

**A WEB APPLICATION FOR EXAMINATION
(Exam Portal)**

Major project report submitted in partial fulfillment of the requirement for
the degree of Bachelor of Technology

in

Computer Science and Engineering

By

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UNDER THE SUPERVISION OF

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DECLARATION

I hereby declare that this project has been done by me under the supervision of Dr. Amol Vasudeva, Affiliation, Jaypee University of Information Technology. I also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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CERTIFICATE

This is to certify that the work which is being presented in the project report titled “Exam Portal” in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science And Engineering and submitted to the Department of Computer Science And Engineering, Jaypee University of Information Technology, Wagnaghat is an authentic record of work carried out by “Aditya Singh, 191360, Chandan Kumar Yadav, 191355” during the period from January 2023 to May 2023 under the supervision of Dr. Amol Vasudeva, Department of Computer Science and Engineering, Jaypee University of Information Technology, Wagnaghat.

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The above statement made is correct to the best of my knowledge.

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Aditya Singh (191360)

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ABSTRACT

Online examination systems have become increasingly popular in recent years due to their numerous benefits. These systems allow students to take tests from any location with internet connectivity, eliminating the need for physical infrastructure such as classrooms and examination halls. Students can also take tests at their convenience, allowing them to balance their academic commitments with other responsibilities. The system's immediate feedback feature enables students to identify their weak areas and work on them, leading to improved academic performance. This feature also allows administrators to monitor students' progress and identify areas where they may need additional support. and also cost-effective, particularly for institutions that have to rent or maintain physical spaces for testing purposes. This makes the system accessible to a wider range of students, including those from low-income families or remote areas, promoting inclusivity and reducing the education gap between students from different socioeconomic backgrounds. However, online examination systems also have several challenges that administrators and students must overcome. Cheating is a significant challenge, and the system must include features such as randomizing questions, setting time limits, and restricting access to external materials during the test to mitigate this challenge. Technical glitches such as server downtime, slow internet connection, and software errors can also impact the student's test-taking experience and their performance. Despite these challenges, online examination systems have a significant impact on student learning and performance. With the continued advancement in technology, online examination systems will continue to revolutionize the education sector, promoting inclusivity and improving student learning and performance.

Chapter 01: Introduction

1.1 Introduction

A technology called an online test website enables students to take exams remotely from any place with internet access. The student interface and the administrator interaction are the two main parts of the system. While administrators can manage and edit tests and student profiles via the administrator interface, students are able to sign in and take exams through the student user interface.

Accessibility, flexibility, efficiency, and cost-effectiveness are just a few advantages that online testing portals can provide. Tests can be taken anywhere, hence there is no longer a need for physical infrastructure like classrooms and exam rooms. Additionally, this lowers the system's cost, which is beneficial for institutions that must rent or maintain physical spaces for testing.

Students can take exams at their convenience, provided they meet the deadline set by the administrator, enabling them to balance their academic commitments with other responsibilities such as work and family. The system's immediate feedback feature provides students with instant feedback on their performance, allowing them to identify their weak areas and work on them before taking subsequent exams, leading to improved academic performance.

The system's efficiency makes it easy for administrators to manage and edit student profiles and exams. The administrator can add or remove students from the system, create and edit exams, and monitor students' progress, making it particularly useful for institutions with large numbers of students.

However, online examination portals also have several challenges that administrators and students must overcome. Cheating is a significant challenge, and the system must include features such as randomizing questions, setting time limits, and restricting access to external materials during the exam to mitigate this challenge.

Technical glitches such as server downtime, slow internet connection, and software errors can significantly impact the student's exam-taking experience and their performance. To mitigate

this challenge, the system must have a robust technical infrastructure, including backup servers, high-speed internet connectivity, and reliable software. In conclusion, online examination portals have numerous benefits for both students and administrators. They provide accessibility, flexibility, efficiency, and cost-effectiveness, making them an ideal testing platform for modern-day learners. However, the system's challenges, such as cheating and technical glitches, must be adequately addressed to ensure its success. With the continued advancement in technology, online examination portals will continue to revolutionize the education sector, promoting inclusivity and improving student learning and performance.

1.2 Problem Statement

The problem statement for creating an online examination portal is the traditional exam system's inefficiencies and limitations. Traditional exam systems are often costly, time-consuming, and require physical infrastructure such as classrooms and examination halls, which can be a challenge for institutions with limited resources. Additionally, traditional exam systems can be inflexible, with students required to take exams at a specific time and location, which can be challenging for students with other commitments. Moreover, traditional exam systems can be prone to technical glitches and issues, resulting in delays and impacting the exam's fairness and accuracy. Finally, traditional exam systems are vulnerable to cheating, which can significantly impact student learning and performance, leading to a lack of confidence in the exam system's integrity. Therefore, the problem statement for creating an online examination portal is to address these inefficiencies and limitations of traditional exam systems by providing an efficient, accessible, flexible, and cost-effective platform for students to take exams remotely while addressing cheating concerns and technical glitches.

1.3 Objective

The objective of an online examination portal is to provide an efficient and cost-effective platform for students to take exams remotely from any location with internet connectivity. The system aims to offer flexibility, accessibility, and efficiency in scheduling and grading exams while providing instant feedback to students. It also aims to address the challenges of traditional testing methods such as cheating and technical glitches while providing a

user-friendly interface for administrators to manage and edit student profiles and exams. In the current world, it becomes very important for anyone and everyone to be updated about tech-related news and inventions. Being updated about tech is important for both students and professionals. Students need to be informed about these things to make a place for themselves in the industry while professionals need to learn about the latest trends to stay relevant. This website will serve the mentioned purpose perfectly. Another objective of this project is to implement the knowledge gained in the last three years. Practical knowledge is best to know how much we have learned so far. We decided to make a website with all basic features like login/register, CRUD operations, and use of front-end frameworks like Angular js, and Bootstrap and backend frameworks like SpringBoot, and MySQL to test our understanding and gain some experience in the field of development.

1.4 Motivation

The motivation behind creating an online examination portal is to revolutionize the traditional exam system and address the challenges posed by it. The system aims to provide an efficient, cost-effective, and accessible platform for students to take exams remotely from any location with internet connectivity, particularly during the COVID-19 pandemic. The system also aims to provide flexibility in scheduling exams, instant feedback to students, and efficient grading for administrators. Additionally, the system aims to address the issue of cheating, which can significantly impact student learning and performance, by implementing features such as randomizing questions, setting time limits, and restricting access to external materials during the exam. Overall, the motivation behind creating an online examination portal is to promote inclusivity, improve student learning and performance, and make the exam process more efficient and effective.

After putting all those aspects, we created proper documentation of our project describing every step such as what we are using for the frontend and backend parts. Which tool we are going to use for the same. How and where we are going to deploy our application. We mailed our project details to our supervisor Amol Vashudeva sir, thankfully he approved our project, and under his supervision, we started implementing it.

Scope:

The Following points are most valuable.

- Conduct Exam effortless. It reduces exam anxiety among test takers.
- Promote social interaction between the test taker and experts.
- Prevents cheating.
- Safe and secure data.
- Can get result instantly

1.4 Language Used

Front-end:

Angular: A well-liked front-end programming framework called Angular is used to create dynamic web applications. Angular is a sophisticated framework created and maintained by Google that includes two-way data binding, dependency injection, and a component-based architecture. Additionally, it offers seamless integration with other Angular ecosystem tools like RxJS and Angular CLI. Angular is a popular option for large-scale commercial applications because of its performance and scalability. Future predictions indicate that its use will gain in popularity.

HTML: It is one of the most basic building blocks of any website. It stands for “Hypertext markup language”. It has various tags for different components like paragraph tags, bold tags, italic tags, button tags, form tags, etc.

Bootstrap: is used for front-end templates and to make the web application responsive.

CSS: It stands for “cascading style sheet”. It is used to control all the design-related functions such as color, font, alignment, margin, and padding.

TypeScript: TypeScript is a programming language and an open-source superset of JavaScript that adds optional static typing and class-based object-oriented programming (OOP) features to JavaScript. It was developed and maintained by Microsoft and has gained

a lot of popularity among developers due to its ability to catch errors before runtime and make code more maintainable and scalable.

Back-end:

Spring Boot: A well-liked open-source framework called Spring Boot is used to create Java web apps. It offers a wide range of features including out-of-the-box configurations, embedded servers, and easy integration with other Spring frameworks. A well-liked open-source framework called Spring Boot is used to create Java web apps. By eliminating the need for boilerplate code and letting developers to concentrate on business logic, the framework streamlines the development process. It is flexible and supports multiple database technologies, making it a versatile choice for a variety of use cases. Additionally, Spring Boot has a large and active community, providing extensive documentation and support to developers. Overall, Spring Boot is a powerful and efficient tool for developing scalable and robust web applications.

MySQL: MySQL is a popular open-source relational database management system used for storing and retrieving data. It uses Structured Query Language (SQL) to manage data and can handle large amounts of data efficiently. There are several libraries available for MySQL in different programming languages such as Java, Python, and PHP, allowing developers to easily connect to and interact with MySQL databases in their applications. These libraries provide a wide range of features, such as connecting to databases, executing queries, and managing transactions.

1.5 Technical Requirements

Hardware

Windows requirements Mac requirements Linux requirements

Operating system Windows 8 or later macOS Sierra 10.12 or later 64-bit Ubuntu 14.04+, Debian 8+, openSUSE 13.3+, or Fedora Linux 24+ Processor Intel Pentium 4 or later Intel

Intel Pentium 4 or later

- Memory 2 GB minimum, 4 GB recommended
- Screen resolution 1280x1024 or larger
- Application Window Size 1024x680 or larger
- Internet connection required.

Software

Java is a popular programming language for creating a wide variety of applications, including web applications. Here are some tools and frameworks that are commonly used for developing web applications in Java.

Spring: Spring is a popular framework for building web applications in Java. It provides a range of features, such as dependency injection, web MVC, and security.

Hibernate: Hibernate is an object-relational mapping framework that allows developers to map Java classes to database tables. It simplifies database access and reduces the amount of boilerplate code required.

Struts: Struts is a web application framework that follows the Model-View-Controller (MVC) architectural pattern. It provides a range of features for building web applications, such as form handling and validation.

Vaadin: Vaadin is a web application framework that allows developers to build web applications using Java and HTML. It provides a set of UI components and a server-side API for building the user interface.

Apache Wicket: Apache Wicket is a web application framework that allows developers to build web applications using Java and HTML. It follows a component-based approach and provides a range of features for building the user interface.

Ultimately, the choice of tool or framework will depend on your specific needs and preferences. It's important to consider factors such as ease of use, performance, scalability, and community support when choosing a tool or framework for your Java web application.

1.6 Methodology

Developing an online examination portal requires a systematic approach to ensure that the system is efficient, reliable, and user-friendly. Here is a general methodology that you can follow. Identify the purpose of the portal, target audience, exam types, and technical requirements of the system. Develop a plan: Create a plan that outlines the features, functionality, and design of the portal. This should include an exam creation and management process, authentication process, security measures, and reporting. Select an appropriate platform that suits your needs and budget. There are various platforms available in the market, such as Moodle, Blackboard, and Canvas. Create and manage exam content in a structured format, including the number of questions, types of questions, and question difficulty level. Ensure that the exam content is relevant and valid. Conduct a pilot test with a small group of users to ensure that the portal functions as expected. This should include testings the exam creation and management process, authentication, and security features. Provide training and support to users on how to use the portal. This can include tutorials, webinars, and online documentation. Once the portal is tested and refined, implement it and ensure that it is working as expected. This includes monitoring the system, updating the exam content, and resolving technical issues. Continuously improve the portal by gathering feedback from users and analyzing data. Use this information to refine and update the portal, keeping it up-to-date with the latest technology and best practices. By following this methodology, we can develop an online examination portal that is user-friendly, secure, and effective in achieving its goal.

System flowchart

A system flowchart is a useful presenting tool since it illustrates how the main parts of my system work together and communicate. It acts as a kind of system road map.

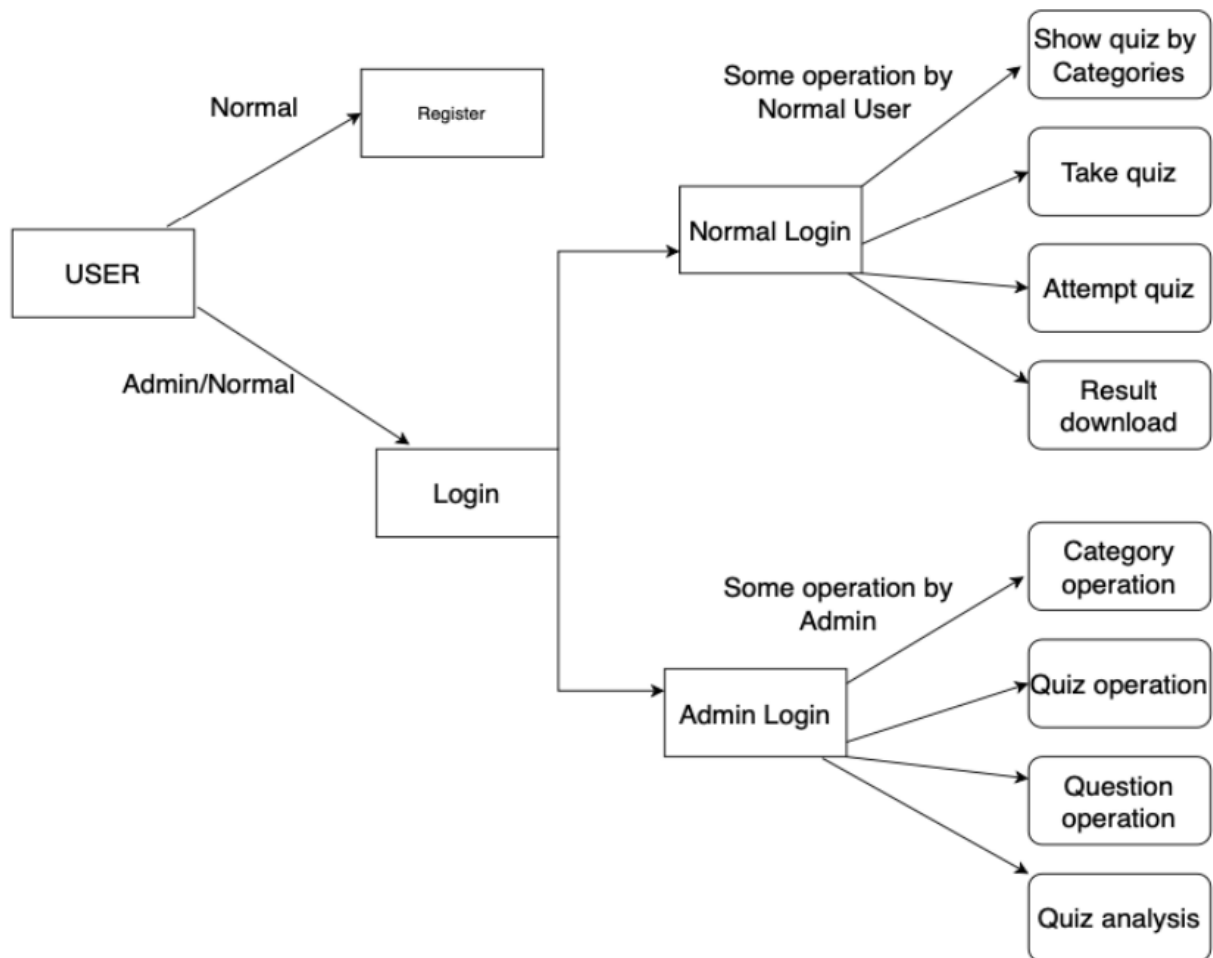


Figure 1.1. System flow diagram

1.7 Deliverables/Outcomes

The outcomes of creating an online examination portal include:

1. Accessibility: An online examination portal provides students with access to exams from any location with internet connectivity, eliminating the need for physical infrastructure such as classrooms and examination halls. This increases accessibility, particularly for students in remote areas, those with disabilities, or those with other commitments.

2. Flexibility: An online examination portal allows students to take exams at their convenience, provided they meet the deadline set by the administrator. This provides flexibility in scheduling and enables students to balance their academic commitments with other responsibilities, leading to improved academic performance.

3. Efficiency: An online examination portal makes it easy for administrators to manage and edit student profiles and exams, particularly for institutions with large numbers of students. The system also provides efficient grading and instant feedback to students, reducing the time and resources required for grading and feedback.

4. Cost-effectiveness: An online examination portal eliminates the need for physical infrastructure such as classrooms and examination halls, making it cost-effective for institutions that have to rent or maintain physical spaces for testing purposes. Additionally, the system reduces the cost of printing exam papers and associated materials.

5. Cheating Prevention: An online examination portal addresses the issue of cheating, which can significantly impact student learning and performance, by implementing features such as randomizing questions, setting time limits, and restricting access to external materials during the exam.

6. Improved Learning: An online examination portal provides instant feedback to students, enabling them to identify their weak areas and work on them before taking subsequent exams. This leads to improved learning outcomes and academic performance.

Overall, the outcomes of creating an online examination portal include increased accessibility, flexibility, efficiency, cost-effectiveness, cheating prevention, and improved learning outcomes.

Chapter 02:Literature Survey

2.1 Literature Survey

The right design is now a crucial component required to engage visitors of websites and mobile applications. To specify the precise components employed in the design of successful websites and mobile applications, however, little study has been done. We make an effort to summarise the research on effective design and provide a concise list of components that are regularly employed in studies. The design components that were discussed the most frequently in the works under examination were readability, navigation, graphical representation, organization, content utility, and purpose. We go over how earlier research has characterized and rated these seven components. In order to operationalize best practices for encouraging and forecasting user involvement, designers and researchers may find this review and the accompanying concise list of design features useful. In the last ten years, internet usage has grown significantly and quickly ("Internet Use Over Time," 2014). For most, if not all, businesses and organizations, websites have emerged as the most significant platform for public communication. According to the 2013 study "Internet User Demographics," 87% of American individuals 18 and older used the Internet in 2014. Website design is essential for attracting customers because most business-to-consumer transactions take place online (Flavián, Guinalu, & Gurrea, 2006; Lee & Kozar, 2012; Petre, Minocha, & Roberts, 2006). Poorly designed websites may annoy visitors and cause a high "bounce rate," or the percentage of visitors who only view the home page before leaving the site (Google.com, 2015). Avouris, Tselios, Fidas, and Papachristos (2014); Flavián et al. (2016); Lee & Kozar 2020) have discovered that a well-designed website with excellent usability has a beneficial impact on visitor retention (revisit rates) and purchasing behavior.

To define the precise components of efficient web design, however, little study has been done. Usability is one of the most important design criteria (International Standardisation Organisation, 1998).By identifying and compiling the essential website design components that, according to previous studies, influence user engagement, this review aimed to provide an answer to that topic. The goal of this analysis was to identify the website design components that are most frequently suggested or displayed to boost user engagement. The best way to operationalize and evaluate the usability of websites, however, is still up for

debate (Lee & Kozar, 2012). For instance, Nielson (2012) links usability to learnability, effectiveness, memorability, mistakes, and satisfaction. Palmer (2002) asserts, however, that factors such as download time, navigation, content, interactivity, and responsiveness affect usability. Similar to usability, a lot of other important design factors, like scalability, readability, and visual appeal, are still poorly understood (Bevan, 1997; Brady & Phillips, 2003; Kim, Lee, Han, & Lee, 2002). Clearly defined rules that people can adhere to when designing websites to boost engagement. Therefore, the work is exploratory research that offers definitions for these website design components as well as a place to start for future research to refer to.

2.1 Application architecture patterns

This chapter includes details about my application architecture patterns. Here I am using three-tier architecture for developing full-stack applications.

2.2 Three-Tier Architecture

Three-tier architecture, which separates applications into three logical and physical computing tiers, is the predominant software architecture for traditional client-server applications. Three-tier architecture is a well-established software application architecture that organizes applications into three logical and physical computing tiers: the presentation tier, or user interface; the application tier, where data is processed; and the data tier, where the data associated with the application is stored and managed.

The three-tier is -

- 1. Presentation tier** – it is the user interface and communication layer of the application
- 2. Application tier** – it is known as the logic tier or middle tier and is the heart of the application.
- 3. Data tier** - sometimes called database tier, data access tier, or back-end of the application.

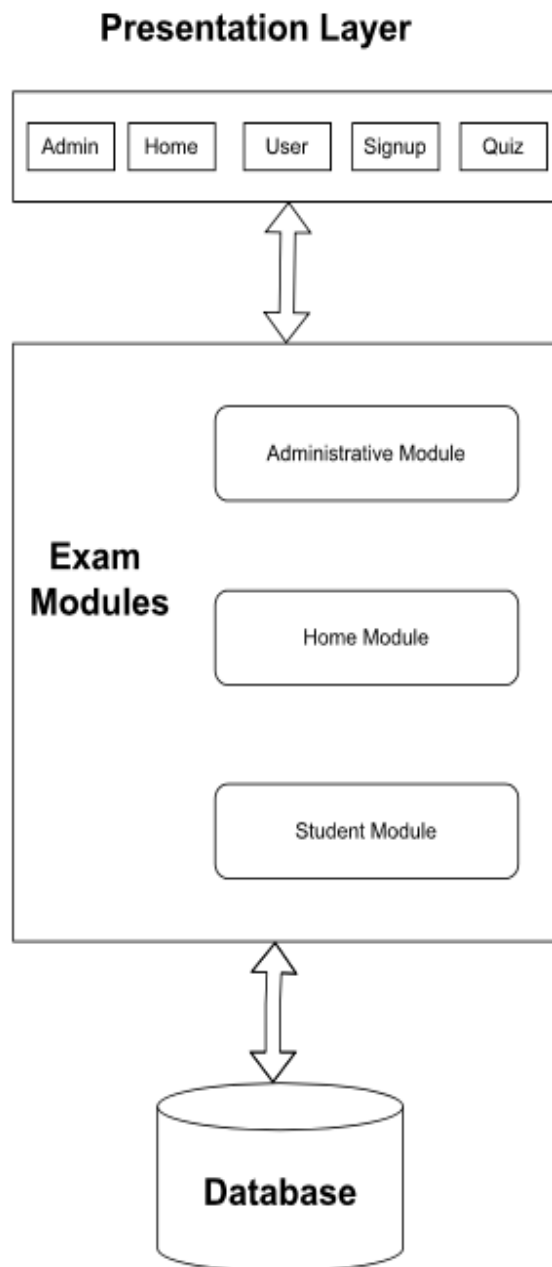


Figure 2.1: Three-Tier Architecture

Related Articles and their key Points

Many different researches have focused on the subject of an online examination system.

This work can be represented as follows:

SIETTE: Guzman and Conejo (2005) proposed an online examination system called System of Intelligent Evaluation using Tests for Tele-education (SIETTE). SIETTE is a web-based environment to generate and construct adaptive tests. It can be used for instructional objectives via combining adaptive student self-assessment test questions with hints and feedback. SIETTE supports secure login and portability features. On the other hand, the other features: resumption capability, multi-instructor, random question selection, random questions distribution and random choices distribution is missing.

EMS: Rashad Et. Al. (2010) proposed a web-based online examination system called Exam Management System (EMS). EMS manages the examination and auto-grading for student's exams and supports conducting exams, collects the answers, auto mark the submissions, and produce the reports for the test. EMS supports secure login, multi-instructor, and portability features. However, the other features: resumption capability, random question selection, random questions distribution, and random choices distribution is missing Arvind Singh, Niraj Shirke, Kiran Shette 2011: The project evaluates the examiners by using the online examination system concept. The exams will be totally customizable. This system will check results automatically based on student's answers.

CBTS: Fagbola et. al. (2013) developed a Computer Based Test System (CBTS). CBTS is a web-based online examination system developed to address issues such as lack of timing flexibility for automation candidates log-off upon expiration of allowed time, result integrity, guaranty, stand-alone deployment, need for flexibility, robustness, designed to support the examination processes and overcome challenges framing the conduct of examination, auto-marking, auto- submission, and generation report of examination result.

Chapter 03: System Development

3.1 Software Specifications

All algorithms were written in Java 8 as .java files. Java was chosen because it is a powerful compiler. Java supports both OOPS execution and debugging at the same time. Furthermore, Java is platform independent, unlike other languages like C++, C which compile onto the platform but Java is write-once, run-anywhere language. Java differs from other platforms it is software based on other platforms based software, and it has two components. Java programming is platform-independent. Linux, Mac OS, Sun Solaris, Windows, etc. A compiler compiles Java code and turns it into bytecode. This bytecode can run on various platforms, making it platform-independent code. Run anywhere and write once.

3.1.1 Problem Definition

Many people are unaware of the latest technologies and trends in this field. In today's world, it becomes very important for everyone to learn or at least know about the latest technology and inventions. The main reason why we should learn modern technology is that it's our reality. One can state that technologies aren't influential nowadays, but I can't agree with such statements. I believe that the technological revolution brought us a lot in these years. In my opinion, such people who claim that they don't want to get along with technology just don't know how to do it. I guess that people should stand for technologies today because the future depends on them. Everything is based on technology today and it's kind of difficult not to notice it. The technologies in the future will be much more influential and this influence will only grow. India is developing, and a key factor in this development is the country's rural population. Rural India is expanding more than three times as quickly as urban India, which means that access to the Internet and the overall digital ecosystem will likely need to shift significantly. In rural areas, everybody is somehow connected with the technologies and able to access the websites in their day-to-day life. Also, all offline work is gradually shifting to online, either the work related to the government or private sectors.

3.1.2 Problem Analysis

There are very few websites that cover technological advancements taking place. That's why fewer people are informed about these things. The world is becoming more competent and it's crucial to stay aligned with the ongoing progress. Also, the workforce demand is increasing in the technology field.

A web-based platform called an online examination portal enables students to take tests remotely from any location in the world. However, developing such a platform can be challenging, and there are several potential problems that need to be analyzed before creating such a portal. Some of the major problems that need to be addressed in the development of an online examination portal include.

Technical issues: One of the main challenges in developing an online examination portal is ensuring that the platform is technically sound and reliable. Issues such as slow loading times, system crashes, and security breaches can negatively impact the user experience and the integrity of the exam results.

Cheating: Online exams can be susceptible to cheating, as students can easily access external resources during the exam. Preventing cheating through secure authentication mechanisms, and proctor.

3.1.3 Problem Solution

Through our website, we will be able to keep the users updated and informed about the latest developments in the field of technology and related research. This website will be hugely beneficial for students in tech-related fields. We will be trying our best to cover all the latest developments in simple and precise words. Since our target users are mainly students who are not left with much time to read/learn about things outside their academics, we will be trying to keep the features simple and try to cover all the important aspects at the same time. To stay current, everyone—especially students—needs to constantly keep up with technological advances. The best & newest technology seems to be developed quickly these days. Consequently, stay in touch with our clients and potential employers. Employers, both past

and present, are interested in our knowledge of the sector and current technological advancements.

Here are some potential solutions to the problems mentioned in the analysis for an online examination portal:

Technical issues: To address technical issues, the online examination portal should be thoroughly tested before deployment to ensure that it is reliable and scalable. This includes load testing, stress testing, and security testing to identify and fix any potential issues. Additionally, the portal should be hosted on a reliable and secure server that can handle high traffic volumes and is regularly monitored for any issues.

Cheating: There are several ways to prevent cheating on an online examination portal. One of the most effective methods is to use remote proctoring, which involves using a webcam to monitor students during the exam. The proctor can watch for any suspicious behavior, and any irregularities can be flagged for further review. Additionally, the portal can implement anti-cheating measures such as randomized questions, time limits, and disabling copy-pasting during the exam.

3.2 Requirements

3.2.1 Functional Requirements

3.2.1.1 General application requirements

Login

Users can use the login forms because logging in is necessary for any actions that can be taken with the application. In this case, the user is prompted to sign in or create an account on the online app. once the user has given the application permission to access his social media. He is given a fresh account if he has never used the software before.

Sign-Up

Users and organizations can independently register and gain access to your system via a signup page, also known as a registration page. Different signup pages are frequently used depending on the people and organizations you want to register. The website now includes a

sign-up tool to allow users' information to be saved. In this web application, we take users' information depending on the role of the user, and then according to the user's role, different web pages are accessible by the user role-based. If a user selects a role as 'student', then they have to log in there and take the assessment and also check their result.

Modify profile information

All users' profile information can be modified by the admin. The profile information contains the name, phone number, email, profile photo, and role of the user. The admin can easily edit this information in order to be contacted and recognized.

Contact Us through social media

User has the option to contact the admin through different social media like WhatsApp, Facebook, etc., on the Contact Us page there is an option to contact us directly through WhatsApp messages.

Change User Password.

Our passwords could be compromised if someone loses their computer or switches PCs. By often changing our passwords, we ensure that your data remains private even if someone finds an old or remembered password.

Create an events list.

Adding the events.

On the admin dashboard, there is an option to update tests and quizzes.

Deleting the events

Only the admin has access to the delete API of the events. When an admin feels that the events added are inappropriate then he has an option on the admin dashboard to delete the events.

Showing all the event details When a user visits the website, they can access the test section by login and seeing the quizzes and results.

Use case diagram:

Use case diagrams are the common modeling language. A use case is a collection of examples that illustrates how a user and a system interact. The connection between actors and application cases is easily seen in an application diagram. Use cases and actors are the two fundamental elements of a use case diagram. Teachers and learners are the participants in our system.

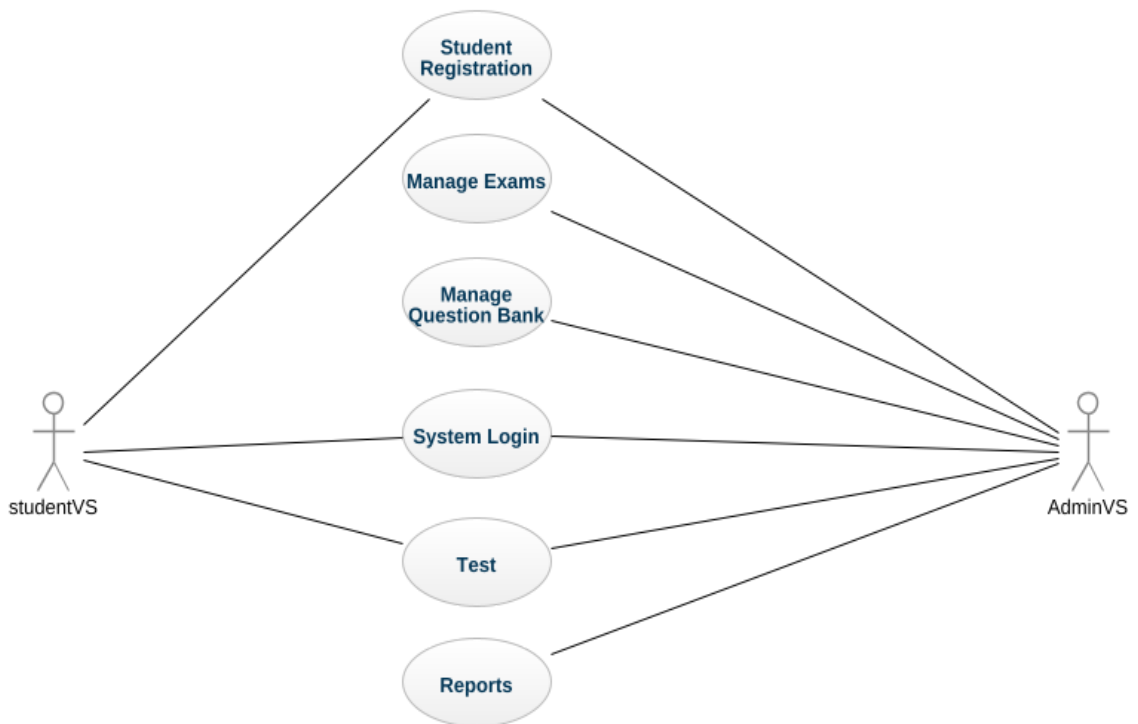


Figure 3.1. Use case diagram.

3.2.2 Non-Functional Requirements

Performance

When a user delivers a request, the program must respond very quickly. In other words, the server must have the ability to respond immediately. 1000 people should be able to send inquiries simultaneously using the program.

Scalability

A significant increase in users should cause the program to react appropriately. It ought to be able to manage between 10,000 and 100,000 users.

Extensibility

In order to support several platforms like iOS, Windows Phone, and the Web, the program needs to be extendable.

Availability

The program must be extremely available and ensure a strong server uptime because it contains a lot of information about the pupils. The server should only permit 1 hour of downtime annually, or 99.99% uptime.

Privacy and Security

The program should guarantee the confidentiality of all user information, including data and accounts. Only people who have been given permission to post and update their own content should be able to log in. Maintainability

It should be simple to maintain since the program may grow in the future by adding new features.

Chapter 04: Implementation

4.1 Tools Used:

Angular Material, type script html css, spring boot

Angular

Spring Boot: Spring Boot is a popular Java-based framework designed to simplify and accelerate the development of Spring applications. It offers a streamlined configuration process and includes many commonly used libraries, reducing the amount of boilerplate code required to get a project up and running. Spring Boot also includes features such as auto-configuration, which automatically configures the application based on its dependencies, and embedded servers, which allow for easy deployment of the application. These features make Spring Boot a popular choice for developing modern, scalable, and easily deployable web applications.

- **Auto-configuration:** Spring Boot includes a set of predefined configurations that can be automatically applied based on the dependencies included in the project.
- **Embedded servers:** Spring Boot includes embedded servers like Tomcat, Jetty, and Undertow that allow the application to be run as a standalone executable.
- **Spring CLI:** Spring Boot provides a command-line interface that allows developers to quickly create and run Spring applications.
- **Actuator:** Spring Boot Actuator provides a set of endpoints that can be used to monitor and manage the application at runtime.
- **Dependency management:** Spring Boot manages dependencies for the application, making it easier to manage and upgrade dependencies.
- **Spring Data JPA:** Spring Boot provides support for Spring Data JPA, which simplifies the development of data access layers in the application.

ng serve: ng serve is a command used in Angular development to start a local development server that compiles and serves an Angular application locally. It is a part of the Angular CLI (Command Line Interface) and is used during the development phase of an Angular application. when you run ng serve in your terminal, it will start the development server and

watch for any changes to your application files. When any changes are made, the application will automatically recompile and refresh in the browser. This allows developers to see the changes they make in real-time, without having to stop and restart the server manually.

The `ng serve` command also provides additional options, such as specifying the port number to use, enabling hot module reloading, and setting up a proxy configuration for API requests. These options can be passed as command-line arguments to the `ng serve` command.

MVC (Model View Controller): The Model-View-Controller (MVC) is an architectural pattern that separates an application into three main logical components: the model, the view, and the controller. Each of these components are built to handle specific development aspects of an application.

MVC is one of the most frequently used industry-standard web development frameworks to create scalable and extensible projects.

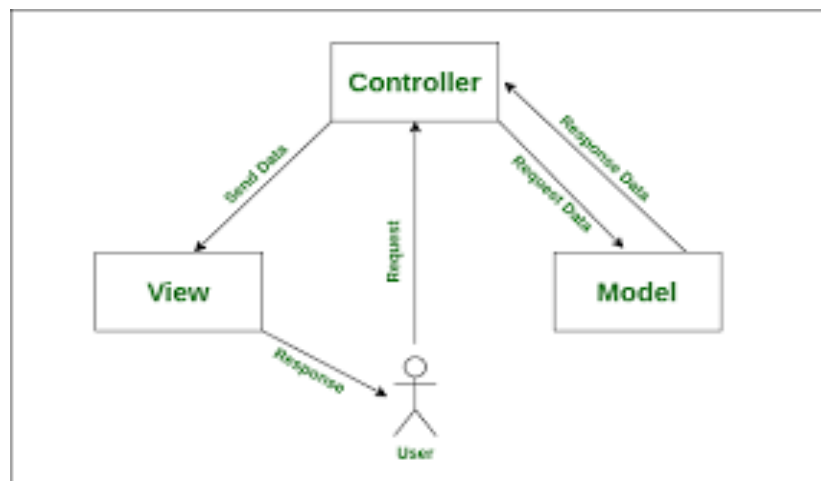


Figure 4.1: Model-View-Controller

Model :The Model component corresponds to all the data-related logic that the user works with. This can represent either the data that is being transferred between the View and Controller components or any other business logic-related data. For example, a customer object will retrieve the customer information from the database, manipulate it and update it data back to the database or use it to render data.

View :The View component is used for all the UI logic of the application. For example,the

Customer view will include all the UI components such as text boxes, dropdowns, etc. that the final user interacts with.

Controllers: Controllers act as an interface between Model and View components to process all the business logic and incoming requests, manipulate data using the Model component and interact with the Views to render the final output. For example, the Customer controller will handle all the interactions and inputs from Customer View and update the database using the Customer Model. The same controller will be used to view the Customer data.

MySQL: MySQL is an open-source relational database management system (RDBMS) that is widely used for building web applications. It is one of the most popular databases in use today and is often used in combination with the PHP programming language to build dynamic websites. MySQL is based on SQL (Structured Query Language) and uses tables, columns, and rows to store and manage data.

Angular Material: Button, form, card, and dialogue UI components are all pre-built and adaptable with the help of the Angular Material UI component library. It follows Google's Material Design guidelines and offers a consistent, modern look and feel for web applications. Angular Material also includes powerful features such as theming, accessibility, and internationalization support. It is built on top of the Angular framework and is designed to work seamlessly with it, providing a cohesive development experience. With Angular Material, developers can create responsive and mobile-friendly web applications quickly and easily, reducing the time and effort required to build a modern UI.

TypeScript: TypeScript is a statically-typed superset of JavaScript that adds optional static typing, classes, interfaces, and other advanced features to JavaScript. It is designed to improve the development experience and catch errors early in the development process. TypeScript code is compiled into plain JavaScript, making it compatible with all browsers and environments that support JavaScript. Some of the key features of TypeScript include: It is open-source software, especially for web applications and APIs. It is a fast and minimalist framework that helps make web applications fastly, easily, and with minimum lines of code.

Pom.XML File

- The Pom.XML file contains all the related dependencies which are used in the project.
- The most important part of this file is that it automatically downloads and configures all the jars and the suitable versions which are used to deploy or to connect the project. Just you need to add all the dependencies and plugins in the Pom.XML file.

Spring-boot-starter-data-jpa:

Spring Boot Starter Data JPA is a popular starter package that enables developers to quickly set up and use the Java Persistence API (JPA) with the Spring framework. JPA is a specification that defines a standard way to map Java objects to relational databases, and Spring Boot provides a simplified and consistent way to configure JPA in your application. The starter package includes all the necessary dependencies, configuration, and auto-configuration to get started with JPA quickly and easily. With Spring Boot Starter Data JPA, developers can use annotations to define entities and relationships between them, perform CRUD operations, and write queries without writing SQL. The package also provides features like pagination, sorting, and caching to enhance performance. Spring Boot Starter Data JPA integrates seamlessly with other Spring Boot starters and is widely used in building modern web applications and microservices.

All the database-related operations such as connecting projects with databases or defining Local port numbers when we are building our project and storing the data in the database.

All the above figure shows the user role and the relation of the user, default and parameterized constructor getter and setter methods that anyone can't access or manipulate the data directly, and the access authority of the data of the different fields.

REST API for Exam Porta :

REST (Representational State Transfer) API is a type of web service that uses HTTP protocol to exchange data between client and server. RESTful APIs are designed to be scalable, stateless, and cacheable, and they typically use standard HTTP methods like GET, POST, PUT, and DELETE to interact with resources. REST APIs can be used to build complex applications by providing a flexible and standardized way of accessing data across multiple platforms and devices. They have become a popular choice for building modern web applications and services.

- To upload the user-related data such as username, password, First Name, Last Name, email, and phone number and it also defines the role of the user he/she is ADMIN or NORMAL user.
- This first API is used to access the data of a person with the username and the other one for the same but it will return the details with the user.
- It is auto-wiring the other class by creating the child of that class so that it can be used in this particular class according to the need.

Token : A token generator in an API is a tool that generates a unique access token for a client or user to authenticate and authorize access to the API's resources. The access token typically contains a randomly generated string of characters that represents the client's identity and access privileges. The token generator issues the token upon successful authentication and validates the token during subsequent requests to ensure the user has the necessary permissions to access the requested resource. Token-based authentication is commonly used in modern API architectures and can enhance security by eliminating the need to transmit sensitive information like passwords over the network.

It will generate the token whenever any user will log in to the system and it will save it in the database.

- If the password and username are not right then it will return the message invalid credentials.

- The above API will reflect the details of the current user who has accessed the portal.
- Throughout the one login period it will be there on logout it will automatically delete from the database.
- If the both username and password are not correct it will return the message user not found

It will help to show the profile of the user and he or she can update or change the details.

- This will generate and validate the token of the login user.

Login and the request :

- If the token has login and the request portal is not null then it will return the string from the 7th index.
- If the token is invalid or expired it will reflect the message accordingly or if it is not started with Bearer it will also reflect the message.

Frontend:

Home Page:

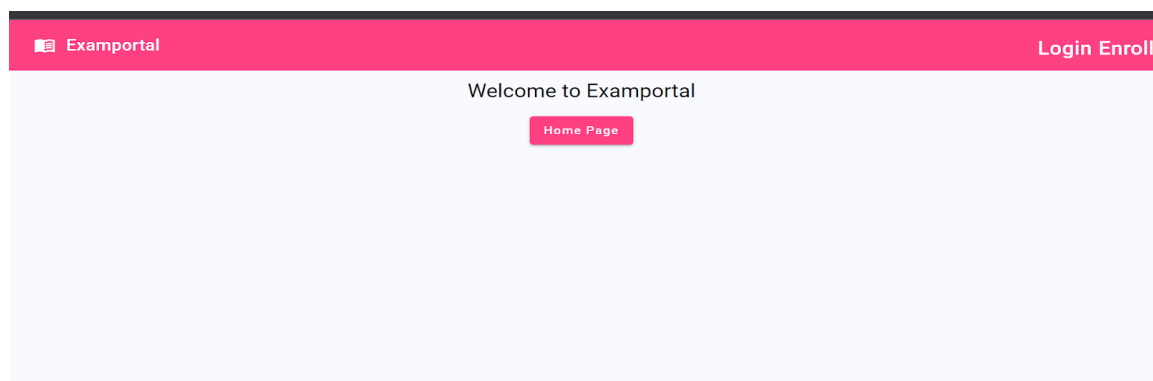


Figure 4.2:Home Page of portal

- This is the home page of the web application. The user will be redirected to this page after login.

Register Page:

Register Here !!

Username*

Username must be unique

Password*

firstname*

Last name*

Email Address*

Figure 4.2: Register Page screen

- To register for the new user.

Register Here !!

Username*

chand9779

U

P

f

F

L

Y

E

R

Phone Number*

8765432234

Register

Clear

Successfully done!!

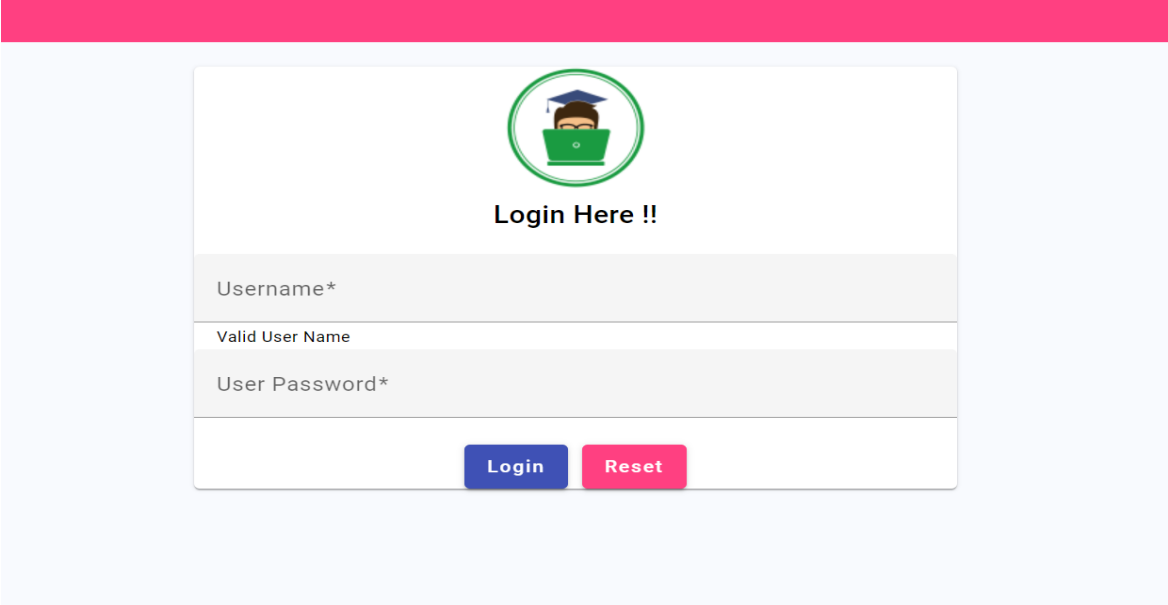
User id is 702

OK

Figure 4.3: Successfully registered screen

- It will pop up a bar and it will show the message and the unique user id generated.

Login Page:



Username*

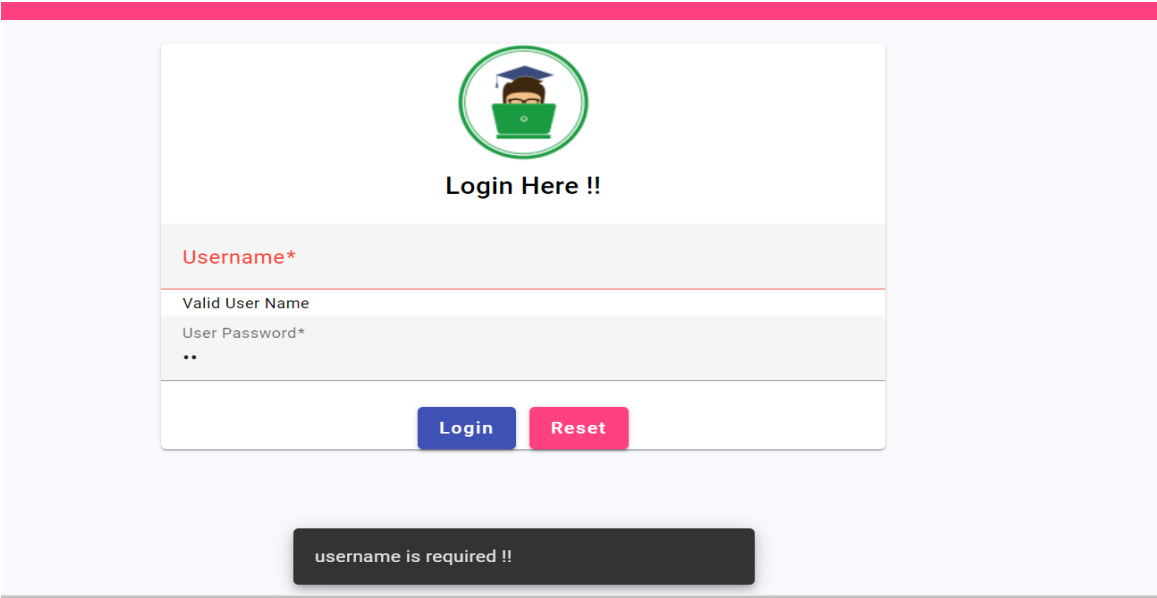
Valid User Name

User Password*

Login Reset

Figure 4.4: Login page screen

- This is the login page.



Username*

Valid User Name

User Password*

••

Login Reset

username is required !!

Figure 4.5: Login Screen

- If the username or password is not given then it will reflect the message that Please provide a username and the password is required.

Admin Dashboard:

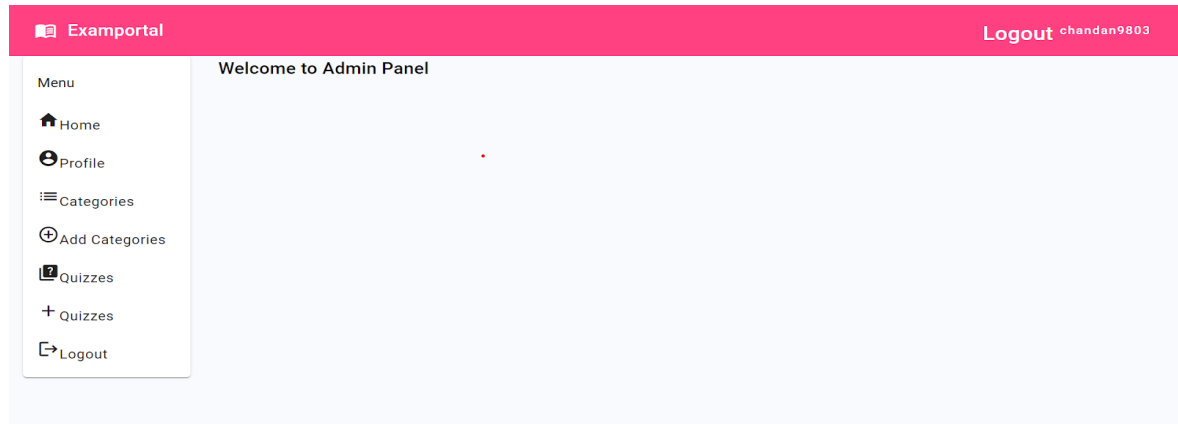


Figure 4.6: Admin Dashboard screen

- After login as Admin you will be reflected to this page where what a user can do it will be shown there.
- Users can conduct quizzes by adding different quizzes and categories.

Profile:

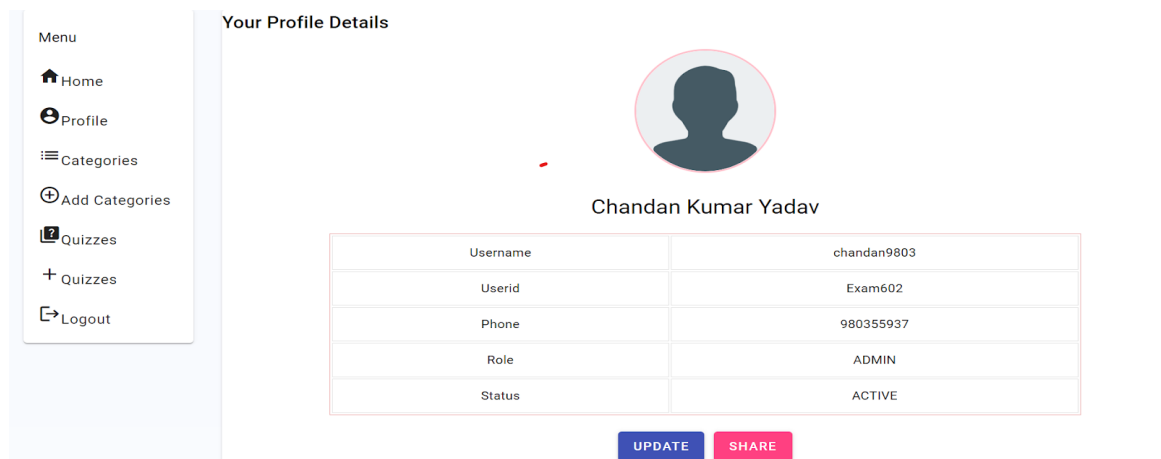


Figure 4.7: Profile details

- It is showing the profile details where the user can see their own registered name and email or mobile no.

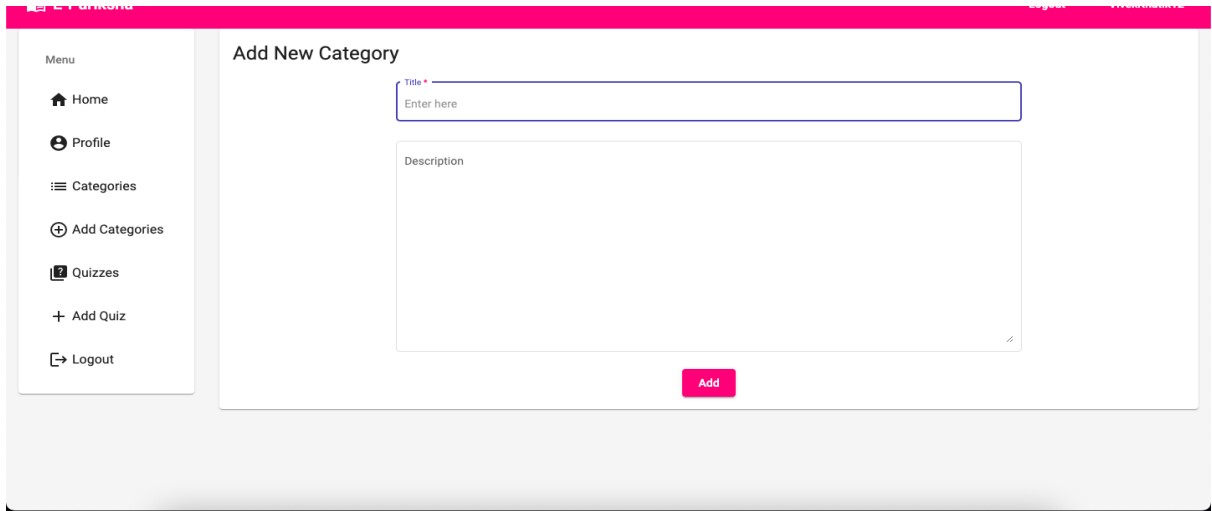


Figure 4.8: LogIn As an Admin - Category Operations of Exam portal

All categories:

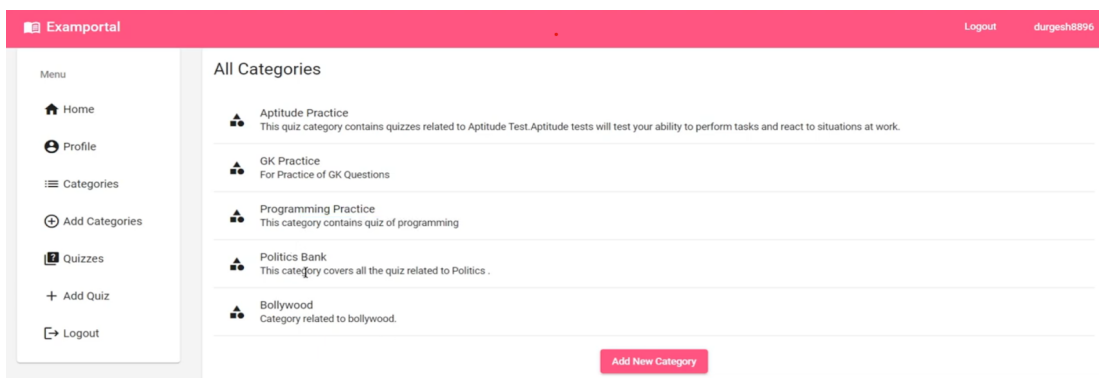


Figure 4.9: All categories of quizzes and exams

- This is showing all the categories which are present and the admin can add more new categories.

Quizzes:

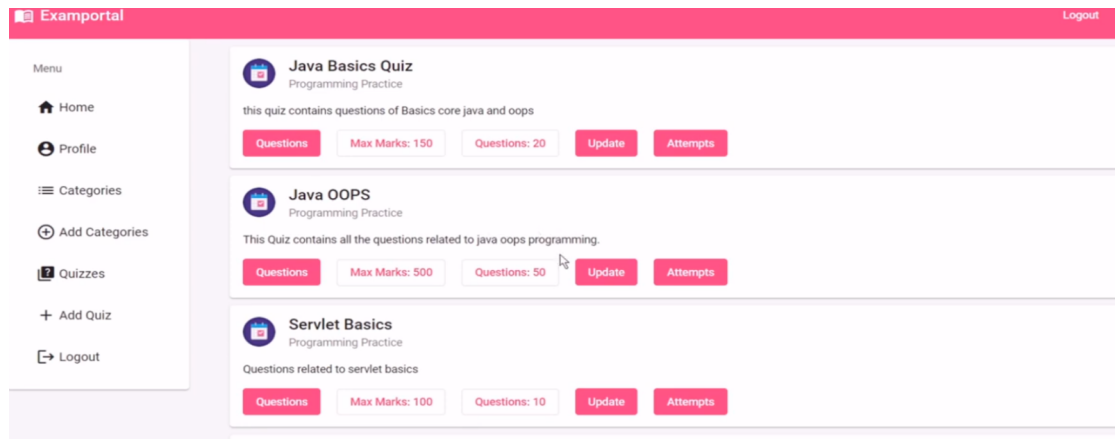


Figure 4.10: Available Quizzes screen

- These are the quizzes.

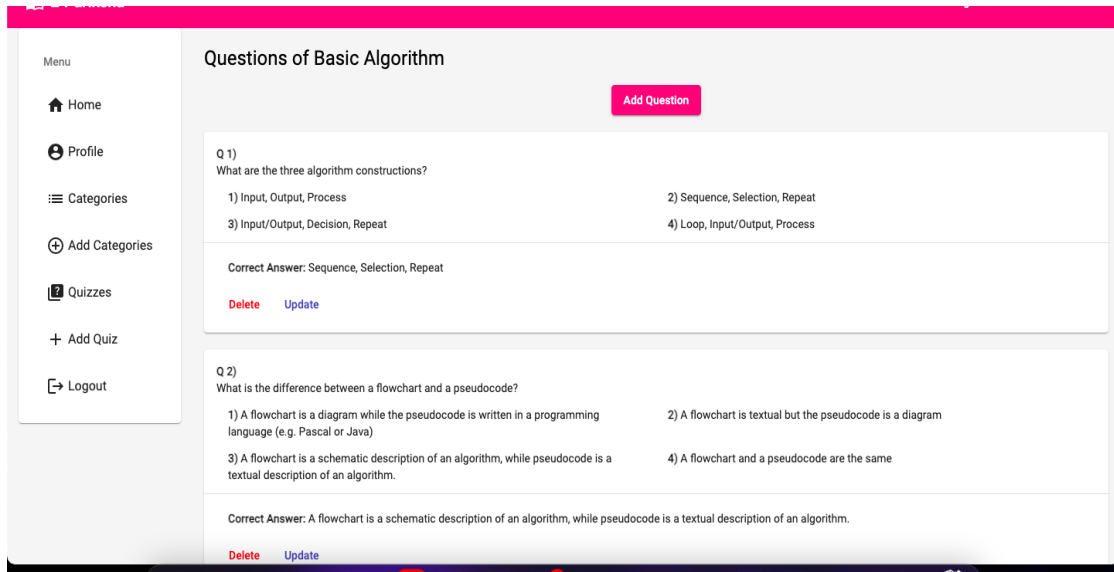
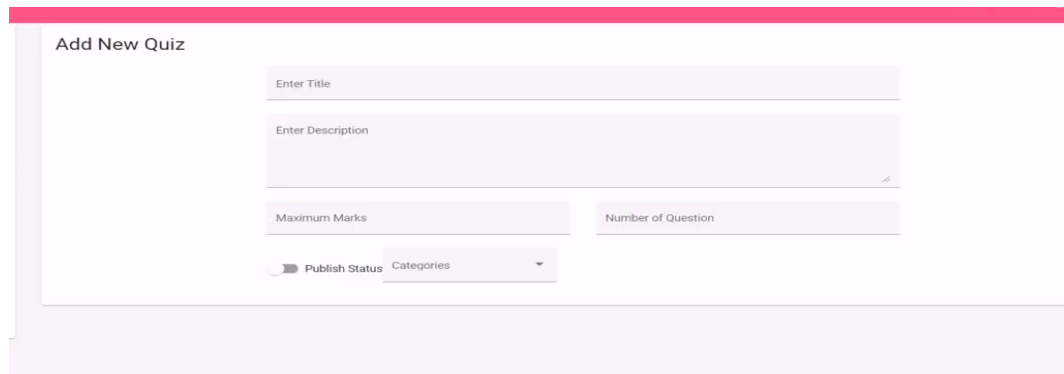


Figure 4.11: Quizzes screen

Adding quizzes:



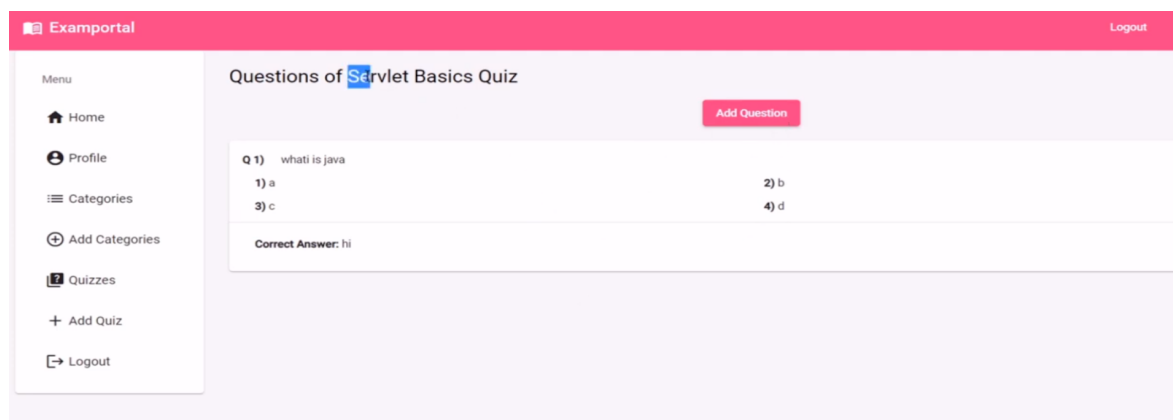
The screenshot shows a form titled "Add New Quiz". It contains the following elements:

- An input field labeled "Enter Title".
- A larger input field labeled "Enter Description".
- Two input fields: "Maximum Marks" and "Number of Question".
- A toggle switch labeled "Publish Status".
- A dropdown menu labeled "Categories".

Figure 4.12: Adding quizzes

- Adding new quizzes to the quiz section.

Adding Questions:



The screenshot shows the "Adding Questions" interface. It includes a sidebar menu with options like Home, Profile, Categories, Add Categories, Quizzes, Add Quiz, and Logout. The main content area is titled "Questions of Servlet Basics Quiz" and features an "Add Question" button. A question is displayed: "Q 1) what is java" with four options: "1) a", "2) b", "3) c", and "4) d". Below the options, it states "Correct Answer: hi".

Figure 4.13: Adding Questions

- Here User will send the solution to the problem statement and add the question.

User Side Pages:

Available Quizzes:

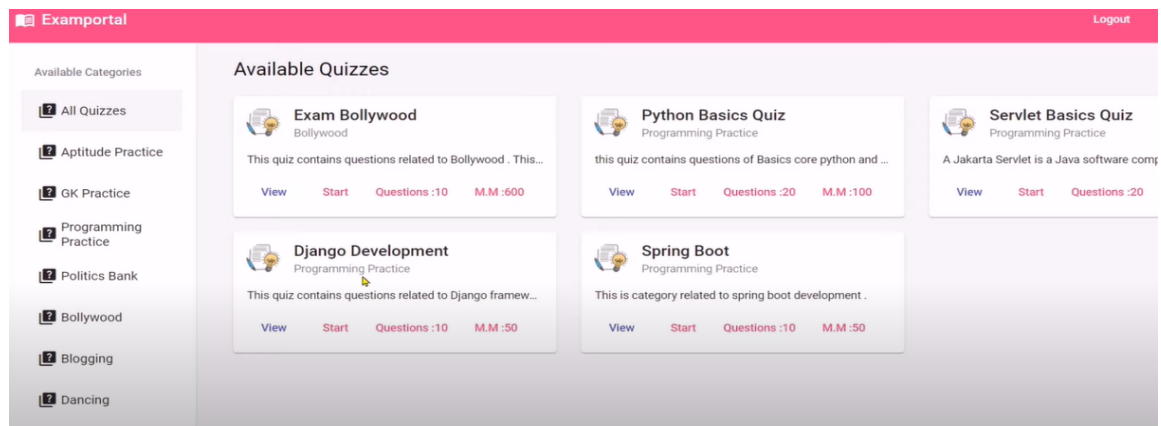


Figure 4.14: Available Quizzes

- These are the available quizzes normal users or students can see and attempt.

Instructions Page:

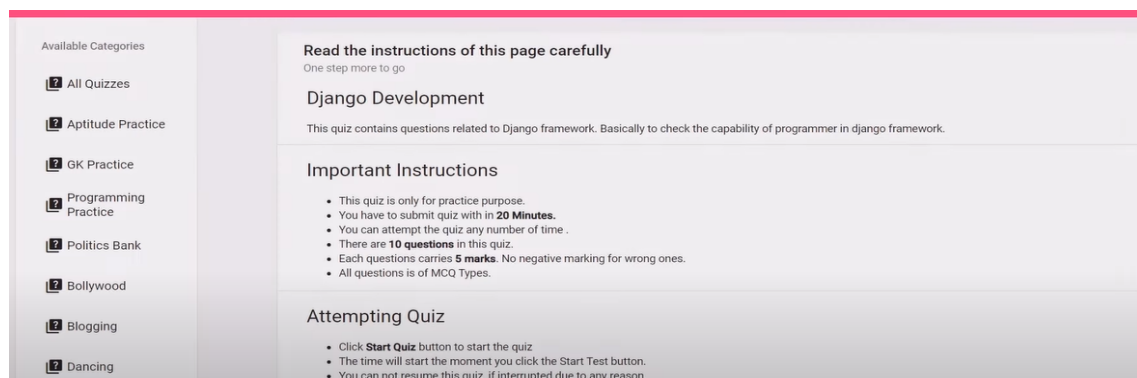


Figure 4.15: Instructions Page

- Instructions page containing the number of questions, time, and marks.

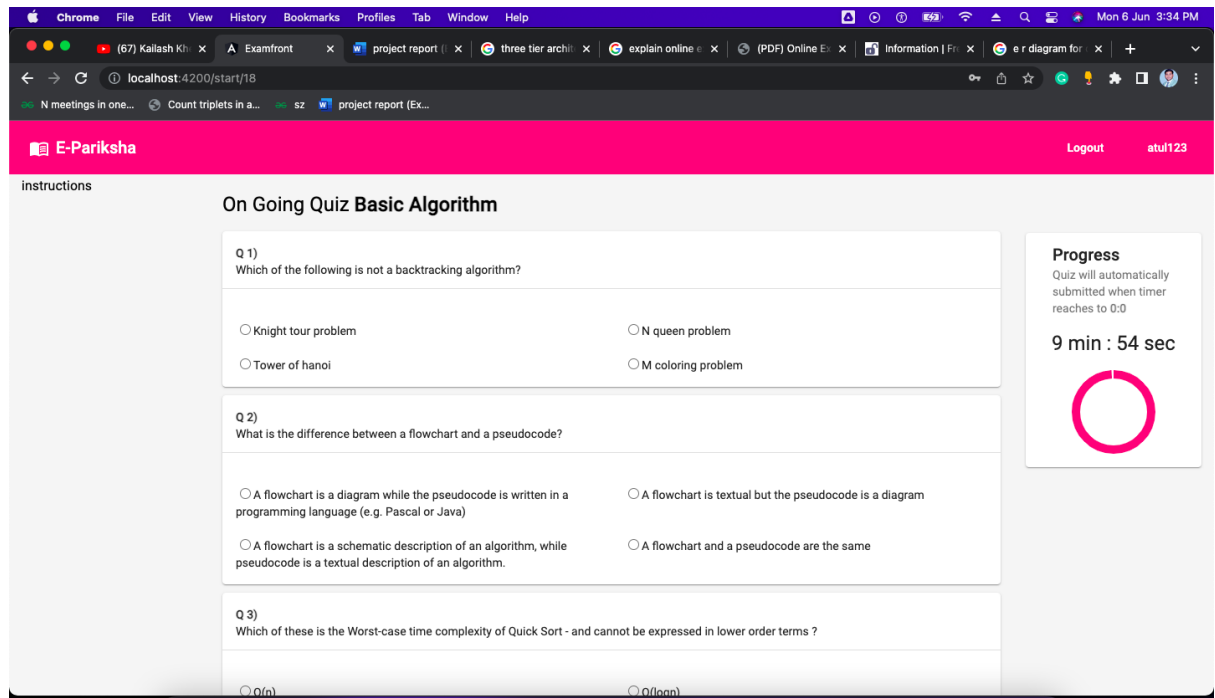


Figure 4.16: Attempt Quiz

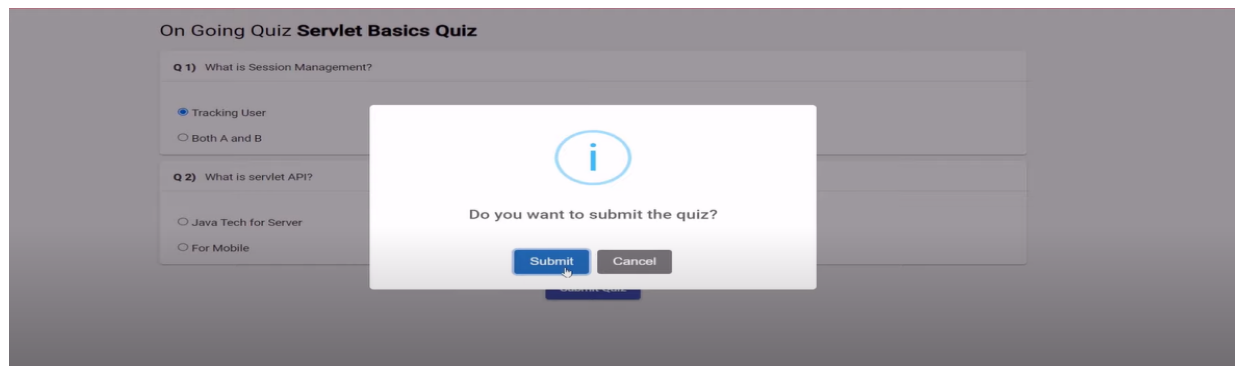


Figure 4.17: A pop-up that you want to submit the quiz

- It is showing the pop-up that you want to submit the quiz.

Timer in quizzes:

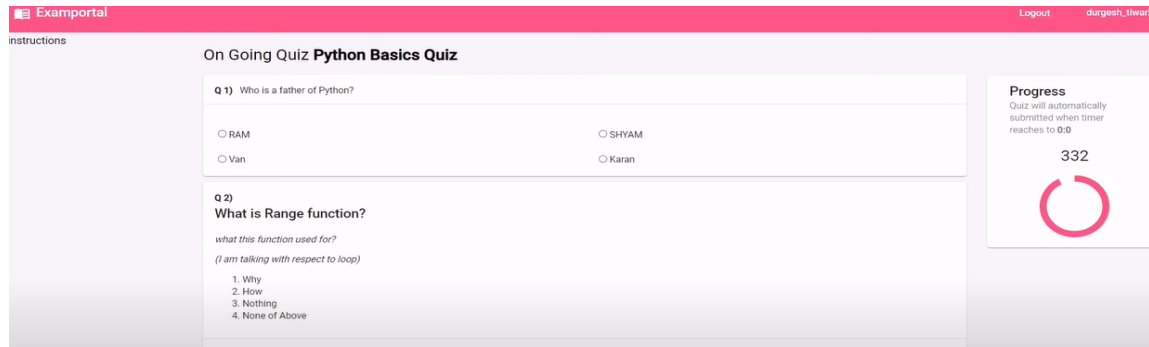


Figure 4.18: Timer Screen

- At the right it is showing a timer section. It will keep running throughout the quiz so that users should be aware of the time-bound.

Marks:

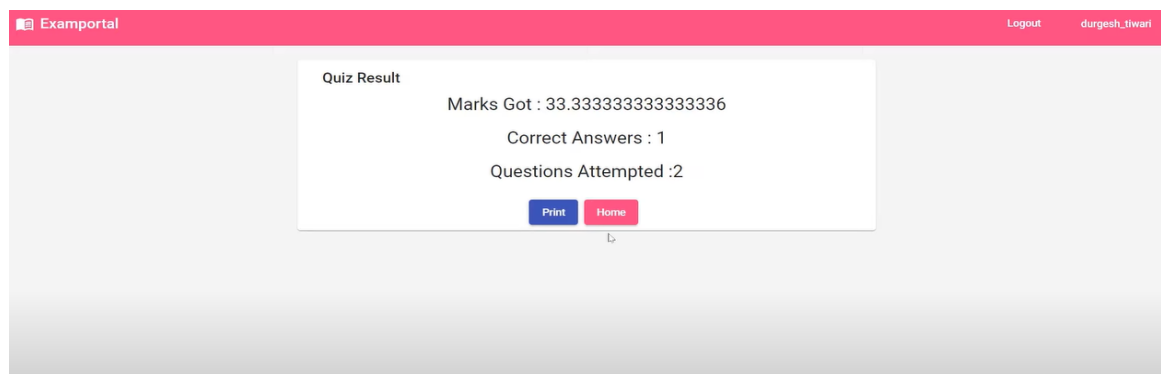


Figure 4.19: Marks Screen

- Users can see the marks just after attempting the quiz.

Chapter 05: Conclusion

Discussion on the Results Achieved

Examination portal can make it easier for people to access education and training programs, regardless of their location or schedule. This can lead to increased participation and higher completion rates. It will reduce errors and inconsistencies in the grading process, resulting in more accurate and reliable assessments of student performance. Online examinations can save time and money by automating tasks such as exam creation, administration, and grading. This can free up resources that can be used for other educational or business purposes and also incorporate security measures such as biometric authentication, anti-cheating features, and data encryption to ensure the integrity of the exam results. provide instant feedback to students, helping them to identify areas where they need improvement and to adjust their learning strategies accordingly. This can lead to better learning outcomes and higher levels of student achievement.

Application of the Major Project

Educational Institutions: Online examination systems are commonly used by educational institutions such as schools, colleges, and universities to conduct exams for students. These systems can be used to create and administer exams, generate results, and provide feedback to students.

Corporate training: Online examination systems can be used to evaluate the knowledge and skills of employees in various domains. This can help organizations to identify areas where employees need training and to track their progress over time.

Certification and licensure: Online examination systems can be used by certification and licensure bodies to evaluate the competence of professionals in various fields. These systems can be used to create and administer exams, evaluate candidates, and issue certificates or licenses.

Government recruitment: Online examination systems can be used by government agencies to conduct competitive exams for various positions in the public sector. These systems can be used to create and administer exams, evaluate candidates, and generate results.

Recruitment and selection: Online examination systems can be used by recruitment agencies and employers to evaluate the knowledge and skills of job applicants. These systems can be

used to create and administer tests, evaluate candidates, and provide feedback.

If any problem is resolved by any user then they can give your feedback on the portal in the suggestion and feedback section.

So that our Team quickly solves these problems and also brings notice to these problems in front of the teacher(admin).

Future Work

Mobile compatibility: Develop a mobile app or optimize the existing portal for mobile devices to increase accessibility and convenience for users who prefer to take exams on their smartphones or tablets.

- **Advanced analytics:** Implement advanced analytics tools such as machine learning algorithms and predictive models to analyze exam results and provide insights that can improve the effectiveness of the online examination portal.
- **Collaborative exams:** Allow students to take collaborative exams in which they can work together in real-time to solve problems and answer questions. This can promote teamwork and enhance the learning experience.
- **Integration with learning management systems:** Integrate the online examination portal with learning management systems (LMS) such as Moodle, Blackboard, or Canvas to streamline the exam creation, delivery, and reporting process.
- **Accessibility features:** Ensure that the online examination portal meets accessibility standards such as WCAG 2.0 to accommodate users with disabilities such as visual impairments or motor disabilities.

Overall, incorporating mobile compatibility, advanced analytics, collaborative exams, integration with LMS, gamification, accessibility features, and blockchain technology can help to improve the functionality and effectiveness of an online examination portal.

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