# Online Examination System

## A PROJECT REPORT

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## BONAFIDE CERTIFICATE

Certified that this project report **“Online Examination System”** is the bonafide work of “**Pankaj Kumar (21BCS4991), Prabhakar Shekhu (21BCS4978), Nitin Thakur (21BCS5043), Thirumurugan V G (21BCS4984)”** who carried out the project work under my/our supervision.

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## INTRODUCTION

### Identification of Client / Need / Relevant Contemporary issue

Over the years, technology has improved our lives vastly. We no longer write the lengthy paper-based examinations. From Entrance exams of Schools and Colleges to semester exams of universities and from Bank exams to Civil Service exams almost all of them are being conducted online. Online examination systems can reduce the time and costs associated with traditional paper-based exams, such as printing and transportation costs.

According to a report by India Today, the National Testing Agency (NTA) conducted over 60 online entrance exams in 2019-2020, with over 10 million students appearing for these exams. The most popular online exams in India are the Joint Entrance Exam (JEE) for engineering and the National Eligibility cum Entrance Test (NEET) for medical entrance. The number will only increase thanks to employment exams turning online in the recent past.

To create an online examination website, the following technologies are commonly used: PHP, HTML, CSS, JavaScript, and MySQL. PHP is a server-side scripting language that is widely used for web development. HTML and CSS are used for creating the front-end of the website, while JavaScript is used to add interactivity and dynamic features to the website. MySQL is a popular open-source database management system that is used to store data. Several studies have found that online examination systems can improve the efficiency and accuracy of the examination process, reduce the workload of educators, and provide instant feedback to students.

Universities and colleges made an epic pivot toward the online ecosystem after the contagion of COVID-19 set in. The use of online examination systems in India has grown significantly in recent years, especially with the increase in the availability of digital infrastructure and internet connectivity. But this is new to the students and people who have written subjective exams throughout their lives. There are huge number of people who are not even exposed to technology let alone this online system of examinations. The website should also be designed to be accessible to students with disabilities, such as providing alternative text for images, using high-contrast colours, and allowing keyboard navigation. Hence there are still challenges that need to be addressed to ensure a reliable and fair examination process for all students.

**1.2. Identification of Problem**

India has over 45 million students enrolled in the year 2022 for higher education. With this massive number of students, India is turning into one of the biggest organizers of online examinations globally. However, there are also several challenges and problems associated with online exams in India. Some of these problems are:

1. Technical difficulties: Technical issues such as server crashes, power failures, and slow internet speed can disrupt exams and cause stress and frustration among students. Some students may not have access to reliable internet connections or may not be familiar with the technology required for online exams, which can put them at a disadvantage.
2. Cheating: Online exams can make it easier for students to cheat by using unauthorized resources such as textbooks, notes, or search engines. It is difficult for invigilators to monitor every student in an online environment, which increases the risk of cheating.
3. Lack of standardization: Online exams are often conducted by different institutions with varying levels of standards and guidelines. This can lead to inconsistencies in the exam process and questions, making it difficult to compare the results and evaluate the performance of students.
4. Security concerns: Online exams may be vulnerable to security breaches, hacking, or data leaks, which can compromise the privacy and confidentiality of exam materials and student data.
5. Accessibility issues: Online exams may not be accessible to students with disabilities or those who have limited access to technology, which can result in unequal opportunities and disadvantage certain groups of students.

Overall, while online exams offer many benefits, it is important to address the above challenges to ensure a fair and reliable exam process.

### 1.3. Identification of Tasks

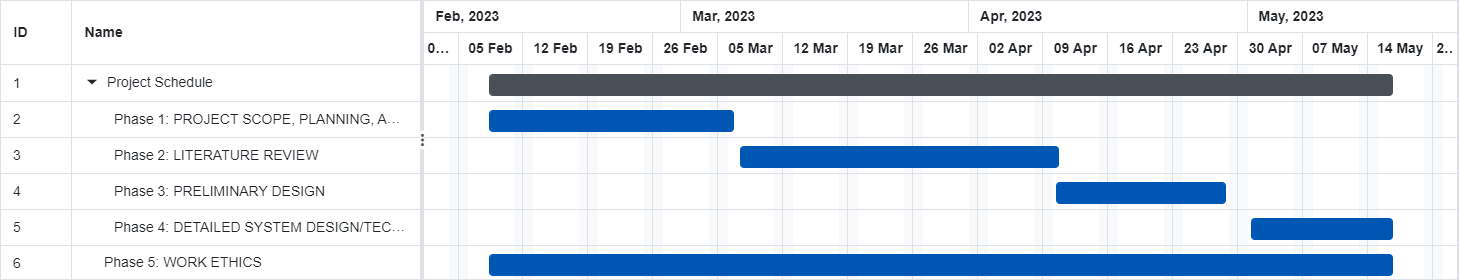
Developing a website for an efficient online examination system involves various tasks in different categories like website layout, styling and features. It's important to keep in mind that creating an online examination website involves complex functionalities such as security, user authentication, and question randomization, which require advanced knowledge and skills in programming. Moving forward the task at hand entails a comprehensive analysis of the requisites with regards to an online examination system, the following tasks are typically required:

1. Requirement gathering: Determine the specific requirements of the online examination system, includes delving into the intricacies surrounding factors such as the type of questions that will be included, the format of the exam, the number of questions, the time limit, and the intended audience.
2. Design: Create a design for the online examination system that meets the identified requirements. This includes designing the user interface, the question formats, and the scoring and feedback mechanisms. The task at hand is to construct an elaborate online examination platform by authoring intricate code, unifying it with databases of high complexity, and diligently verifying its functionality in accordance with the intended purpose.
3. Development: Develop the online examination system, which involves writing code for the system, integrating it with databases, and ensuring it works as intended. Development of a website involves things like creating domain name, hosting rights etc., but noting briefly requires the following tasks:

* Choose a hosting service: There arises a need of hosting service to host the website. Choose a hosting service that supports PHP and MySQL.
* Choose a domain name: Choose a domain name that is easy to remember and relevant to your website.
* Install a web server: You need to install a web server like Apache on your hosting account.
* Create a MySQL database: Creation of a MySQL database is optionally useful to store the questions, answers, and results of the exam in a better way.
* Create the front-end: Usage of HTML, CSS, and JavaScript to create the front-end of your website. This includes designing the layout, creating forms, and displaying the questions.
* Create the back-end: Usage of PHP to create the back-end of your website. This includes connecting to the database, retrieving and storing data, and generating the results.

1. Testing: Test the online examination system to ensure that it works as expected and is free from any bugs or glitches. Verifying the efficacy of the online exam system through a thorough testing process that identifies any issues or malfunctions. The examination will encompass various types of checks such as functional, performance-related evaluations, security measures inspection and analysis on usability aspects in order to ensure complete competency without errors or glitches. This includes functional testing, performance testing, security testing, and usability testing.
2. Deployment: Deploy the online examination system on a server or cloud-based platform, making it accessible to users.
3. Maintenance and Support: Provide ongoing maintenance and support for the online examination system, including bug fixes, updates, and user support.
4. Security: Ensure that the online examination system is secure from external threats such as hacking and that users' data is protected. Safeguard the integrity of online examination system by implementing comprehensive security measures to thwart any attempts made from malicious hackers, and guarantee utmost protection for personal information stored in the database.
5. Integration: Integrate the online examination system with other software and systems, such as learning management systems, to ensure seamless functionality.
6. Training: Provide training for users on how to use the online examination system, including how to create and administer exams, how to grade exams, and how to troubleshoot common issues.Top of Form Instruct pupils in the art of utilizing the digital evaluation platform, encompassing elucidation on generating and supervising examinations, appraising exams with heightened details and wisdom, as well as identifying solutions to commonplace predicaments.Bottom of Form

**1.4. Timeline** – **A Gantt Chart**



**1.5. Organization of the Report**

The Project report presented at the external examination is organized into five chapters. After this introductory chapter, chapter 2, “LITERATURE REVIEW/BACKGROUND STUDY” describes about the study made to understand the requirement of careful planning, design, and implementation to ensure a smooth user experience for both students and teachers. There are some key aspects to be considered such as user interface, integration and scalability.

Chapter 3, “DESIGN FLOW/PROCESS” presents brief summaries of the development of the website with useful features. It addresses the usage of various other technologies for the process of designing and programming languages like HTML, CSS, php.

Chapter 4, “RESULTS ANALYSIS AND VALIDATION” provides an account of the presentation of the project testing to identify bugs and malfunctions and analyse if it meets various conditions and thereby measuring its efficiency.

Finally, chapter 5, “CONCLUSION AND FUTURE WORK” compiles the inference obtained after the implementation of the project and suggestions about how the exam system could be made better as in picture perfect with other futuristic and expensive technologies that require heavy funding and propose ways to enhance the efficiency and engagement of the website.

## LITERATURE REVIEW/BACKGROUND STUDY

### 2.1. Timeline of the reported problem

The problem of offline exams has been identified and documented in various countries around the world over the past decade. The offline exams are historically being prone to cheating and other issues associated with traditional paper-and-pencil exams has been recognized for many years. There have been various incidents and reports documenting this problem throughout the world. Some of the earliest documented incidents of offline exam-related problems date back to the early 2000s, when cases of exam paper leaks, cheating, and other malpractices were reported in countries like India, United States, and the United Kingdom, among others.

The major issue with offline exams is the potential for cheating, as students may have access to outside materials or may collaborate with each other during the exam. This problem has been recognized for decades, with reports of cheating during high-stakes exams such as college entrance exams and professional certification tests. For example, in India, incidents of cheating during offline exams have been reported for several years, with some particularly high-profile cases occurring in 2015 and 2017. In 2015, over 1,000 students were caught cheating during a state-level medical entrance exam, leading to protests and calls for reforms. In 2017, there were reports of cheating during a national-level engineering entrance exam, leading to arrests and investigations. Similar incidents have been reported in other countries as well. For example, in Egypt, there were reports of widespread cheating during high school exams in 2016, leading to the arrest of dozens of people. In the United States, there have been occasional reports of cheating during standardized tests, such as the SAT and ACT.

Another issue with offline exams is the logistical challenge of administering and grading large-scale exams, particularly in countries with large populations. This can lead to delays in exam results and other logistical issues, as well as the potential for errors in grading. In recent years, there has also been increased attention given to the issue of accessibility in offline exams, as traditional exams may not be well-suited for students with disabilities or those who require accommodations. The COVID-19 pandemic has also accelerated the need for online exam alternatives, as many educational institutions around the world have had to move to remote learning and assessment. As a result, there has been a surge in the adoption of online exam platforms and proctoring solutions. These incidents have highlighted the need for different exam delivery methods that are more secure and reliable.

Overall, the problem of offline exams and the need for alternative exam delivery methods has been recognized and documented in various countries around the world over the past decade, and continues to be a topic of discussion and innovation in the education sector. In many parts of the world, concerns about the fairness, accuracy, and security of traditional pen-and-paper exams have led to increased scrutiny and calls for alternative methods of assessment.

**2.2. Existing solutions**

Numerous studies have been conducted on online examination systems, and many researchers have developed their own systems. Various researchers made their researches regarding the online examination systems which are as follows:

[1] Luecht (2001) centered his analysis on an internet testing in terms of challenges that may be faced. Among the difficulties identified were the issue of unique pupils who utilize the system, as well as security risks, skills in response to totally different kinds of questionnaire among those students, the challenges of maintaining and assessing such a system.

[2] Zhenming et. al. (2003): They developed an online examination system supported web browser and the server framework for administering tests and auto calculating answers to objective and operational problems such as programming, Microsoft Windows operations, Microsoft Word, Microsoft Excel, and Microsoft PowerPoint editing, and more.

[3] R. Conejo et. al.: They developed an internet examination system referred to as SIETTE (System of intelligent analysis victimization Tests for Tele education). It’s a Web-based platform for generating and construction of the adaptive tests. In this system, the examiner can create a self-assessment test. The question is shown to the student one by one and after answering each question, the correct answer of the same is shown immediately along with the feedback for it.

[4] Magdi Z. Rashad et. al. proposed an Arabic web-based exam management system which manages the objective type of questions only. The reason behind this system is to organize the test or exams, get the responses, automatically assign the scores and hence produce the test reports. The main limitation of this system is that it doesn’t supports the subjective questions or other complex questions like graphs, ER-Diagram, DFD or UML.

[5] Deepankar et. al. proposed an online examination system which uses the Random Number Generator Algorithms to auto generate the set of questions and hence each time a different set of question is provided to the user/student.

[6] Jim et. al. explained that the e-assessment can be used in a variety of ways. First, they created an online e-assessment, and then they developed the concept that the e-assessment might be upgraded to an online examination system. They also assumed that the assessment and e-examination would be available in a variety of formats. They continued to add content until it took the form of an e-examination platform. Because it is significantly more accurate and different from the typical manner of taking any entrance examination or evaluation. One of the most effective and fulfilling kinds of testing is computer-based testing.

[7] Zahirul et. al. proposed an online examination system suitable for both Academic and Non-Academic examinations. They analyze 3 different type of available examination systems to create a more flexible and user friendly in the context of Bangladesh. It is a multilingual system that permits users to conduct tests in their mother language that is Bangla.

**2.3. Bibliometric analysis**

Table 1. Different researchers with their applied technologies for the Examination systems

|  |  |
| --- | --- |
| **Researcher/s** | **Proposed/Used Technology** |
| Luecht | Visual-Basic.NET, Windows.NET, Server Explorer, Object Model and API |
| Zhenming et al | Internet-Information Server 4.0, Microsoft SQL Server 7.0 and DCOM |
| Conejo et. al. | HTML, RDBMS software |
| Magdi Z. Rashad et al. | Apache, MYSQL, HTML, JavaScript, CSS and AJAX |
| Deepankar et al. | HTML,Tomcat, MS Access, |
| Jim et al. | - |
| Zahirul et. al. | PHP, MYSQL, XHTML |

Analysis based on key features of their systems help us explore different ways to take e-assessments and conclude that e-examinations were far superior to traditional methods of taking entrance exams or assessments. They continuously added content and eventually created an e-examination portal. Computer-based examinations are now considered one of the most efficient and reliable methods of administering exams.

**2.4. Review Summary**

The literature review discusses the increasing importance of remote examination and proctoring, especially in the context of online education and certifications. The review highlights various online examination systems that utilize advanced and secure AI technology to monitor students and ensure fair exams. The review also emphasizes the importance of student support services in online education and the need for institutions to develop and implement effective support services for their diverse student population. The proposed online examination system uses a client/server architecture methodology, which makes it simple and adaptable for future maintenance and development. The system uses PHP and MySQL in the server-side to manage test processes and store data in a well-designed database. The need for student support services in online programs is highlighted, and the OSP (Online Support Portal) online application is presented as a solution, providing students with reliable access to information and support services. Additionally, the review proposes an online examination system with an automatic assessment technique that uses algorithms to evaluate responses to descriptive questions. Overall, the literature review underscores the importance of ensuring student welfare and providing reliable, secure, and efficient online examination systems for the growing population of online learners. The review also discusses a proposed system with an automatic assessment technique that uses algorithms to evaluate descriptive questions in online exams. The system uses a four-step process, including extraction of keywords, weightage of keywords, feature matching, and score generation, to evaluate answers accurately. This system is time and cost-efficient and secure, making it ideal for conducting competitive exams online. The review concludes by emphasizing that learners' welfare needs to be the primary goal of the online education system. Developing and implementing support services and reliable assessment systems can help retain students and ensure their success in online education.

### 2.5. Problem Definition

Due to various shortcomings such as time-intensive procedures, the difficulty of manual analysis, the need for additional examiners to administer tests to a large number of students, the potential for errors in manual calculations leading to inaccurate results, the increased risk of losing exam results in current systems, and the time-consuming nature of manually checking results, the current traditional examination methods are limited in their capacity to serve students effectively. However, the use of information technology in an organized and effective manner can help to overcome these limitations. By implementing an online examination system, exam information can be stored in a database, making it easier to administer exams. Additionally, teachers can set exam rules and students can take exams using a fully automated system.

When developing an online examination system, there are certain things that should be avoided to ensure that the system is effective, secure, and reliable. Here are some things that should not be done while making an online examination system:

1. Using outdated or insecure technologies: It is important to use the latest technologies and frameworks to ensure that the system is secure and reliable. Using outdated technologies may lead to security vulnerabilities that can be exploited by hackers.
2. Compromising on security: Security is of utmost importance in an online examination system. Any compromise on security can lead to cheating, plagiarism, and other unethical practices that can undermine the integrity of the examination system.
3. Making the system too complex: The online examination system should be user-friendly and easy to navigate. Making the system too complex can lead to confusion and frustration among users, which can affect the overall user experience.
4. Neglecting accessibility: Accessibility is an important aspect of online examination systems. Neglecting accessibility can lead to students with disabilities being excluded from the examination process, which is unfair and unethical.

### 2.6. Goals/Objectives

Goal/Objective statements that can act as milestones for the project of an online examination system that help accomplish the examination in the absolute complete way possible making it feasible and efficient on all fronts.

1. Goal: To create a secure and reliable online examination system that can be used by students and educators across multiple institutions.

Objective: Develop a robust security system that prevents cheating and plagiarism, and ensure system uptime of at least 99.9% to ensure that exams can be taken at any time.

1. Goal: To create an accessible online examination system that accommodates the needs of students with disabilities.

Objective: Develop a system that meets the requirements of accessibility standards, including WCAG 2.0, and ensure that it is tested with assistive technology to ensure that it is fully accessible to students with disabilities.

1. Goal: To create a user-friendly online examination system that is easy to use and navigate for both students and examiners.

Objective: Conduct user testing throughout the development process to ensure that the system is intuitive and user-friendly, and ensure that the system has clear instructions and guidance for both students and examiners.

1. Goal: To create a scalable online examination system that can handle a large number of concurrent users during peak times.

Objective: Conduct load testing to ensure that the system can handle a high volume of users, and ensure that the system can be easily scaled up to accommodate future growth and demand.

1. Goal: To create an online examination system that is integrated with existing learning management systems (LMS) and student information systems (SIS).

Objective: Ensure that the online examination system can be easily integrated with popular LMS and SIS platforms, such as Blackboard, Canvas, and Moodle, to allow for seamless integration into existing institutional workflows.

## DESIGN FLOW/PROCESS

### 3.1. Evaluation & Selection of Specifications/Features

An online examination system is a software application designed to conduct and administer the examinations using the internet. One of the essential features of an online examination system is the use of Random Number Generator (RNG) algorithms to auto-generate sets of questions for each user or student. This feature has several benefits that make the online examination system more reliable and efficient.

Initially, through the application of Random Number Generator (RNG) algorithms lies the guarantee that every user and/or scholar is bestowed with a distinctive set of interrogations. This feature eliminates the possibility of cheating and ensures the integrity of the examination process. Because each assemblage of inquiries varies, it presents a challenge for learners to exchange solutions or converse about the exam queries prior to and subsequent to its administration.

Secondly, random number generator algorithms provide a fair and unbiased evaluation of each student's performance. Distinct arrays of inquiries are employed to assess students' grasp on the subject matter rather than their capacity to commit responses to memory. Varied sets of evaluative interrogatories focus on gauging intellectual comprehension above rote memorization capabilities. The implementation of this function guarantees that pupils are assessed according to their mastery and grasp on the subject matter, rather than relying on chance or recollection.

Furthermore, the employment of chance-based numerical generation formulas substantially diminishes potential inaccuracies during the evaluation procedure. Traditional paper-based examinations are prone to errors such as misprinting or mixing up questions, which can affect the performance of students. With the online examination system, the algorithm generates sets of questions, reducing the possibility of errors in the examination process.

Lastly, the use of random number generator algorithms reduces the workload of the examination administrators. When utilizing conventional assessments on paper, the administrators must craft and publish exam documents by hand. This procedure can be dreary and time-exhausting in nature. Through the utilization of an examination system that operates digitally, a computerized method generates multiple sets of inquiries automatically. This innovative approach serves to lessen the burden on capable administrators and enables them to concentrate their efforts towards other pressing assignments with greater ease.

In addition to employing Random Number Generator (RNG) algorithm there are several other noteworthy and engrossing attributes that may be incorporated into fashioning a productive and imaginative computer-based testing platform. Here are two such features:

Adaptive Testing: The implementation of adaptive testing feature ensures a dynamic difficulty level that caters to the student's performance. By scrutinizing responses pertaining to a subset of initial questions, it recalibrates and customizes subsequent question sets according to each learner's degree of comprehension. Embracing this capacity grants students personalized experiences tailored optimally towards their individual aptitude levels as well as perceptibly highlights areas where they need strengthening or require further fortification.

Anti-Cheating Mechanisms: Supplementary to the inclusion of stochastic computations, an internet-based test structure may further contain mechanisms engineered against academic misconduct for safeguarding the authenticity throughout exam proceedings. Some of these mechanisms include live proctoring, where a proctor monitors the student's activity in real-time through a webcam, and plagiarism detectors that scan the internet for any copied answers. These mechanisms can prevent students from cheating and ensure that the evaluation is fair and unbiased.

Ultimately, the utilization of algorithms programmed to generate randomized numerical values for query compilation is a pivotal component within the framework of web-based assessment mechanisms. The presence of these attributes guarantees the soundness and coherence of the assessment procedure, delivers an impartial appraisal for every student's presentation, diminishes the likelihood of inaccuracies happening, while simultaneously easing up on the burden that examination administrators’ shoulder. Incorporating these features into an online examination system can make it more effective and efficient in evaluating the students' knowledge and skills. Adaptive testing provides a personalized experience to each student, while anti-cheating mechanisms ensure the integrity of the examination process.

### 3.2. Design Constraints

Designing an online examination system involves taking into consideration various design constraints, including standards, regulations, economic factors, health and safety issues, professional and ethical considerations, and social and political issues. The following are some of the specific design constraints that should be considered:

* 1. Standards: The online examination system must comply with industry standards, such as data protection laws, online security protocols, accessibility guidelines, data security standards, and performance standards. Adherence to standards ensures that the system is reliable, efficient, and secure. For example, it should be designed to meet the privacy and security requirements of data protection laws like GDPR.
  2. Regulations: The system must comply with legal regulations, such as data privacy laws, intellectual property laws, and copyright laws. Compliance with regulations ensures that the system is legally compliant and protects users' rights.
  3. Economic factors: The cost of the system is a critical design constraint which should be considered, along with any potential revenue streams to accommodate a large number of users. The system must be designed to be cost-effective while ensuring that it meets all the necessary requirements for maintenance over a longer period of time.
  4. Health and safety issues: The system should be designed to ensure the health and safety of users. This includes ensuring the system to be accessible to people with disabilities, ergonomic design considerations, such as the placement of computer screens, chairs, and desks. The system should be designed with safety in mind, to ensure that it does not pose any risks to users or their data. For example, if the system uses video conferencing for remote proctoring, it should be designed to prevent eye strain or other health issues that can arise from prolonged screen time.
  5. Professional and ethical considerations: The system should be designed to adhere to professional and ethical standards, such as confidentiality and integrity. It should also be designed to be accessible to all users, including those with disabilities. The system should be designed with ethical considerations in mind, such as ensuring that it does not facilitate cheating or discrimination.
  6. Social and political issues: The system must be designed to be socially and politically acceptable. This involves considering cultural norms, political views, and ethical considerations when designing the system.

In conclusion, designing an online examination system requires careful consideration of several design constraints. A system that is designed excellently must possess unfaltering dependability, precision and be simple to maneuver; it should also provide economic benefits while accommodating a vast number of users. Although such exceptional features should not compromise safety and confidentiality concerns while advocating for neutrality and inclusivity in compliance with appropriate industrial directives and regulations, they should not compromise safety.

**3.3. Analysis of Features and finalization subject to constraints**

An online examination system should have various features to ensure that it meets the design constraints mentioned earlier. Here is an analysis of some of the key features that an online examination system should have to comply with the design constraints:

* 1. Security and Privacy: The system should have robust security features, such as data encryption, secure login authentication, and anti-cheating measures to ensure the integrity of the examination. It should also comply with privacy regulations such as GDPR to protect the personal data of users by implementing security measures such as encryption and two-factor authentication.
  2. Accessibility and Usability: The system should be designed to be user-friendly, accessible, and easy to use for all users, including those with disabilities. It should also be compatible with different devices, such as desktops, laptops, and mobile devices. Features such as adjustable display settings, break intervals, and ergonomic design are necessary to prevent eye strain, repetitive stress injuries, and other health issues that can arise from prolonged screen time. Features such as reliable server infrastructure, fast response times, and accurate grading to ensure a high-quality user experience.
  3. Remote Proctoring: The system should include remote proctoring features that allow an authorized proctor to monitor the examination remotely. This includes features like live video monitoring, screen sharing, and audio recording involving AI-based proctoring, live proctoring, or a combination of both.
  4. Question Bank Management: The system should be capable of supporting different types of assessments, including multiple-choice questions, essays, and open-ended questions. The system should allow the creation and management of a question bank, which could be categorized according to different subjects, difficulty levels, and question types such as multiple-choice, essay-type, or fill in the blanks. Randomized question banks, anti-plagiarism tools, and user privacy controls to ensure fairness and objectivity.
  5. Reporting and Analytics: The system should provide real-time reporting and analytics, including performance analytics, exam statistics, and feedback from users to identify areas for improvement. The system should be customizable to meet the needs of different educational institutions, including custom branding, content, and user roles.
  6. Integration with Learning Management Systems (LMS): The system should integrate seamlessly with LMS platforms, such as Moodle or Canvas, to streamline the assessment process and minimize manual data entry.
  7. Cost-Effectiveness: The system should be cost-effective, efficient, and scalable to accommodate a large number of users. It should have features such as cloud-based hosting, low setup fees, pay-per-use pricing, subscription models to ensure that users can access the system at an affordable cost, automated grading, and user-friendly interfaces to reduce the costs of development, maintenance, and administration.

In conclusion, the features of an online examination system can be finalized based on the design constraints mentioned. By incorporating these features, the needs of the users and the design constraints, an effective and efficient online examination system can be developed that meets the needs of all stakeholders while ensuring the safety, privacy, and security of users.

**3.4. Design Flow**

1. **Collaborative Process Design:**

This approach involves a collaborative process between the development team and the end-users, which could include students and teachers. The goal is to ensure that the system meets the users' needs and is easy to use.

The process involves several stages:

Requirement Gathering: The development team meets with the users to understand their requirements, such as the types of exams they want to create, the number of questions, and the grading criteria.

Design: The team then designs the system based on the users' requirements, incorporating feedback and suggestions from the users.

Development: The team develops the system according to the agreed-upon design, incorporating feedback and suggestions from the users.

Testing: The system is then tested by the users to ensure that it meets their needs and is easy to use. Any issues or bugs are identified and fixed.

Deployment: The system is then deployed, and users are trained on how to use it.

By following this collaborative process, the development team can ensure that the system meets the users' needs and is easy to use, leading to higher user satisfaction and adoption.

1. **Modular System Design:**

Instead of building the entire system from scratch, this approach involves building the online examination system in modules, each of which can be developed and tested independently. This way, the development team can focus on one module at a time and ensure that it works as intended before moving on to the next one. The modules can then be integrated into a complete system at the end of the development process. This approach can help to reduce development time and improve the overall quality of the system.

The modules that could be included in this design are:

User Management: Allows students and teachers to create and manage their accounts, log in and log out of the system, and reset their passwords.

Exam Creation: Allows teachers to create and manage exams, including setting the duration, number of questions, and passing criteria.

Question Bank: Allows teachers to create, edit, and store questions for future use.

Exam Taking: Allows students to take exams, including answering questions, saving answers, and submitting the exam.

Grading: Automatically grades exams, provides detailed feedback on each question, and generates a final score for each student.

1. **Low-Code Development:**

Another alternative design is to use a low-code development platform to build the online examination system. Low-code platforms provide a visual interface for building applications, allowing developers to create applications without having to write a lot of code. This approach can be faster and more cost-effective than traditional software development, as it allows developers to focus on the business logic of the application rather than the technical details of the underlying infrastructure. Low-code platforms also provide pre-built components that can be used to speed up development, such as user authentication and database integration. This approach can be particularly useful for teams with limited development resources or those who are new to software development. Use a combination of in-house and outsourced development to speed up the development process and ensure quality.

1. **Agile development approach:**

In this approach, the online examination system is developed in an iterative and incremental manner. The development process is broken down into smaller chunks called sprints, with each sprint focused on delivering a specific set of features. The Agile development approach is based on the following principles:

* Collaboration between developers and stakeholders
* Adaptation to changing requirements
* Continuous delivery of working software
* Incremental improvement based on feedback

The Agile development approach allows for greater flexibility in terms of development and delivery. It enables developers to respond to changing requirements and deliver working software quickly. This approach also encourages collaboration between developers and stakeholders, resulting in a better end product.

### 3.5. Design selection

In our online examination system, we have approached Modular System Design for designing the Examination system.

Here are some modules and part of project in which the project is done:

1. **Define System Requirements:**

* Identify the requirements and functionalities of the online examination system.
* Determine the user roles, such as administrators, instructors, and students, and their respective permissions.

1. **Database Design:**

* Design the database schema to store the necessary data, such as users, exams, questions, answers, and results.
* Create the appropriate tables and define relationships between them using SQL.

1. **User Management:**

* Implement user registration and login functionality.
* Create user authentication and authorization mechanisms to ensure secure access to the system.
* Define different user roles and permissions to control system access and functionalities.

1. **Question Bank Management:**

* Develop a module to manage the question bank.
* Allow administrators to add, modify, and categorize questions for different exams.
* Implement search and filtering functionalities to easily retrieve and manage questions.

1. **Exam Creation and Administration:**

* Create a module to handle exam creation and administration.
* Allow instructors to create exams, define exam details (such as duration and passing criteria), and select questions from the question bank.
* Implement features like randomizing questions, setting time limits, and displaying exam instructions.

1. **Exam Taking:**

* Design the user interface for taking exams.
* Implement functionalities for presenting questions to the students and recording their answers.
* Handle time limits, submission, and validation of answers.

1. **Result Processing and Reporting:**

* Develop a module to process exam results.
* Calculate and store individual student scores and overall exam performance.
* Generate reports and statistics to provide insights into exam results, such as average scores, pass/fail rates, and question-wise analysis.

1. **Security Measures:**

* Implement necessary security measures, such as input validation, data sanitization, and protection against SQL injection.
* Apply encryption techniques to secure sensitive data, such as user passwords.

1. **User Interface Design:**

* Design an intuitive and user-friendly interface for seamless navigation and interaction.
* Ensure responsive design to support different devices and screen sizes.

1. **Testing and Debugging:**

* Conduct thorough testing to identify and fix any bugs or issues.
* Perform functional testing, usability testing, and security testing to ensure the system's reliability and stability.

1. **Deployment and Hosting:**

* Choose a suitable hosting environment and deploy the online examination system.
* Configure the server, database, and necessary dependencies for smooth operation.

1. **Ongoing Maintenance and Enhancements:**

* Continuously monitor the system for performance, security, and usability improvements.
* Regularly update and maintain the system to address any issues and incorporate user feedback.

### 3.6. Implementation plan/methodology

Algorithm for implementation of the examination system, the below algorithm provides a high-level overview of the steps involved. Each step may require further decomposition and implementation details based on the specific requirements and technologies used:

1. Define System Requirements:

- Identify required functionalities and user roles.

2. Database Design:

- Design the database schema and create necessary tables.

3. User Management:

- Implement user registration and login functionality.

- Create user authentication and authorization mechanisms.

4. Question Bank Management:

- Develop a module to manage the question bank.

- Allow administrators to add, modify, and categorize questions.

5. Exam Creation and Administration:

- Create a module for exam creation and administration.

- Allow instructors to create exams, set details, and select questions.

6. Exam Taking:

- Design the user interface for taking exams.

- Present questions to students and record their answers.

7. Result Processing and Reporting:

- Develop a module to process exam results.

- Calculate and store individual student scores and overall performance.

8. Security Measures:

- Implement input validation, data sanitization, and encryption techniques.

9. User Interface Design:

- Design an intuitive and responsive user interface.

10. Testing and Debugging:

- Conduct functional, usability, and security testing.

11. Deployment and Hosting:

- Choose a suitable hosting environment and deploy the system.

12. Ongoing Maintenance and Enhancements:

- Monitor performance, address issues, and incorporate user feedback.

**RESULTS ANALYSIS AND VALIDATION**

### 4.1. Implementation of solution

The implementation of the online examination system is discussed in detail. It includes a comprehensive analysis of how the system was developed and the specific features and functionalities that were implemented. The programming languages, frameworks, and tools used during the development process are explained, along with any challenges encountered and the corresponding solutions.

The validation of the implemented solution is also focused here. Various testing methods and techniques employed to ensure the correctness, robustness, and reliability of the system are discussed. This includes unit testing, integration testing, system testing, and user acceptance testing. The results of these tests are presented, highlighting any issues identified and how they were resolved.

Additionally, the performance of the system is evaluated and analyzed. Metrics such as response time, scalability, and resource utilization are measured and compared against predefined performance goals. The results of the performance analysis provide insights into the system's efficiency and its ability to handle a large number of users and concurrent examination sessions.

We present the implementation details of the Online Examination System using PHP and MySQL. We discuss the various components and modules of the system that were developed to achieve the desired functionality. The implementation phase involved translating the design specifications into actual working code, integrating the different components, and conducting extensive testing to ensure the system's reliability and accuracy.

1. System Architecture:

The system architecture of the Online Examination System comprises multiple layers and components working together to deliver a seamless user experience. At the core, we have the PHP programming language, which acts as the server-side scripting language. PHP provides the necessary functionality to interact with the database and handle user requests.

The front-end of the system is built using HTML, CSS, and JavaScript. These technologies are responsible for creating the user interface, displaying the exam questions, capturing user responses, and handling user interactions. The responsive design ensures that the system can be accessed and used across different devices, such as desktop computers, laptops, tablets, and smartphones.

The back-end of the system relies on the MySQL database to store and manage all the exam-related data, including user information, question banks, exam schedules, and results. The database is designed to ensure data integrity, security, and efficient retrieval of information.

1. User Registration and Authentication:

To provide a secure and personalized experience, the system includes a user registration and authentication module. Users can create an account by providing their basic information, such as name, email address, and password. The registration process ensures that each user has a unique account and maintains the integrity of the system.

Once registered, users can log in using their credentials to access the system's features. The authentication process verifies the user's identity and grants appropriate access privileges based on their role, such as student, instructor, or administrator. This ensures that only authorized individuals can interact with the system and perform specific actions based on their assigned permissions.

1. Exam Management:

The Online Examination System provides comprehensive exam management capabilities for instructors and administrators. Instructors can create and manage exams by selecting questions from the question bank, setting time limits, assigning difficulty levels, and specifying scoring criteria. They can also schedule exams and notify registered students about the upcoming exams.

During the exam, the system ensures a smooth and secure experience for students. It presents the questions one by one, captures the student's responses, and enforces time limits. The system automatically grades the exams based on the predefined scoring criteria, eliminating the need for manual grading and reducing the possibility of human errors.

1. Results Generation and Analysis:

Once the exams are completed, the system generates instant results for students. The results include the overall score, individual question scores, and any feedback provided by the instructor. Students can view their results immediately after completing the exam, allowing them to assess their performance and identify areas for improvement.

Instructors and administrators have access to comprehensive result analysis tools. They can generate reports that provide insights into the overall performance of students, class averages, question-wise analysis, and other relevant metrics. This information can be used to evaluate the effectiveness of the exams, identify knowledge gaps, and make data-driven decisions for future assessments.

1. Testing and Validation:

During the implementation phase, rigorous testing and validation procedures were followed to ensure the system's functionality and reliability. Various testing techniques, such as unit testing, integration testing, and system testing, were conducted to identify and resolve any issues or bugs. The system was tested on different platforms, browsers, and devices to ensure cross-compatibility and optimal performance.

User feedback and suggestions were also collected and incorporated into the system's improvement process. User acceptance testing was performed to assess the system's usability and gather valuable insights and feedback from actual users. This iterative approach allowed us to fine-tune the system and address any usability concerns or functional gaps.

1. Security Measures:

The security of the Online Examination System is of utmost importance to protect sensitive user data and maintain the integrity of the exams. Several security measures have been implemented to ensure a secure environment for both users and the system itself.

User authentication is enforced to prevent unauthorized access to the system. Passwords are stored securely using cryptographic hashing algorithms to protect them from being compromised. Additionally, measures such as session management, input validation, and secure communication protocols (e.g., HTTPS) are implemented to mitigate common security vulnerabilities.

To prevent cheating during exams, the system includes features like randomizing question orders, disabling copy-paste functionality, and restricting access to external resources. These measures aim to maintain the integrity and fairness of the exams, ensuring that each student's performance is an accurate reflection of their knowledge and abilities.

1. Scalability and Performance Optimization:

Efforts were made to design the Online Examination System to be scalable and capable of handling a large number of concurrent users. Techniques such as database indexing, query optimization, and caching were employed to optimize the system's performance and response times.

Load testing was conducted to assess the system's performance under different levels of user activity and to identify potential bottlenecks. Based on the test results, optimizations were implemented to ensure that the system can handle high user loads without compromising its responsiveness.

1. User Documentation and Support:

Comprehensive user documentation was created to guide users through the process of using the Online Examination System. The documentation covers topics such as user registration, exam participation, result viewing, and frequently asked questions. This resource aims to provide clear instructions and support to users, enabling them to navigate the system effectively.

Additionally, a support mechanism was established to address user queries and issues. Users can reach out to the system administrators or support team through designated communication channels, such as email or a dedicated support portal. Prompt responses and resolutions are provided to ensure a smooth user experience and resolve any technical or functional challenges.

Overall, the implementation of the Online Examination System has been successful, meeting the project objectives and delivering a robust and user-friendly platform for conducting online exams. The system's features, security measures, scalability, and performance optimizations have been thoroughly implemented and validated through testing and user feedback. The next chapter will provide concluding remarks and outline potential future enhancements for the system.

## CONCLUSION AND FUTURE WORK

### 5.1. Conclusion

The development of the Online Examination System using PHP and MySQL has successfully addressed the need for an efficient and scalable platform for conducting online exams. This project has demonstrated the potential and advantages of utilizing web-based technologies to streamline the examination process in educational institutions.

Throughout the project, various objectives were achieved. The system was designed and implemented, allowing students to register, access exam materials, and submit their answers online. Teachers and administrators were equipped with the necessary tools to create and manage exams, monitor student progress, and generate reports.

The advantages of the Online Examination System are evident. Firstly, it provides convenience and flexibility to both students and educators by eliminating the need for traditional paper-based exams. Students can take exams from any location with an internet connection, saving time and effort. Secondly, the system ensures fairness and integrity in the examination process through robust security measures, preventing unauthorized access and cheating.

The project also considered important aspects such as system performance and user experience. Extensive testing and optimization were conducted to ensure the system's responsiveness, scalability, and stability, even under high user loads. User feedback and usability testing helped refine the system's interface and functionality, resulting in an intuitive and user-friendly experience.

The Online Examination System using PHP and MySQL has proven to be a valuable tool for educational institutions, offering a convenient, secure, and efficient platform for conducting exams. It has the potential to revolutionize the examination process, improve administrative efficiency, and enhance the learning experience for students. By embracing technology and leveraging web-based solutions, educational institutions can embrace the benefits of online assessments and adapt to the ever-changing educational landscape.

### 5.2. Future work

There are several potential enhancements to consider. Integration with learning management systems and the development of mobile applications could further extend the system's reach and accessibility. The inclusion of advanced analytics and data visualization features would provide valuable insights into student performance and assessment outcomes. Continuous updates and maintenance will be crucial to ensure the system remains up-to-date and aligned with evolving educational requirements. There are several areas that can be explored to further enhance the Online Examination System:

* 1. Enhanced Security Measures: Continual improvements in security should be a priority. Implementing advanced authentication mechanisms, such as biometric authentication or two-factor authentication, can add an extra layer of security and prevent unauthorized access to the system.
  2. Adaptive Testing: Implementing adaptive testing techniques can enhance the system's ability to dynamically adjust the difficulty level of questions based on individual student performance. This approach ensures a more personalized and accurate assessment of students' knowledge and abilities.
  3. Integration with Learning Management Systems (LMS): Integrating the Online Examination System with popular Learning Management Systems, such as Moodle or Canvas, would streamline the process of exam creation, student enrollment, and result management. This integration would provide a seamless experience for both students and educators.
  4. Mobile Application Development: Creating a mobile application for the Online Examination System would enable students to take exams on their smartphones or tablets, providing even more flexibility and accessibility. The application could also incorporate features like offline mode and push notifications for exam reminders and updates.
  5. Multilingual Support: Adding multilingual support to the system would make it more inclusive and accessible to students from different language backgrounds.

**REFERENCES**

For our project on the Online Examination System using PHP and MySQL, we have taken references from various sources such as research papers, books, websites, online documentation, and any other relevant materials. Here is list of references that we used:

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**APPENDIX**

1. Plagiarism Report

Attached with the project report.

1. Design Checklist

Here's the Design Checklist for your Online Examination System using PHP and MySQL:

* 1. User Interface Design:
* The user interface is intuitive and user-friendly.
* The design follows standard web design principles.
* The layout is responsive and compatible with different devices.
* All the necessary elements such as buttons, forms, and navigation has been properly placed and styled.
* The design ensures a seamless user experience throughout the examination process.
  1. Security Design:
* The system designed to protect against unauthorized access.
* Proper authentication and authorization mechanisms is implemented.
* Secure protocols (e.g., HTTPS) used for data transmission.
* User passwords stored securely using hashing algorithms.
* The systemprovide protection against common security vulnerabilities like SQL injection and cross-site scripting.
  1. Database Design:
* The database schema is well-designed and optimized for efficient data storage.
* Appropriate tables and relationships defined to store user information, examination details, and results.
* Proper indexes and constraints implemented to ensure data integrity.
* The database schema is scalable to accommodate future growth and additional features.
  1. Functionality Design:
* The system provides all the necessary functionalities for conducting online examinations, including question creation, test scheduling, and result calculation.
* There are appropriate validation checks in place to ensure data integrity and accurate results.
* The examination workflow is well-defined and logical for both administrators and students.
* Error handling and exception management is implemented to handle unexpected scenarios.
* Provisions made for backup and data recovery in case of system failures.
  1. Performance and Scalability Design:
* The system designed to handle multiple concurrent users without performance degradation.
* Performance optimization techniques such as caching and query optimization are applied.
* The system scalable to handle increased user loads and future expansion.
* Provisions are made for load testing and performance monitoring.
  1. Documentation and Code Maintainability:
* Comprehensive documentation provided, describing the system architecture, design decisions, and implementation details.
* Code comments used effectively to improve code readability and maintainability.
* Coding standards and best practices are followed.
* Version control systems is used to track changes and manage the codebase.

## USER MANUAL

1. **Introduction**
   1. Purpose

The purpose of this manual is to provide users with a comprehensive guide on how to use the online examination system developed using PHP and MySQL. It aims to assist administrators, instructors, and students in understanding the functionalities and features of the system, enabling them to effectively utilize its capabilities for conducting and participating in online exams.

* 1. Overview of the online examination system:

The online examination system is a web-based application designed to streamline the process of conducting exams in an online environment. It allows administrators to create and manage exams, instructors to review and grade exams, and students to take exams and view their results. The system provides a user-friendly interface that supports various question types, time limits, grading systems, and result generation. It also offers features such as exam analytics, communication tools, and administrative controls to ensure smooth exam administration and effective assessment.

* 1. System requirements:

To access and use the online examination system, the following system requirements must be met:

* Web Server: A web server capable of running PHP scripts (e.g., Apache, Nginx).
* PHP: Version 7 or above.
* MySQL Database: Version 5 or above.
* Web Browser: Latest versions of popular web browsers such as Google Chrome, Mozilla Firefox, or Microsoft Edge.
* Internet Connection: A stable internet connection to access the system and submit exam responses.

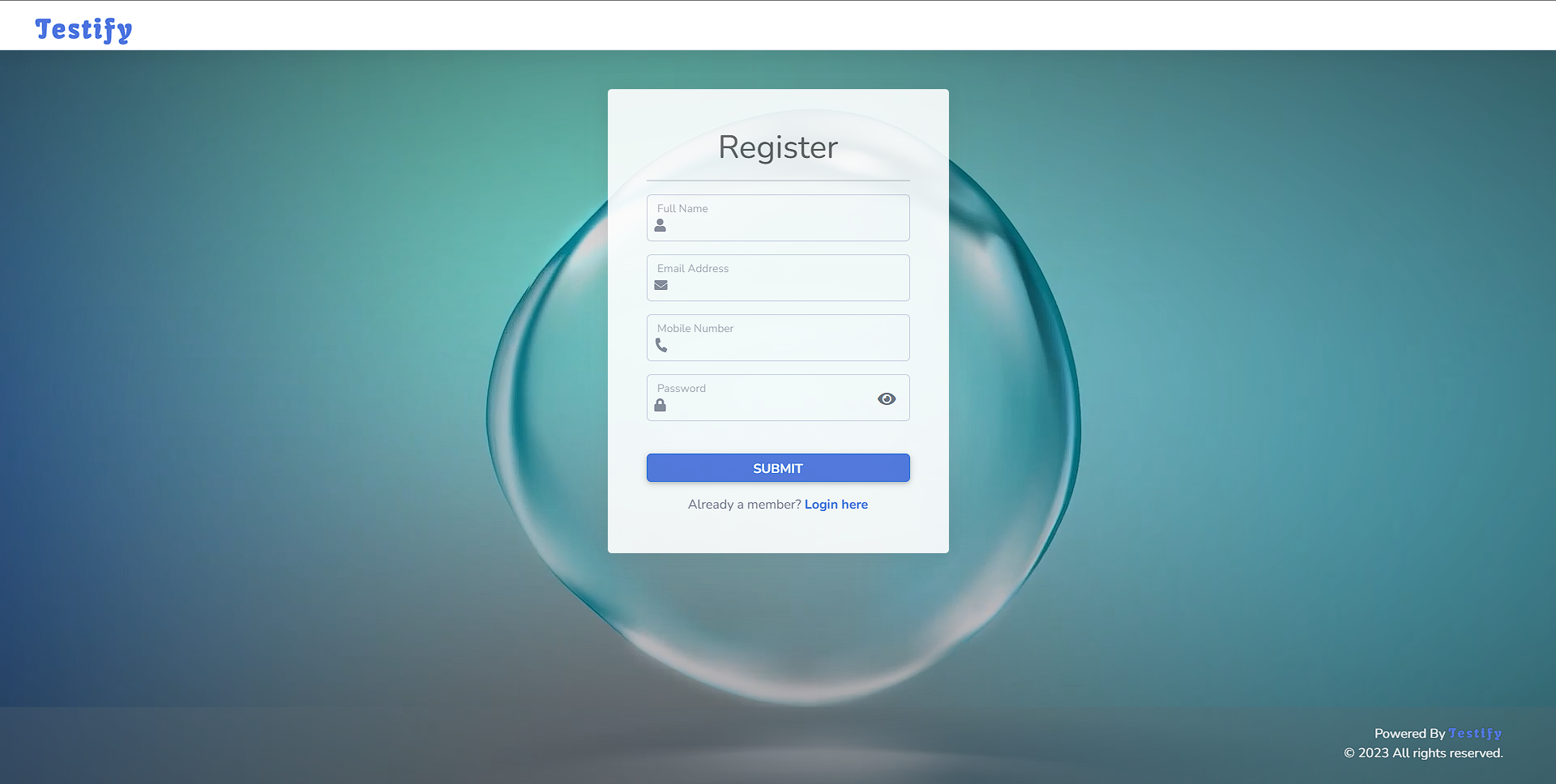
1. **Getting Started:**
   1. Accessing the system:

To access the online examination system, follow these steps:

* Open your preferred web browser (e.g., Google Chrome, Mozilla Firefox).
* Enter the URL of the online examination system in the address bar.
* Press Enter to navigate to the login page of the system.
  1. Creating a user account:

Before you can access the system, you need to create a user account. Follow these steps to create your account:

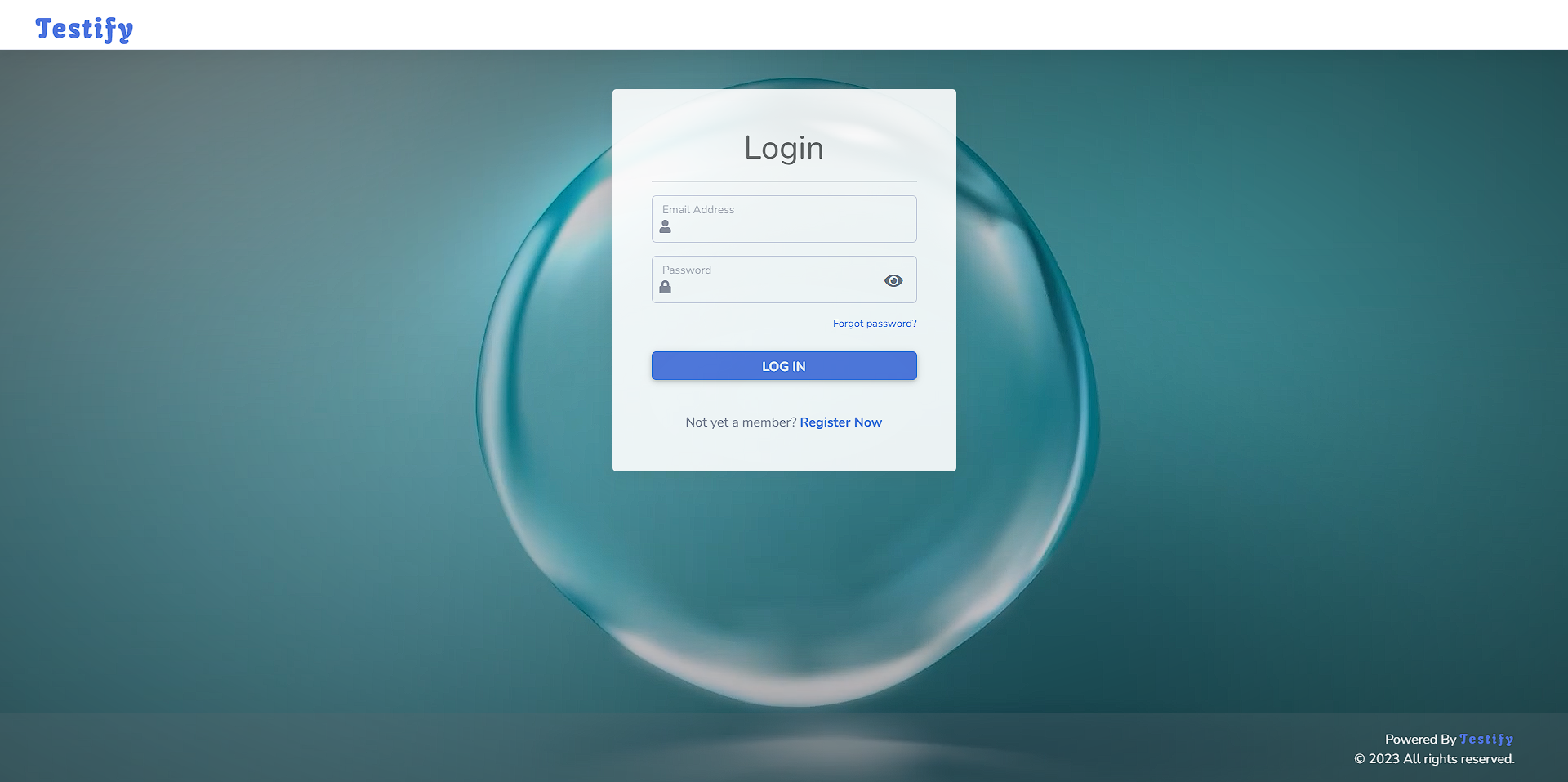
* On the login page, locate the "Register" option.
* Click on the option to proceed to the user registration page. Fill in the required information, such as your name, email address, and a chosen password.
* Confirm the entered information and click on the "Create Account" button.
* If the information provided is valid, your user account will be successfully created.



* 1. Logging in and logging out:

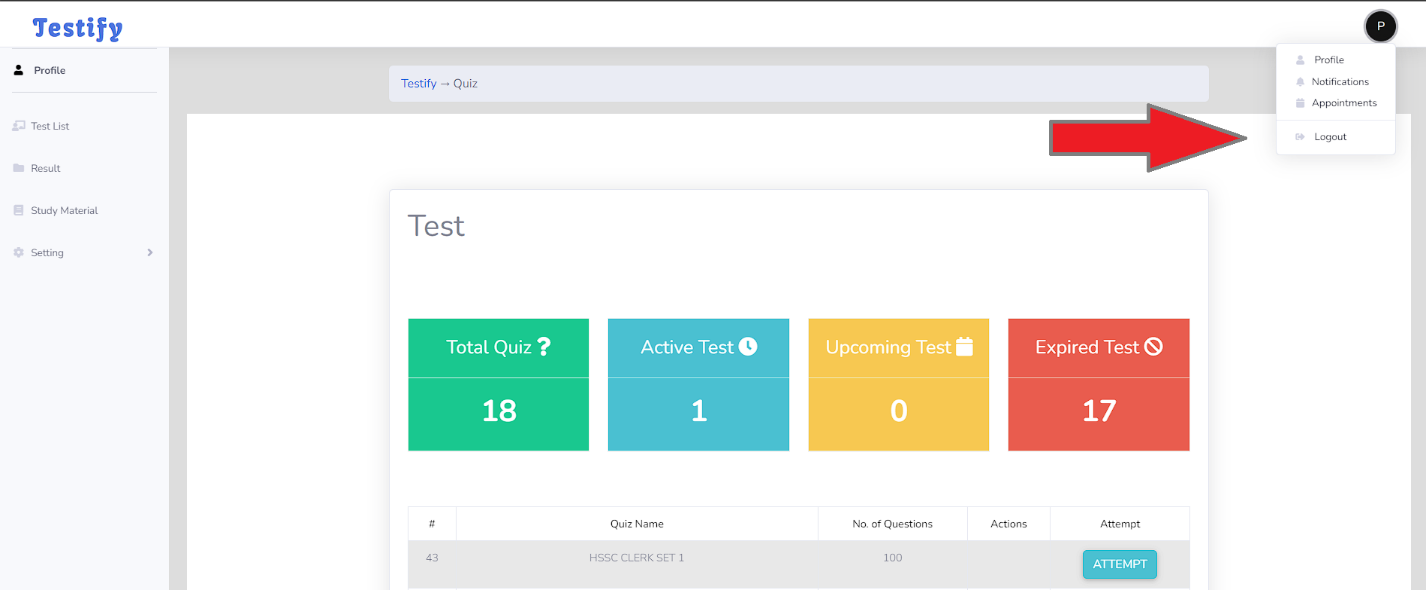
Once you have created a user account, you can log in to the system using the following steps:

* On the login page, enter your registered email address and password in the provided fields.
* Click on the "Login" button to proceed.
* If the entered credentials are correct, you will be redirected to your user dashboard.



To log out of the system, follow these steps:

* Locate the "Logout" option in the user dashboard on right corner.
* Click on the option to initiate the logout process.
* You will be logged out of the system and redirected to the login page.

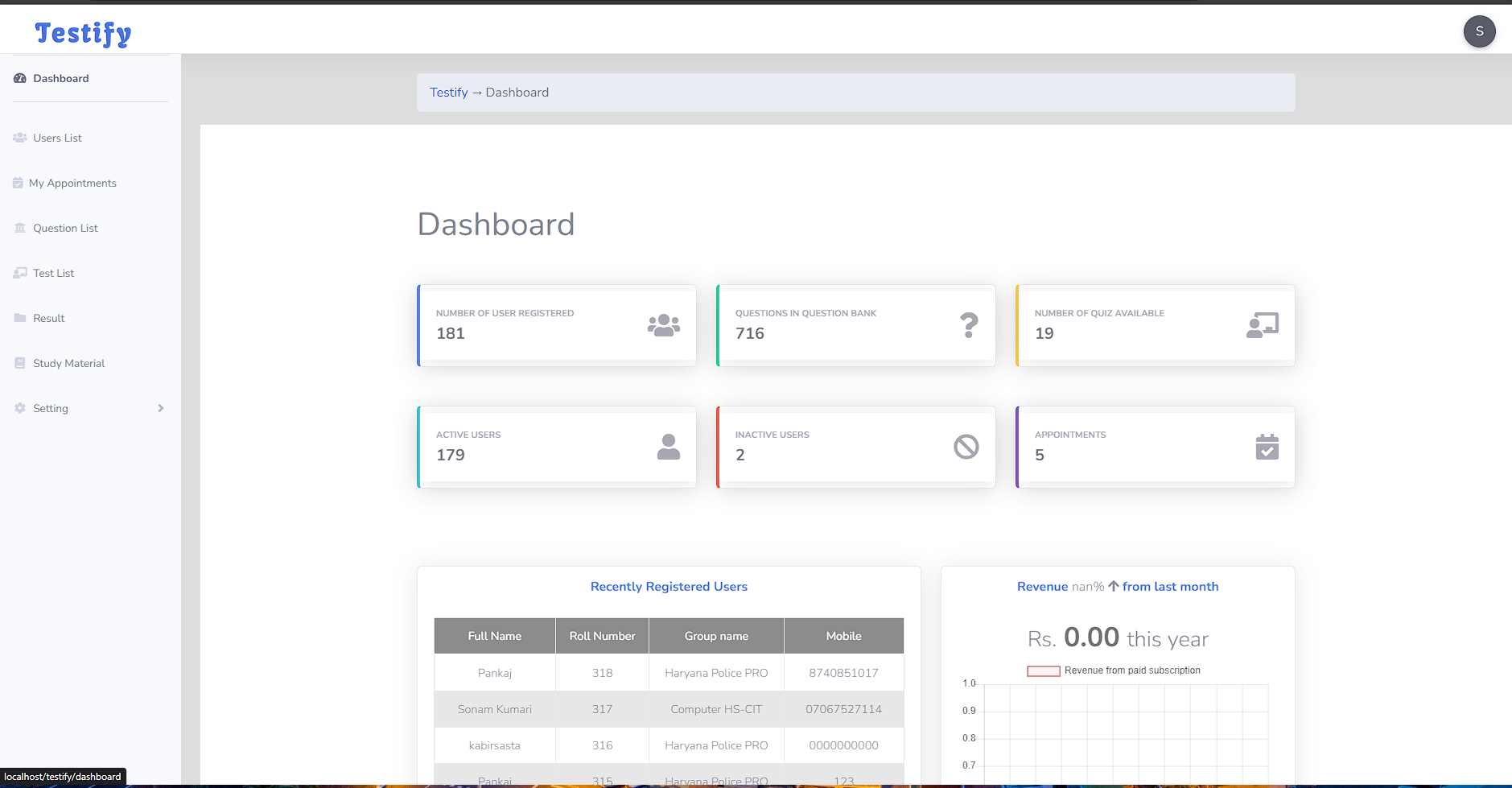


1. User roles:
   1. Administrator:

Responsibilities and privileges:

The administrator is the primary user role with the highest level of access and control over the online examination system. The administrator is responsible for the following tasks:

* System Configuration: Configuring the system settings, such as defining the system title, logo, email templates, and other global settings.
* User Management: Managing user accounts within the system, including creating new user accounts, modifying existing accounts, and deactivating or deleting accounts if necessary.
* Exam Management: Creating and managing exams within the system. This includes creating new exams, defining exam parameters (such as time limits, passing grades, and availability), adding or removing questions, and setting up question banks for reuse.
* Exam Schedule: Setting up exam schedules and assigning exams to specific instructors or groups of students.
* Report Generation: Generating reports for exam results, student performance, and system analytics. These reports provide valuable insights and statistics for evaluation purposes.
* System Maintenance: Performing regular backups, system updates, and database optimizations to ensure the smooth functioning of the online examination system.



Managing user accounts:

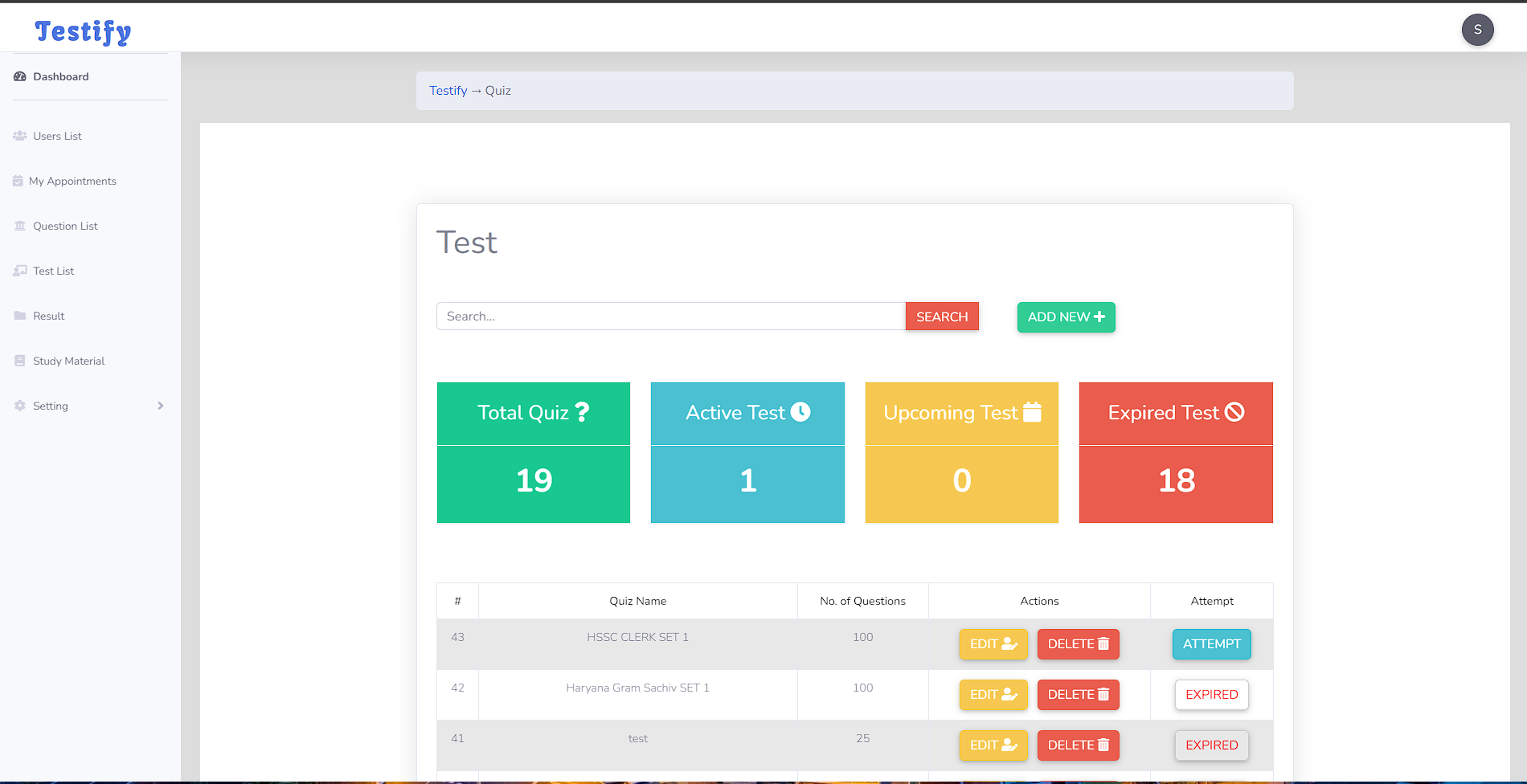
The administrator has the authority to manage user accounts within the system. This includes the following tasks:

* Creating User Accounts: Creating new user accounts by providing essential details such as name, email address, and password.
* Modifying User Accounts: Modifying user information, such as name, email address, or resetting passwords, if required.
* Deactivating or Deleting User Accounts: Deactivating or permanently deleting user accounts as necessary, for example, when a user leaves the institution or organization.

Creating and managing exams:

The administrator has the ability to create and manage exams within the system. This includes the following tasks:

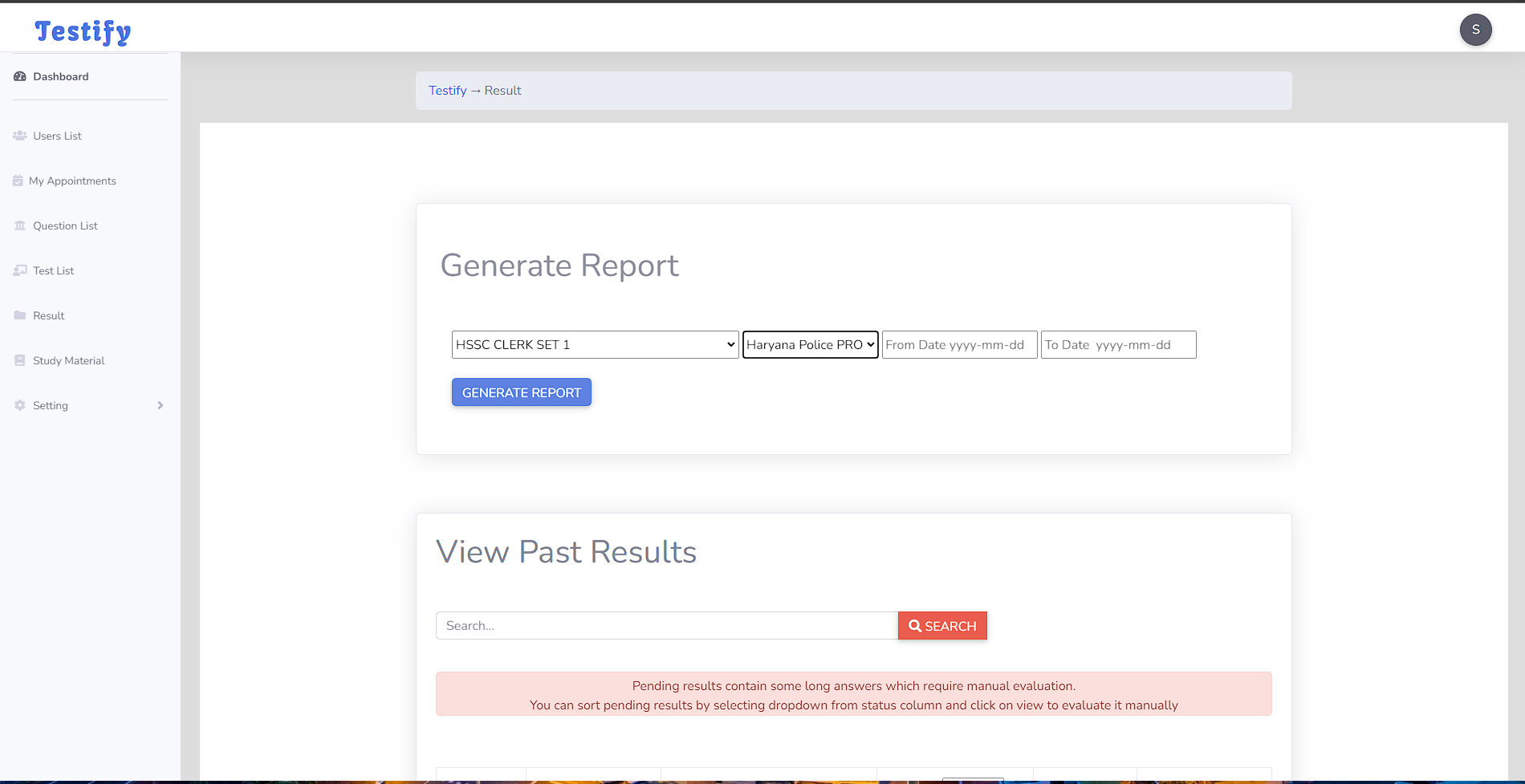
* Creating Exams: Creating new exams by specifying the exam title, description, duration, and other relevant parameters.
* Adding Questions: Adding questions to exams, either by creating new questions or selecting from a question bank, and assigning appropriate marks to each question.
* Managing Exam Parameters: Setting up exam parameters such as time limits, passing grades, negative marking (if applicable), and exam availability.
* Editing and Deleting Exams: Modifying exam details, such as changing the exam duration or description, and deleting exams if necessary.



Generating reports:

The administrator can generate various reports to gain insights into exam results, student performance, and system analytics. These reports can be used for evaluation purposes and to identify areas for improvement. The administrator can generate reports such as:

* Exam Results Report: Provides a summary of exam results, including scores, grades, and performance statistics.
* Student Performance Report: Analyzes individual student performance, identifying strengths and areas for improvement.
* System Analytics Report: Offers overall statistics and insights about the system usage, such as the number of exams conducted, user activity, and system performance.

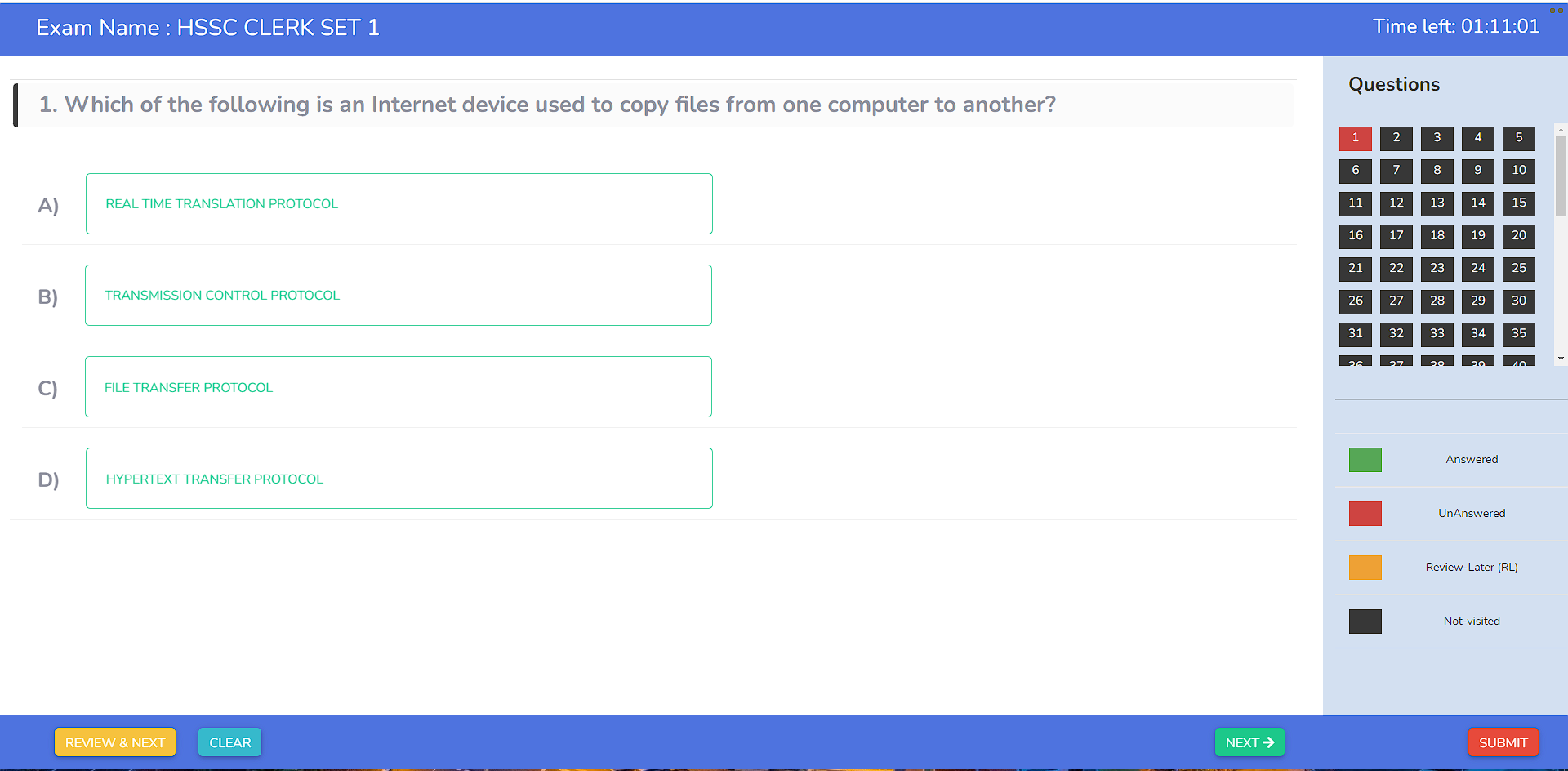


* 1. Student:

Accessing and taking exams:

The student role is designed for individuals who will be taking exams within the system. The student is responsible for the following tasks:

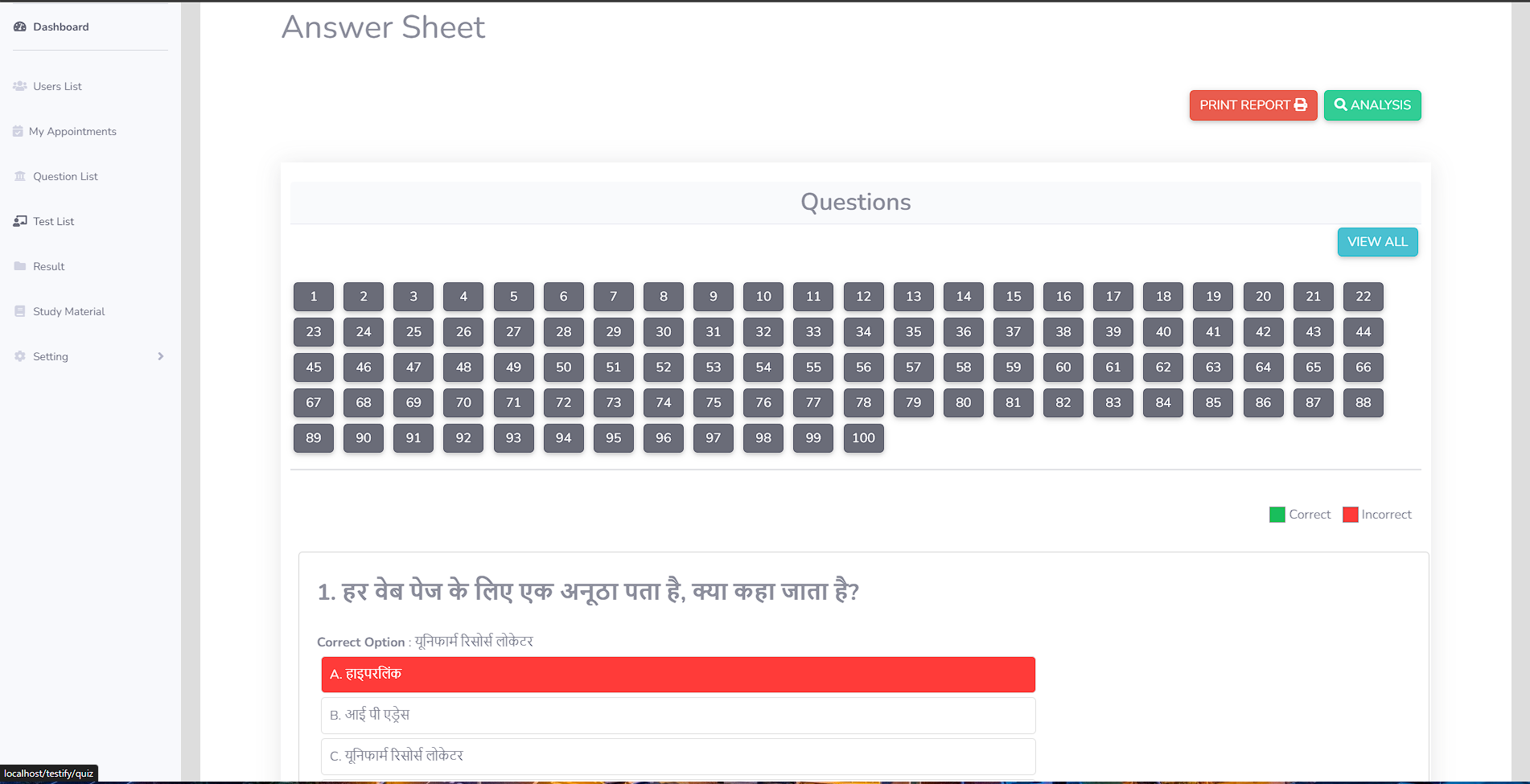
* Exam Access: Accessing and taking exams that have been assigned to them by the administrator or instructor.
* Taking Exams: Answering exam questions within the designated time limit and submitting the completed exam before the deadline.
* Exam Completion: Completing exams within the designated time limit and following the instructions provided.



Viewing exam results and feedback:

Once students have completed an exam, they can view their exam results and feedback provided by the instructor or administrator. This includes the following tasks:

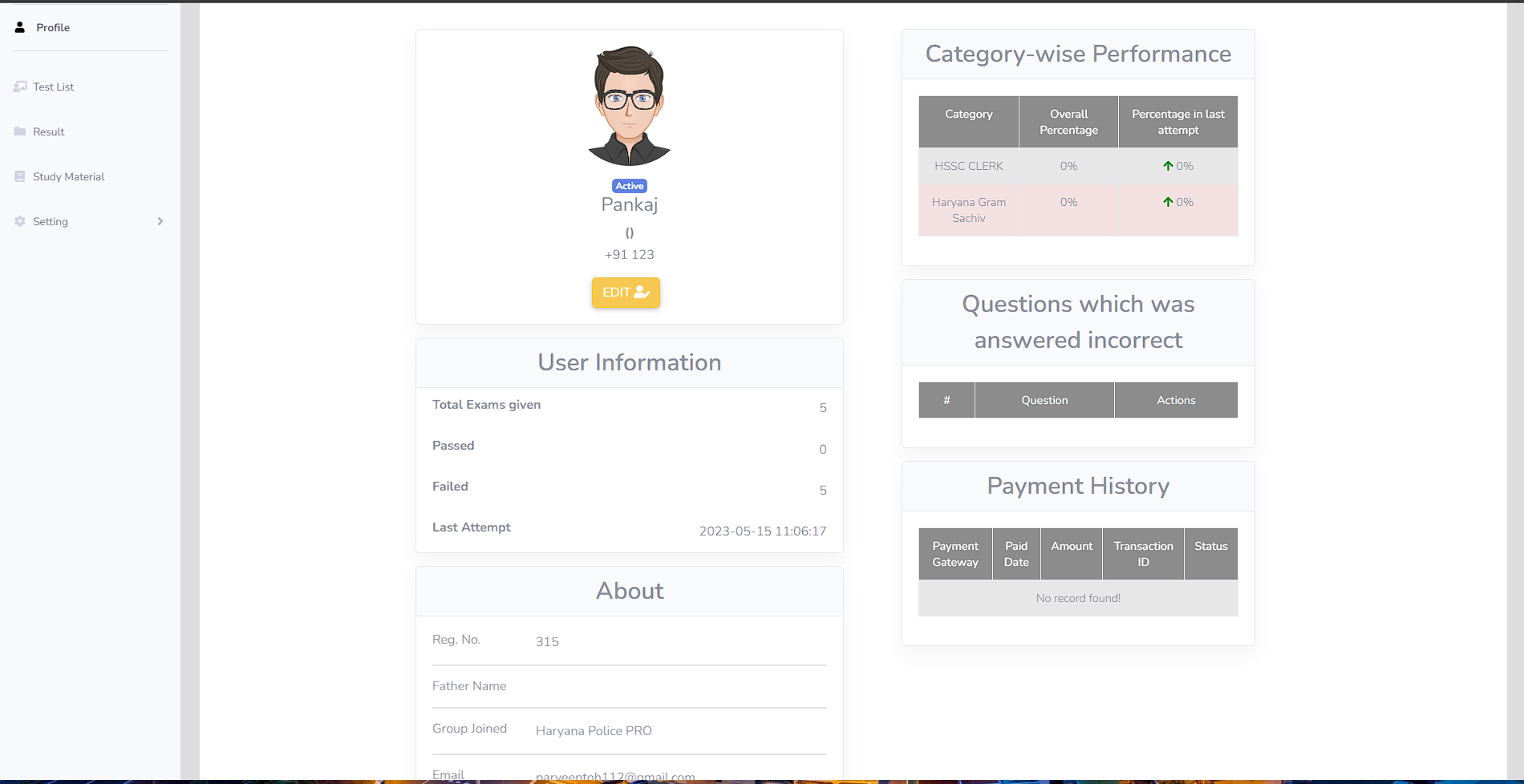
* Exam Results: Viewing exam results, including the total score, passing status, and overall performance.
* Feedback: Accessing feedback provided by the instructor or administrator, such as comments on specific questions or overall performance.
* Exam Review: Reviewing the completed exam and reviewing the correct answers and explanations provided by the instructor or administrator.



1. System Features:
   1. Dashboard Overview:

The dashboard serves as the main interface for users within the online examination system. It provides an overview of important information and access to various features. The key components of the dashboard include:

* Exam Status: Displays upcoming exams, ongoing exams, and recently completed exams.
* Notifications: Alerts users about new messages, exam assignments, or any other important updates.
* Exam Analytics: Presents statistics and insights about overall exam performance, student progress, and other relevant data.



* 1. Managing Exams:

The system allows administrators and instructors to create, edit, and delete exams. Here are the key tasks related to managing exams:

* Creating Exams:

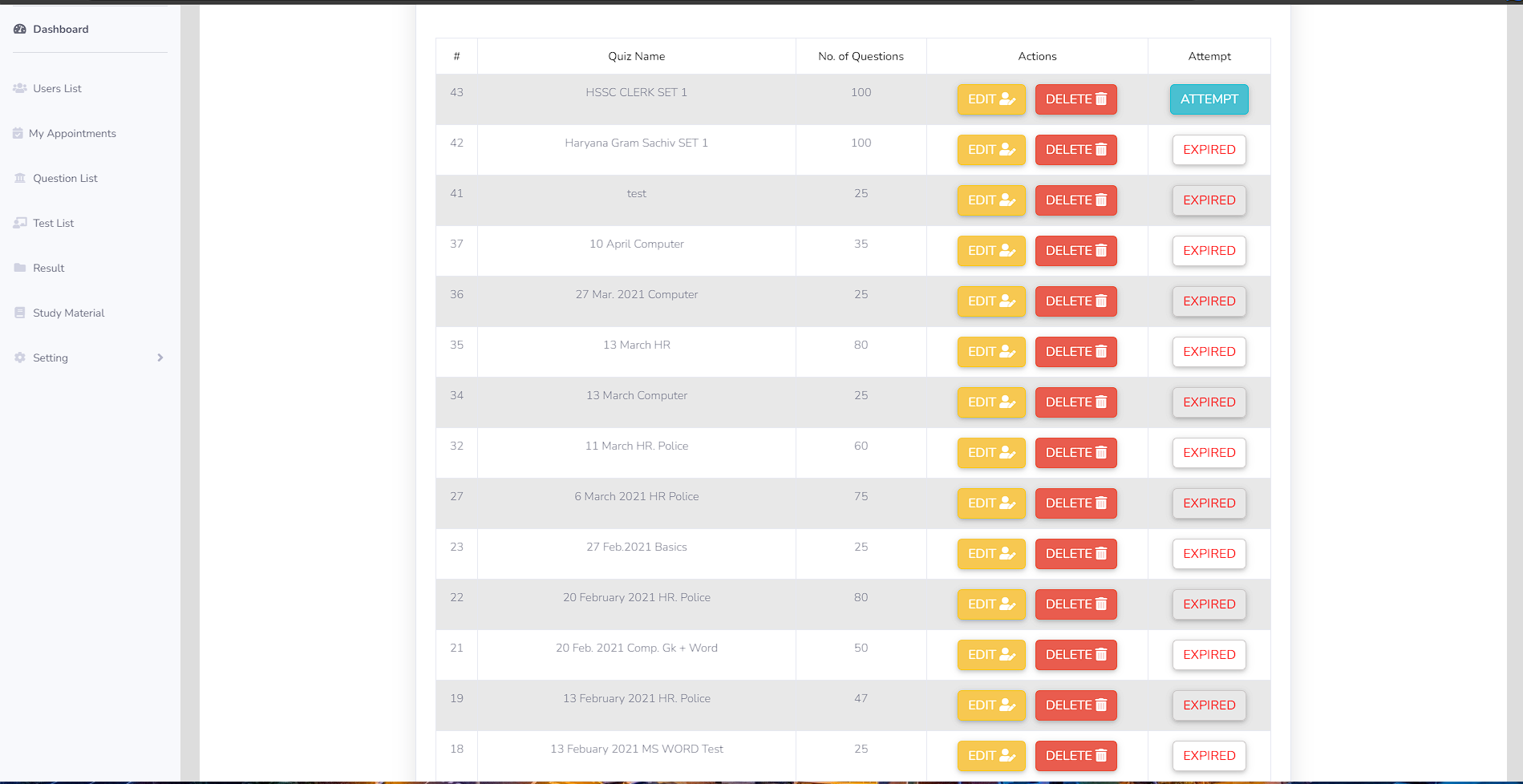
Click on the "Create Exam" or similar option. Provide the exam details, such as the title, description, and duration. Specify the number of questions to be included in the exam.

* Setting Exam Parameters:

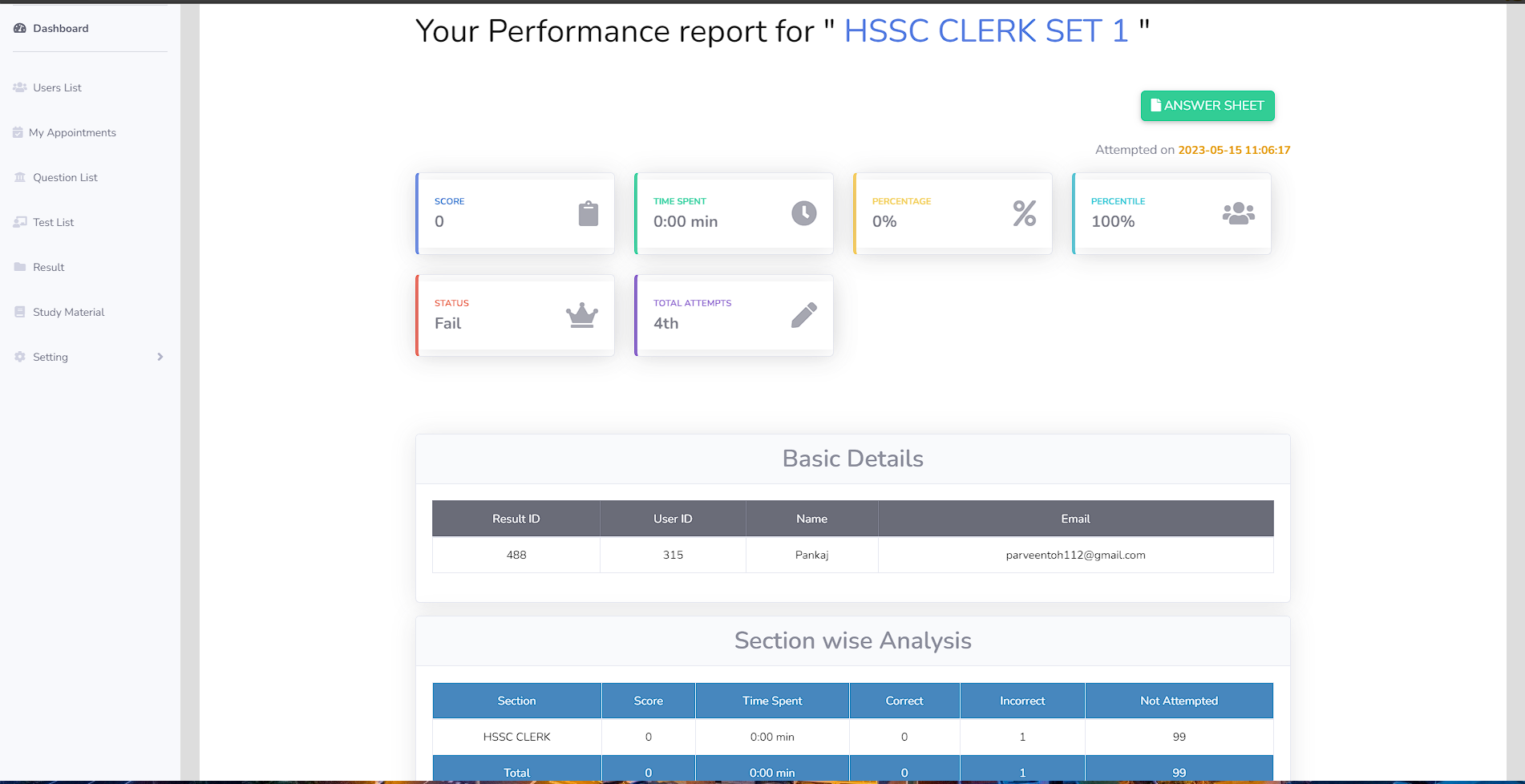
Define the exam parameters, such as the time limit for completing the exam, passing grade, and maximum score. Set additional settings, such as randomizing the order of questions or displaying questions one at a time.

* Editing and Deleting Exams:

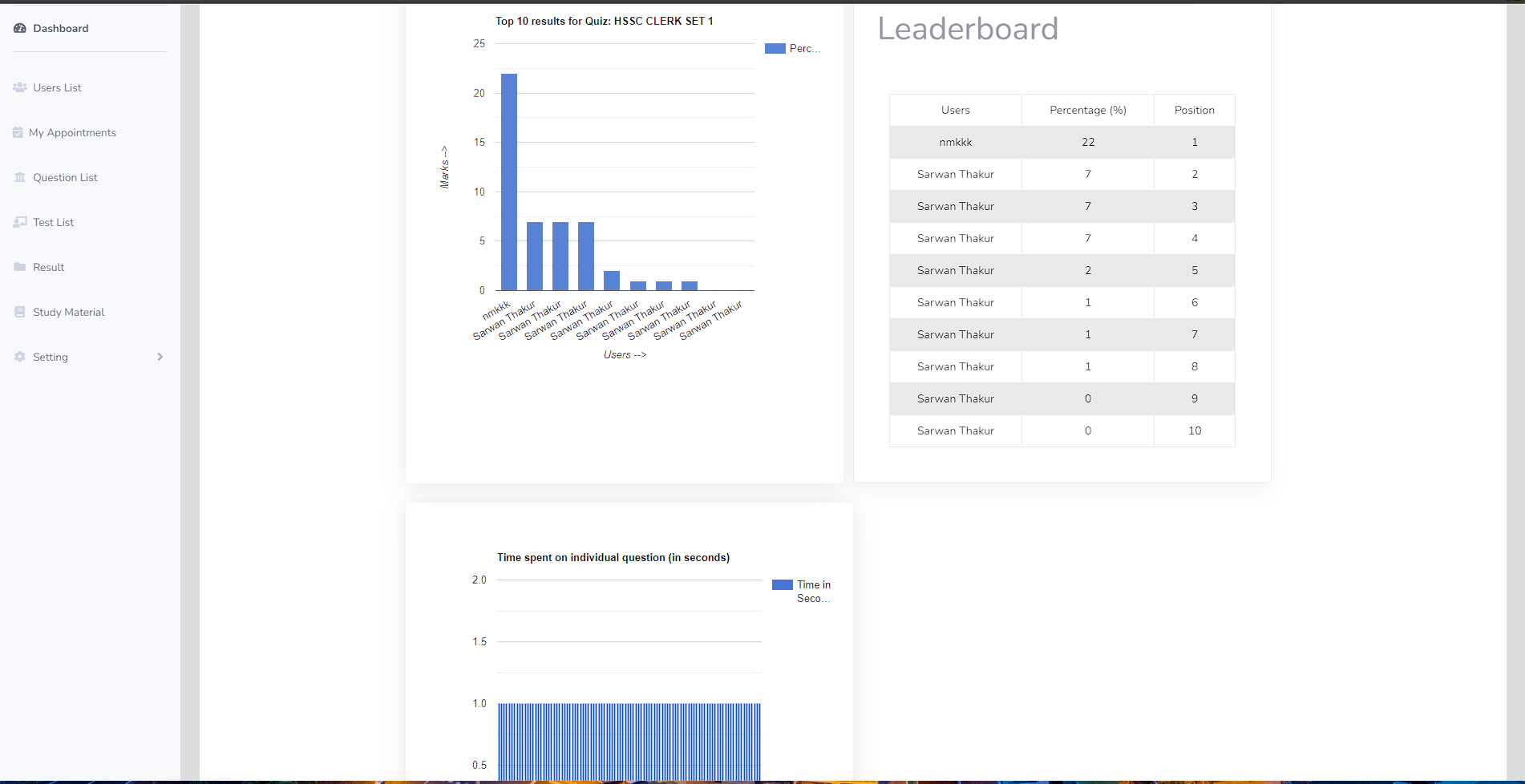
Locate the exam you wish to modify or delete. Click on the "Edit" or "Delete" option. Make the necessary changes or confirm the deletion.



* 1. Generating Exam Reports:
* Access the reporting section or dashboard.
* Select the desired report type (e.g., exam results, student performance).
* Specify the parameters, such as the exam or date range.
* Generate the report and view or download the results.



* 1. Analysing Student Performance:
* Access the student performance analytics section.
* Select the specific exam or student to analyse.
* Review performance metrics, such as scores, grades, and question-wise analysis.
* Identify trends and areas for improvement.



1. Conclusion:

We hope this user manual has provided you with a comprehensive understanding of the online examination system. Should you require any further assistance or have any questions, please consult the resources below:

Additional Resources and Support:

* User Support: If you encounter any issues or need technical assistance, please contact our support team at [support email].
* Updates and Documentation: Stay updated with the latest system features, bug fixes, and enhancements by regularly checking our official website and documentation.