hashing-Based Anomaly Detection for Privacy-Preserving Online Proctoring" (2021).
Privacy-preserving anomaly detection using image-hashing to reduce video exposure while detecting suspicious movement. arXiv

[9] Systematic reviews and surveys of online exams and anti-cheating techniques (2016–2021 SLRs) — Several SLRs summarize features, trends and gaps in online exam systems (good for literature review background). Example: "A Systematic Review of Online Exams Solutions in E-Learning" (2020) and related SLRs. ResearchGate+1

Web Reference:

- https://www.**ibm**.com/developerworks/opensource/top-**projects**/php/
- www.research.**ibm**.com/labs/africa/**project**-lucy.shtml
- www.idc.**iit**b.ac.in/**projects**/student/**project**-areas.html
- www.**iit**r.ac.in/departments/ECE/pages/Academics+BTech_**Projects**.html
- www.**nic**.in/**projects**/government-eprocurement-solution-**nic**-gep**nic**-20
- http://www.projectinsight.net/project-management-basics/basic-project-managementphases
- CodeIgniter Documentation: https://codeigniter.com/userguide3/
- MySQL Documentation: https://dev.mysql.com/doc/
- PHP Official Manual: https://www.php.net/manual/en/
- Bootstrap Documentation: https://getbootstrap.com/docs/
- Research papers and articles on Online Examination Systems from IEEE Xplore and Google Scholar.

BIOGRAPHIES (Optional not mandatory)

1'st Author Photo

Description about the author1
(in 5-6 lines)