My Exam: A Web-Based Application for MCQ Type Online Examination

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Abstract- A Web Based Online Examination System is an effective solution for the college or institute to computerize the traditional way of conducting exams which can simplify the conduct of examinations and the generation of results. It is primarily designed and developed for students and teaching staff to manage their exams. This system is constructed using various open-source technologies: Angular, Spring Boot, and MySQL. In this system, users fall into two categories: teachers and students. Before using the system, faculty need to register, and after that, they must log in with their username and password to enter the system, whereas a student can directly login into the system with the details shared by the faculty via email. The system makes conducting tests more customizable. This gives easier access to the details of a student's test. The information is entered into a database, which the instructor can provide for each student. It can enable institutes to have automated checking based on the response from the candidate. The major objective of this online examination system project is to thoroughly and efficiently evaluate the student using a fully automated method that not only cuts down on the required time but also produces quick and precise results.

Indexed Terms- Web-based online Examination and Result generation system, Database, Multi-Instructor, Resumption Capability, Random Password Generator, Random Exam Code Generator.

I. INTRODUCTION

The most crucial procedure in every institute is the administration and evaluation of exams. Currently, this process is done manually, resulting in a massive effort and countless human errors. As a result, there is a lack of quality, a lot of paperwork that adds to the problem of unmanageable data, and a prolonged process that requires a lot of time and human resources [9]. To overcome the above-mentioned issues, A web-based online examination system is proposed. The online examination system is regarded as a rapidly developing examination method because of its accuracy and timeliness [10]. It takes less manpower to manage the examination. Organizations can easily follow the progress of the student they give through an exam. It helps reduce the paper requirement and workload of teachers. The purpose of this research paper is to discuss the development and implementation of an online examination system that is aimed at improving the efficiency, accuracy, and security of the examination process. The online examination system provides an automated and secure platform for conducting online assessments, tests, and quizzes, which eliminates the need for paper-based exams.

II. LITERATURE SURVEY

On the topic of an online examination system, numerous studies have been conducted. These studies can be summarized as follows:

The System of Intelligent Evaluation using Tests for Tele-Education (SIETTE) is an online examination system that was suggested by Guzman and Conejo [1]. A web-based platform called SIETTE is used to create and generate adaptive tests. By integrating adaptive student self-assessment exam questions with hints and feedback, it can be used to achieve educational goals. Secure login and portability features are supported by SIETTE. However, the following elements are absent:

the ability to resume lessons, multiple instructors, random question generation, random question distribution, and random choice distribution.

Exam Management System (EMS), a web-based online examination system, was suggested by Rashad et al [2]. EMS controls the testing process for students, assists with administering examinations, gathers answers, automatically grades submissions, and generates test-related reports. Secure login, multiple instructors, and portable capabilities are supported by EMS. Resumption capability, random question generation, random question distribution, and random choice distribution are absent from this feature set.

A web-based Online Non-choice-based Examination System (WONES) was proposed by Sheshadri et al [3]. WONES is a useful tool for large-scale educational evaluation; it makes use of unique authentication techniques to secure communications between the test server and the students. Secure login, portability, multiple instructors, and the dissemination of random questions are all supported by WONES. The other aspects, particularly the capacity to resume, the choosing of random questions, and the distribution of random choices, are absent.

An Online Examination System in Bangladesh Context was proposed by Islam et al [4]. OESBC is a web-based system that is effective, versatile, and flexible. In order to suit the demands of diverse Academic and Non-Academic organizations, OESBC can offer an open style of examination. Multiple choice questions of various categories are included in the test. The answers are reviewed, the marks earned are recorded in a database, and the results are immediately available to the examiner from the system in a variety of formats, including a general mark list and a ranking of participants. OESBC includes features like random question generation, multiple instructors, secure login, and portability. The other elements, such as the ability to resume, the distribution of random questions, and the distribution of random choices, are absent.

The Exam Cell Automation System was proposed by M. Selva Sudha and S. Priya Dharshini [5]. The primary goal of the initiative is to make the distribution of institute halls simpler. It also gives

students access to department-specific test information. The faculty and test coordinators of each department provide the data, which is then organized alphabetically in storage. The administrator makes any necessary modifications to the information regarding student information, exam timing, hall information, and available space in the hall. Now that department employees have provided the students with seating orders in the form of spreadsheets, an automated system will create those seating orders for them. By using a GUI or a database entry, the administrator will immediately input data about student grades into their spreadsheets.

An online Examination System with Integrated Learning Management System was suggested by S. R. Singh and P. Singh [6]. The goal of this project was to improve student engagement and learning results by introducing an online assessment system that incorporates a learning management system (LMS). The suggested approach gives students access to study materials and engaging elements like quizzes and discussion boards. To give pupils a more customized exam experience, the authors also suggested using adaptive testing. The system was able to enhance student engagement and learning outcomes, according to the authors' case study, which they used to assess the system's efficacy.

A cloud-Based Online Examination System was approached by S. Biswas et al [7]. This project suggested a scalable, cloud-based solution for online exams. Exam data is processed and stored by the system using cloud computing, making it simple to manage and access. Real-time analytics were also suggested as a method by the authors for analyzing student performance and pinpointing areas that needed work. The technology was able to increase the effectiveness and convenience of the exam, the author's case study of its usefulness revealed.

Secure Online Examination System Using Blockchain Technology was proposed by M. Raza et al [8]. The online exam system shown in this proposal employs blockchain technology to provide security and transparency. Exam results are stored by the system using a decentralized database, which makes sure they can't be tampered with or changed. The method was able to increase the security and dependability of the

exam, according to a case study the authors did to assess its efficiency.

III.   PROBLEM STATEMENT

Since manual test analysis is difficult and time-consuming, the old approach has numerous disadvantages. To examine many students, more observers are needed [10]. As computations are done manually, the results are not correct. In the existing systems, there is a higher risk of losing exam results. The manual nature of result checking and the cap on the number of students who can take a test at once make it time-consuming. With the advancement of information technology and the correct use of it, the flaws in the current manual method can be fixed. An easier way to administer exams is through an online examination system that stores the exam information in a database. Teachers can create exam rules, and students can give exams using a completely automated system [10].

IV.   PROPOSED SYSTEM

The proposed system is a web-based application that gives instructors a platform to administer tests online. The system mainly supports Multiple Choice Questions. It has a separate section for teachers and students [9]. The system provides many options for teachers, such as the ability to create or edit the exam, add or delete questions to the exam, and add students to the exam [10]. The system will generate an exam code for each exam created by teachers. Similarly, the system will generate a random password for every student that the teacher adds. These details can assist the student in logging into the system and can eliminate the registration process that has to be done by the student. The system allows the teachers to set the date and time of an exam, which makes the test more customizable. The system also includes a multi-instructor feature that enables many teachers to log in and assist students in conducting and monitoring their tests simultaneously. The students can simply log in to the system without registration by providing the system with the details that are shared by the teachers via email. They can read the instructions that are required to attempt the test, then take the test, answer the questions, and submit the exam before the timer runs out. Once they submit the exam, the system will calculate their marks and display the results to them immediately, and it will also store them in the database. The system supports test resumption and auto-submission features, making it more robust.

A. System Design

The proposed system was designed using Angular and Spring Boot. While Angular offers a fluid and dynamic frontend for creating the user experience, the Spring Boot framework offers a solid and scalable backbone for web application development. The project has been divided into two main parts: the backend and the front end.

The project's backend was built with the Spring Boot framework, and it is responsible for the following tasks:

- Authentication and Authorization: The backend offers a reliable and secure authentication and authorization mechanism to make sure that only authorized users may access the system.
- Database management: The backend uses the MySQL database to store user data, exam questions, and exam results.
- Exam management: The backend is responsible for creating, scheduling, and grading exams.
- Result management: The backend calculates and saves the exam results.

The project's frontend was built with the Angular framework, and it is responsible for the following tasks:

- User interface: The front end offers a responsive and user-friendly interface for users to interact with the system.
- Exam creation: The front end enables the creation and customization of exams and the addition of questions to the database by the instructors.
- Exam scheduling: The front end offers a calendar view for scheduling exams.
- Exam taking: The front end provides an interface for the students to take exams.
- Result display: The front end displays the exam results to the students.

B. System Architecture

The application's high-end architecture is depicted in Figure 1, which also demonstrates how the user's input is obtained from a web page via Mozilla Firefox, Google Chrome, Internet Explorer, or any other web browser [11]. The request is forwarded to the Apache server, which processes the data, sends a query to the database to see if any records need to be fetched, and retrieves the necessary data from the database. The server retrieves the results and sends the user a response if the database contains the requested data.
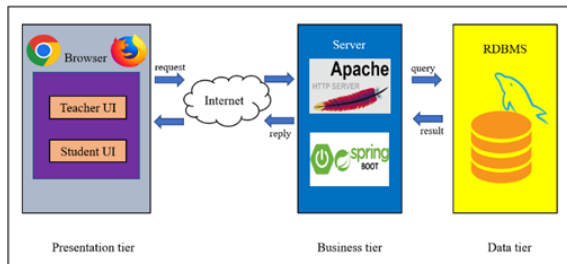
Figure 1 High-end Architecture

The high-end architecture is made up of three different tiers that are used to receive and show the results based on the user's requests. The system that is being suggested has the following tiers.

1. Presentation tier.
2. Business tier.
3. Data tier.

1. Presentation Tier

A user interface is provided by the logical collection of components known as the presentation tier. These components, which can include server pages, forms, and reports, enable user interaction with the application but don't process data, manage business rules, or directly access databases or other storage media [11]. Utilizing Angular, the presentation-tier front end of the system was created. The user can request the server and view the results that were shown on the screen through the GUI, which is part of the presentation tier. Based on the different types of users, the presentation tier has two alternative user interfaces.

1. Teacher UI
2. Student UI

2. Business Tier

The business tier consists of complex processing, validation, business rules, processes, and interfaces to external systems. The term "middleware" has historically been used to describe middle-layer components that run on the business tier [11]. These components are housed within an application server, which serves as their container. The business tier is made up of components that offer the business logic for an application. The business tier acts as a link between the data tier and the presentation tier. This tier executes the business logic; it accepts input from the presentation tier, runs the query, and retrieves the database's data. It performs the activities using Apache servers and SpringBoot.

3. Data Tier

A body that houses all databases and instance objects utilized in an application is referred to as a data-tier application. Instead of having to handle each data-tier item independently, a data tier offers a single unit for authoring, deploying, and managing the data-tier objects [11]. A data tier enables a more seamless connection between the development of the data tier and the corresponding application code. Additionally, it offers staff a view of system resource utilization at the application level. The data tier, which is the final layer of the design, is where all of the data is kept in the RDBMS. For the storage of data in new databases used for financial records, manufacturing and logistical information, and personnel data, the RDBMS has been a popular choice.

C. System Activities

1. Login System

The following services are included in the login system:

• Login as a teacher

The teacher can access the system using the email address and password that have already been saved, or they can sign up as a new user. Logging is only successful if the input details match the database; otherwise, an error message is shown.

• Login as a student

The student can eliminate the registration process and can easily log on to the system by providing the course

code, email address, and password that are shared by the teacher via email. Logging is only successful if the input details match the database; otherwise, an error message is shown.

2. Teacher activities

Teacher activities contain the following functions:

• Exam Management

Exam management involves three main processes:
• Create Exam: It gives the teacher the option of providing overall details of the exam.
• Edit Exam: It allows the teacher to edit the details of the exam.
• Total Exams: It enables the teachers to check the details of their previous exams being conducted.
• Questions management

There are two primary operations in managing questions:
• Adding Questions: It includes the ability of a teacher to add questions alongside the choices and designate the best answer for each question.
• Deleting Questions: The teacher has the option to remove any extra questions that are not needed.

• Student management
Managing students contain two main operations:
• Adding students: To finish the registration procedure, the teacher must add the students to the respective exam with their names and email addresses. They can do this by inserting each student's details individually, or they can do it all at once with the help of a CSV file. Once the teacher adds student's names and email addresses, the system will generate a random password for every student.
• Deleting student: The teacher can delete any student by entering the name and email of the student who is to be removed.

3. Student Activities
Student activities contain the following operations:
• Give the exam: After the student enters their login information, he/she will be redirected to the

respective exam, and a group of questions will be displayed for him to start and give an exam.
• Get the results: The student will complete the exam and see his or her scores on the screen after responding to all the questions within the allotted time frame.

D. Database
It is crucial to ensure that the database is adequately constructed in order to utilize MySQL server technology to its best potential. All of the database's tables were established using file names that attempted to reflect the tables' purposes and, as a result, support well-designed systems [10]. The first stage in designing was to choose which tables should be built and what kind of information each one should contain based on the project's requirements and standards.

E. System flow diagram:
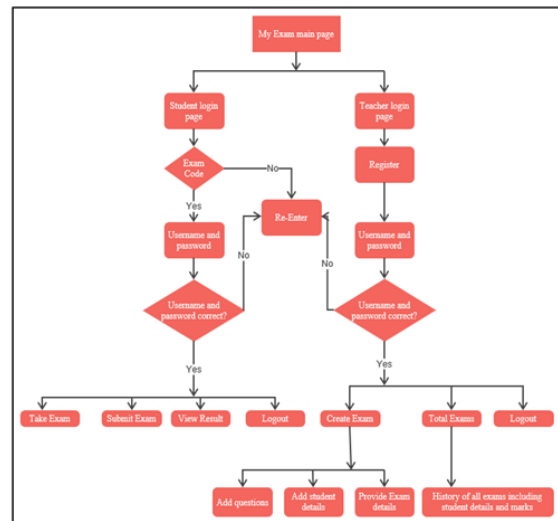The system flow diagram can be depicted as shown in Figure 2.

Figure 2 System flow diagram

The procedure is as follows:
1) Select user type i.e., teacher or student.
2) To log in as a teacher, one must first register to log in to the system.
3) After a successful log-in, the teacher can create and modify the exam as and when required.
4) After creating the exam, they need to add questions to it.

5) After adding questions successfully, the teacher must add the students to the respective exam with their names and email addresses. They can do this by inserting each student's details individually, or they can do it all at once with the help of a CSV file.

6) Once the teacher adds student's names and email addresses, the system will generate a random password for every student.

7) For every exam created by the teacher, the system will generate an exam code.

8) The teacher can send an email to all of the students and include all the information that is required, such as exam instructions, the exam code, a student's log-in information, etc.

9) Similarly, by registering with the system, numerous teachers can utilize the application at the same time.

10) Using the exam code and student log-in details, students can appear for the exam and can write the exam within the specified time.

11) Once the student submits the exam, the system will automatically calculate and display the student's results.

12) Logout from the application.

V. RESULT

Graphical User Interface of the proposed system.
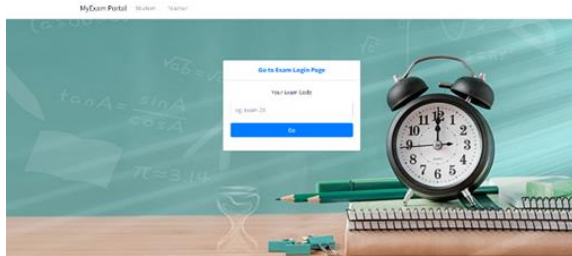
Figure 3 Main Page

The system allows users to login in two ways either as a teacher or student, as shown in Figure 3.
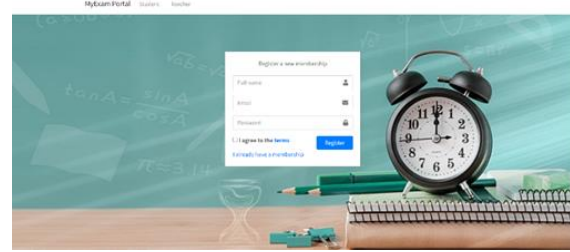
Figure 4 Teacher Registration Page

1. As a teacher: When the user chooses to log in as a teacher, he needs to first register as shown in Figure 4.
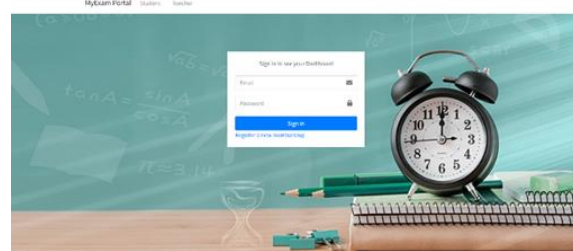
Figure 5 Teacher login page

After registration, the main page will lead him to the teacher login page, which will ask for an email and password as shown in Figure 5.
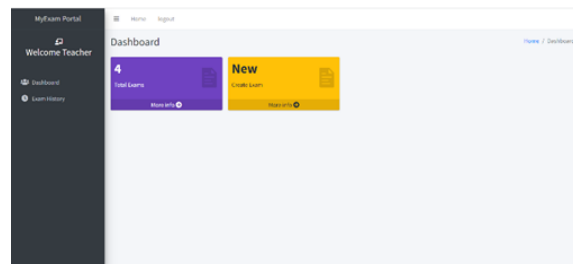
Figure 6 Dashboard Page

After checking for the correct email and password the system will lead the teacher to the dashboard page as shown in Figure 6.
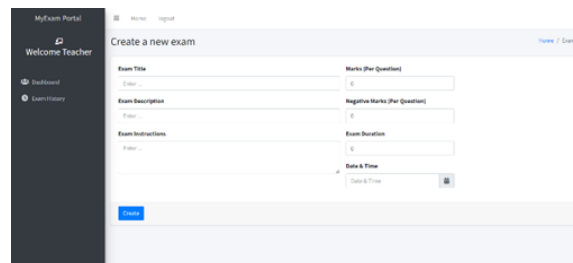

Figure 7 Create exam Page

The Create Exam page allows the teachers to provide overall details of the exam, which include the exam title, exam description, marks per question, exam duration, date and time, etc., as shown in Figure 7.
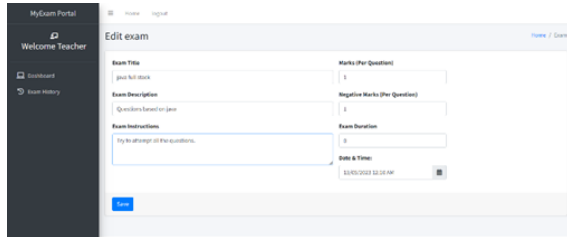

Figure 8 Edit Exam Page

The Edit Exam page allows the teacher to edit the details of the exam, as shown in Figure 8.
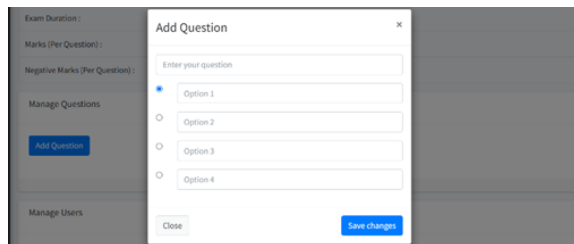

Figure 9 Questions Addition

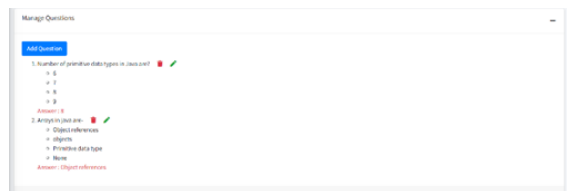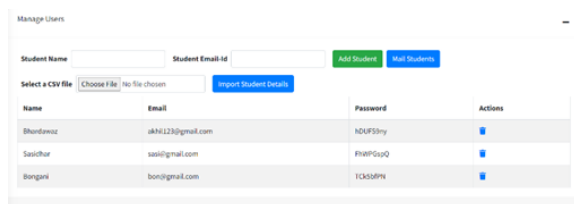The questions management page gives the teacher the ability to add questions as shown in Figure 9.

Figure 10 Questions Deletion

The questions management page gives the teacher the ability to delete questions as shown in Figure 10.

Figure 11 Student Management Page

The Student Management page helps the teacher add or delete students. The teacher adds all the students at

once using a CSV file. Once students are added, the system will generate a random password for every student, as shown in Figure 11.
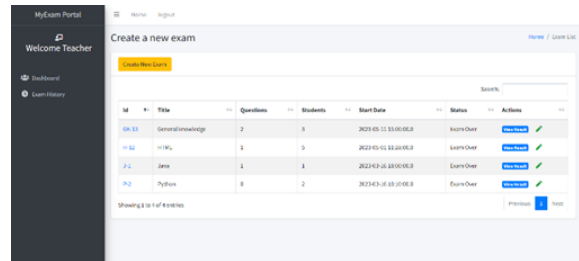
Figure 12 Total Exams Page

The Total Exams page enables the teachers to check the details of their previous exams being conducted, as shown in Figure 12.
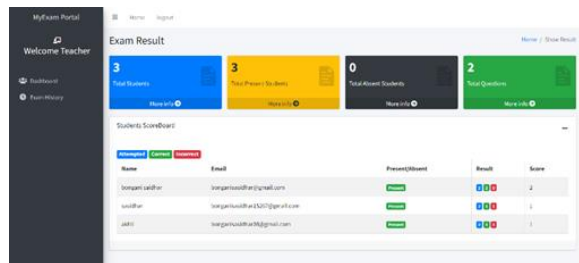

Figure 13 Exam Result page

The Exam Result page helps the teacher to find student details along with logs and scores of a particular exam, as shown in Figure 13.
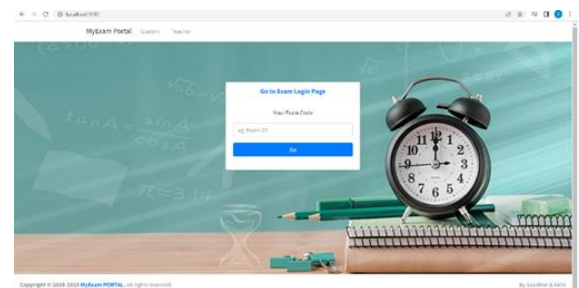

Figure 14 Exam Login Page

2. As a Student: When the user chooses to log in as a student, the main page will lead him to the exam login page, which will ask for an exam code, as shown in Figure 14.
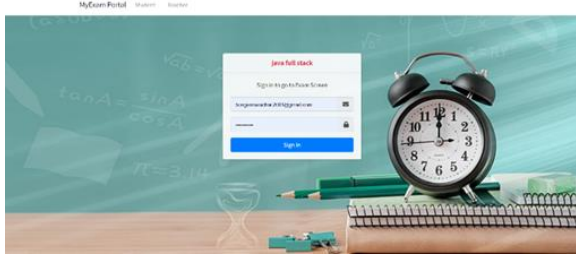
Figure 15 Student Login Page

After checking for the correct exam code, the system will lead the student to the log-in page, as shown in Figure 15.
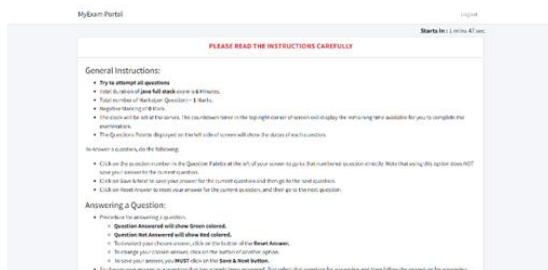

Figure 16 Instructions Page

After checking for the correct email and password, the system will lead the student to the instruction page, as shown in Figure 16.
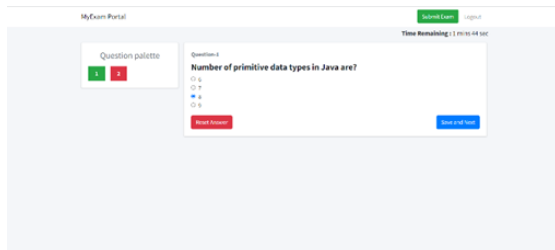

Figure 17 Exam Page

Once the student clicks on Attempt Test, he will be redirected to the exam page, which contains questions set by the teacher and the time allowed for the exam, as shown in Figure 17.
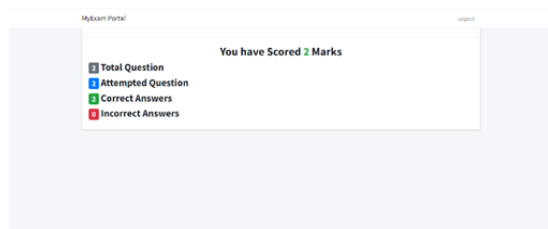

Figure 18 Result Page

After answering the questions and clicking the submit exam button or by the end of the allowed time the result page will be displayed as shown in Figure 18.

CONCLUSION

Finally, the implementation of this project would reduce the workload of students, faculty members, and exam-cell staff. As a result, a fully working Automated Examination Process System in MCQ (multiple choice questions) format will be constructed. The system is divided into two primary subsystems: the student and the teacher. Each of these subsystems is meticulously demonstrated in order to maximize system benefits. Teachers will be able to easily give tests and monitor their student's marks and logs with the help of this technology, allowing universities and institutions to disclose their results more rapidly. This will make manual processes less repetitive and allow for more effective, scalable, and automated processes. The suggested online examination system can be readily used by universities and other organizations to improve the exam's adaptability and security while also accelerating the result's declaration.

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REFERENCES

[1] E. Guzman and R. Conejo, "Self-Assessment in a Feasible, Adaptive Web-Based Testing System", IEEE Transactions on Education, Vol. 48, No. 4, pp. 688-695, November 2005.

[2] M. Z. Rashad, M. S. Kandil, A. E. Hassan, and M. A. Zaher, "An Arabic Web-Based Exam

Management System", International Journal of Electrical and Computer Sciences (IJECS-IJENS), Vol. 10, No. 1, pp. 35-41, February 2010

[3] R. Sheshadri, T. C. Reddy, and N. A. Kumar, "Web-Based-Secure Online Non-Choice-Based Examination System (WONES) using Cryptography", International Journal on Computer Science and Engineering (IJCSE), Vol. 3, No. 10, pp. 3383-3393, October 2011.

[4] M. Z. Islam, M. M. Rahman, and M. K. Islam, "Online Examination System in Bangladesh Context", International Journal of Science, Environment and Technology (IJSET), Vol. 2, No. 3, pp. 351-359, June 2013.

[5] PriyaDharshini, S., SelvaSudha, M. and Anithalakshmi, V., 2017. Exam cell automation system. *Int. J. Eng. Sci. Comput*, 7(3).

[6] Dey, M., Biswas, S., & Roy, A. (2021). Cloud-based online examination system. International Journal of Emerging Trends in Engineering Research, 9(2), 163-167.

[7] Singh, S. R., & Singh, P. (2021). Online examination system with integrated learning management system. International Journal of Innovative Technology and Exploring Engineering, 10(6), 101-105.

[8] Raza, M., Raza, S., & Raza, H. (2021). Secure online examination system using blockchain technology. International Journal of Advanced Research in Computer Science, 12(2), 456-460.

[9] Navik, J., Sawant, A., Saini, S., & Shinde, V. D. (2021). Performance analysis system using web based solution for MCQ type online examination. International Journal of Engineering Research and Technology, 14(5), 1447-1452.

[10] Hameed, M.R. and Abdullatif, F.A., 2017. Online examination system. International Advanced Research Journal in Science, Engineering and Technology, 4(3), pp.106-110.

[11] Yepuri, V.K., Pamu, G.C., Kodali, N. and Pradymna, L.V., 2018. Examination Management Automation System. *Int. Res. J. Eng. Technol*, 5, pp.2773-2779.