Examiner

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1.0 Project Initiation

1.1 Project Overview

Examiner is a new and clever website that aims to make creating, giving, and grading exams much easier. It's designed to be simple for teachers to use and to give students a smooth experience too.

With a user-friendly interface, Examiner ensures that teachers can effortlessly create exams tailored to their needs. The intuitive layout makes it easy to input questions of various formats, including multiple-choice, yes or no, and fill-in-the-blank. Likewise, students can navigate through exams with ease, enhancing their overall learning experience.

Plus, Examiner has some marvelous features that make it stand out. It can automatically help teachers come up with questions and grade exams super quickly. This means less stress for teachers and faster feedback for students.

Examiner isn't just a website, it's a game-changer for how exams are done. It's all about making learning easier and more enjoyable for everyone involved.

1.2 Project Background

Examiner was born from the idea that exams could be a lot simpler for everyone involved. We noticed that creating, giving, and grading exams was often a headache for teachers and students. So, we set out to create a solution that would make the whole process much easier and more enjoyable.

We talked to teachers, students, and experts to understand their challenges with exams. Armed with this knowledge, we got to start building Examiner. Our aim was to make it super easy to create exams that suit everyone's needs.

We wanted Examiner to be accessible to everyone, regardless of their background or abilities. We believe that everyone should have the chance to succeed in their studies, and Examiner is our way of helping make that happen.

So, with a clear mission and lots of determination, we set out to create Examiner. Our goal is to make exams a breeze for teachers and students alike, helping everyone reach their full potential in their learning journey.

1.3 Problem Definition

1.3.1 Problem Statement

Before the introduction of Examiner, the process of managing exams posed numerous challenges for both educators and students. Teachers often found themselves grappling with the time-consuming task of crafting exams, struggling to create diverse and engaging questions within traditional formats. Additionally, administering exams proved to be a hard process, particularly in large classes or remote learning environments, where coordinating schedules and ensuring fairness during testing presented significant obstacles. The manual grading process further compounded the challenges, as educators spent hours marking exams by hand, leading to delays in feedback and inconsistencies in grading. Moreover, traditional exam formats lacked interactivity and failed to provide meaningful feedback to students, resulting in disengagement and limited opportunities for self-assessment. Top of Form

1.3.2 Issues with Current Exam Systems:

1. Time-consuming Exam Creation: Teachers spend a lot of time making exams because the current methods aren't quick or easy.

2. Challenges in Exam Organization: It's tough to organize exams, especially in big classes or when students aren't all in the same place.

3. Tedious Exam Grading: Teachers have to spend a lot of time grading each exam by hand, which takes up a lot of their time.

4. Lack of Helpful Feedback for Students: The exams students take don't always give them useful feedback, which makes it hard for them to know what they need to work on.

5. Repetitive Question Types: Many exams use the same formats, like multiple-choice or short-answer, resulting in duplicated content.

6. Limited Academic Potential with Traditional Exam Systems

1.3.3 Objectives

1. Streamlined Exam Creation Process: Develop an efficient exam creation process to reduce teacher workload and time spent on exam preparation.

2. Enhanced Exam Organization System: Implement a robust exam organization system to simplify logistics and accommodate diverse classroom settings.

3. Automated Grading Implementation: Introduce automated grading systems to expedite the grading process and enable teachers to focus on providing valuable feedback.

4. Improved Feedback Mechanisms: Enhance exam feedback mechanisms to provide students with actionable insights for academic growth and improvement.

5. Diversified Question Formats: Expand the variety of question formats to ensure a comprehensive assessment and prevent repetition in exam content.

6. Drive Academic Excellence: Empower educators and students to achieve their full potential through the effective use of Examiner, promoting academic success and learning outcomes.

1.3.4 Requirements

1. User-Friendly Interface: The proposed systems must feature intuitive and easy-to-navigate interfaces for both educators and students, ensuring accessibility and usability.

2. Customization Options: The systems should allow customization to fit different educational needs and preferences. This means teachers can adjust the systems to match what they need for their classes.

3. Scalability: The systems must be scalable to support different educational settings, including small classrooms and large institutions, without compromising performance or usability.

4. Security Measures: Robust security measures should be implemented to protect sensitive data and ensure the integrity and confidentiality of exams and student information.

5. Compatibility: Compatibility with a range of devices and platforms, including desktop computers, laptops, tablets, and smartphones, should be ensured to facilitate seamless access and usage.

6. Accessibility Features: Accessibility features, such as support for screen readers, keyboard navigation, and adjustable font sizes, should be incorporated to ensure inclusivity and accommodate users with disabilities.

7. Data Analytics: The systems should include features for data analytics and reporting to provide insights into exam performance, student engagement, and overall system usage, enabling informed decision-making and continuous improvement.

1.3.5 Constraints

- Project Completion Deadline: Examiner must be fully developed and implemented within 6 months from the project initiation, ensuring timely delivery and alignment with organizational objectives.

- Budgetary Limitation: The total budget allocated for designing, developing, and testing Examiner is set at $70,000, requiring strict adherence to financial constraints throughout the project lifecycle.

- Human Resource Availability: The project team is limited to a maximum of 6 members due to staffing constraints, potentially impacting the project's scope and timelines.

- Technology Compatibility: Examiner must be compatible with mainstream web browsers (e.g., Chrome, Firefox, Safari) to ensure seamless accessibility for users across different devices and platforms.

- Regulatory Compliance: The development process of Examiner must adhere to relevant data privacy regulations (e.g., GDPR, CCPA) to safeguard user data and ensure legal compliance throughout the project.

1.4 Feasibility Study

1.4.1 Technical Feasibility:

The system is being designed as an online web portal, enabling its operation from anywhere with an internet connection. It utilizes HTML, CSS, JavaScript, and jQuery for design, while Node.js and MySQL are employed for programming and database functions respectively. It can be accessed on any device with a web browser and internet connectivity. For hardware, it includes devices used for internet browsing.

1.4.2 Operational Feasibility:

Our web application is widely used and intuitive, requiring no specialized training for users; it's easy to understand and to use.

Database access and modification privileges are restricted to the system administrator only. However, instructors are also granted the ability to modify the database.

1.4.3 Economic Feasibility:

Development Cost

Table 1 Personnel:

Employee	Cost per Hour (JOD)	Hours	Total Cost (JOD)
Project Manager	45	60	2,700
System Architect	35	70	2,450
Developer/Tester	30	120	3,600
Developer/Tester	30	120	3,600
AI Developer	40	70	2,800
UI/UX Designer	28	80	2,240
Total			17,390

Table 2 Expenses:

Expenses	Cost (JOD)
Marketing	3,000
Legal and Regulatory Compliance	400
Total	3,400

Table 3 New Hardware and Software:

Hardware / Software	Quantity	Cost (JOD)
Server Hardware	3	4,500
computer	4	3,600
laptop	2	1,200
DBMS Software	1	350
Total		9,650

Total Development Cost = 30,440 JOD

Operating Cost

Table 4 Personnel:

employee	Cost per Hour (JOD)	Hours	Total Cost (JOD)
System Architect	22	25	550
Developer/Tester	18	50	900
AI Developer	18	50	900
UI/UX Designer	15	40	600
Total			2950

Table 5 Expenses:

Expenses	Cost (JOD)
Maintenance agreement for server	900
Maintenance agreement for DBMS Software	180
Total	1080

Total Annual Operating Cost = 4030 JOD

Benefits:

Table 6 Tangible Benefits:

Tangible Benefits	Earnings (JOD)
Error reduction	1,500
Increased flexibility	2,000
Increased speed of activity	2,000

Increased visibility (sponsorships, partnerships)	4,000
Business Expansion	6,000
Global Reach	7,000
Total	22,500

Total Tangible Benefits = 22,500 JOD

Intangible Benefits:

Intangible benefits are the good things that are hard to measure but really matter. With Examiner, schools can get:

1. Better Choices: Teachers can make smarter decisions, which helps students learn.

2. Fairness: Exams are graded fairly and accurately, so everyone knows where they stand.

3. Standing Out: Schools look good for using Examiner, which can attract more students.

4. Being Professional: Using Examiner shows that schools are modern and organized.

5. Happier Teachers: Examiner makes teachers' jobs easier, so they feel happier at work.

6.increasing the accuracy of the exams.

Table 7 Payback Analysis:

Cash Flow	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Development Cost	30,440	0	0	0	0	0
Operating Cost	0	4,030	5,000	5,500	6,000	8,000
Benefits	0	22,500	23,500	25,000	27,000	30,000
Discount Rate (5%)	1	0.9	0.9	0.8	0.8	0.7
Time Adjusted Cost	30,440	4,050	4,505	5,450	5,754	6,973
Time Adjusted Benefits	0	19,040	20,322	20,343	19,533	19,653
Cumulative Time Adjusted Cost	30,440	35,234	42,864	46,753	52,765	58,432
Cumulative Time Adjusted Benefits	0	19,040	38,435	58,343	84,343	122,342
Cumulative Time Adjusted (Cost& Benefits)	-30,440	-13,034	12,454	43,342	76,324	95,324

Payback year: cumulative benefits exceed cumulative costs in Year 2.

Lifetime Return on Investment (ROI) = (Estimated Lifetime Benefits - Estimated Lifetime Cost) / Estimated Lifetime Cost = (122,342- 58,432) / 58,432= 1.09

Annual ROI = Lifetime ROI / Lifetime of The System = 1.09 / 5 = 0.218

Net Present Value = Cumulative Benefits - Cumulative Cost = 122,342- 58,432= 63,910 JOD

1.4.4 Schedule Feasibility:

The Examiner project schedule has been meticulously crafted, with task durations carefully estimated and documented in Table 3.5 and 3.6. It spans a total of 62 days, starting from April 15,

2024, and concluding on July 3, 2024. This timeline includes a comfortable buffer, ensuring completion 18 days ahead of the deadline. The project team's competency and the availability of necessary resources ensure seamless execution.

The schedule begins with Project Management and Planning for the initial 7 days, followed by 5 days allocated for Feasibility Studies, and subsequent phases such as Software Requirements Specifications (10 days), UML Diagrams (3 days), and Architectural and Database Design (6 days). GUI Design and GUI Implementation are allotted 3 days and 7 days, respectively, leading into a 20-day period for Application & Database Implementation. User manual preparation takes 3 days, while Testing spans 12 days. The final Presentation phase is set for 3 days.

With a project initiation date of April 15, 2024, the team expects to complete well within the 62-day timeframe, maintaining an 18-day margin before the July 3, 2024, deadline. This confidence stems from the team's proficiency and the thorough allocation of resources. Even in the face of unexpected challenges causing delays, the project has a cushion of 18 days to ensure successful delivery within the specified timeframe. Overall, the schedule provides a clear roadmap for the Examiner project's success.

1.4.5 Legal Feasibility

Legal consultation has affirmed that the services proposed by Examiner do not infringe upon any existing laws. To formalize our operations, we intend to register the website under a company name, ensuring compliance with legal requirements and facilitating interactions with governmental bodies, private enterprises, and NGOs.

Examiner is committed to providing a safe and secure environment for all users. We will implement clear and consistent guidelines to uphold the integrity of our community and ensure the safety of every participant. Additionally, privacy protection is a top priority throughout the development process, with measures in place to safeguard user information at every stage of interaction.

1.5 Local and Global Impact of the Proposed Solution

The proposed Examiner platform has the potential to create a significant impact both locally and globally.

On the local scale, Examiner is a tool that makes it easier for teachers and students to collaborate in local schools. It creates a friendly environment where everyone can share ideas and learn together. This strengthens the school community and makes learning more enjoyable. Also Examiner saves teachers time by simplifying tasks like making exams and keeping track of grades. This means teachers can focus more on teaching and helping students succeed.

Moreover, when schools use Examiner and do well, more students might enroll. This can benefit local businesses like bookstores, tutoring services, and educational technology providers. So, Examiner not only helps schools but also supports the local economy by bringing in more customers to these businesses.

On the global scale, Examiner brings educators and students from around the world together. It offers easy-to-use tools for making and managing exams, which helps people connect and share knowledge no matter where they are. This creates a worldwide community of learners where everyone can exchange ideas and learn from each other. Additionally, Examiner cares about the

environment. By using less paper and promoting digital methods, it helps reduce waste and supports eco-friendly practices in education. This is important for saving resources and reducing pollution, which is good for the planet. So, Examiner not only helps people learn globally but also helps protect the environment.

2.0 Project Management Plan

2.1 Project Organization

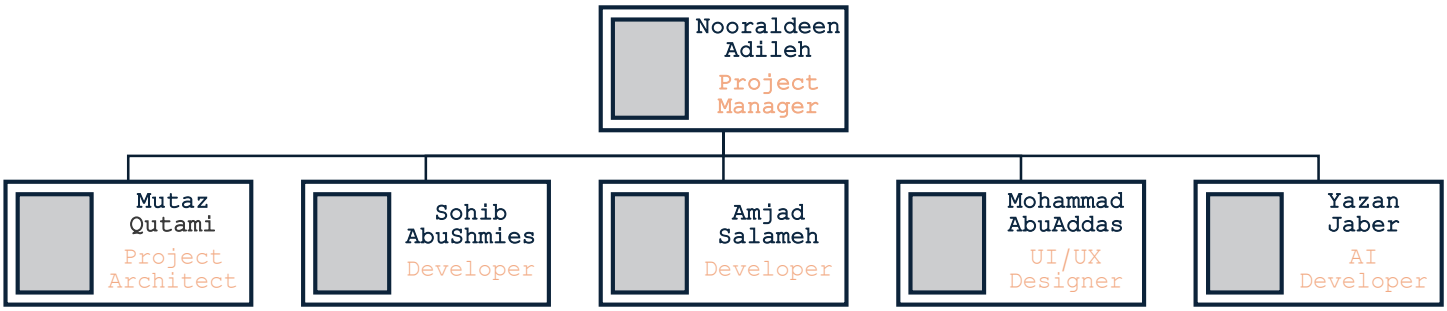


Figure 1 Project Organization

2.2 Roles and Responsibilities

Table 8 Roles and Responsibilities

Name	Role	Responsibilities
Nooraldeen Adileh	Project Manager	Plan, execute, and finalize the project on time and within budget. Distribute tasks appropriately. Manage resources and ensure quality.
Mutaz Qutami	Project Architect	Define the technical and functional architecture of the system. Develop the most critical components of the system. Perform feasibility studies. ensuring adherence to architectural standards.
Sohib Abu Shmies	Developer	Responsible for developing and writing code for assigned tasks and testing it thoroughly to make sure it meets requirements and quality standards.
Amjad Salameh	Developer	Responsible for developing and writing code for assigned tasks and testing it thoroughly to make sure it

		meets requirements and quality standards.
Mohammad Abu Addas	UI/UX Designer	Responsible for the design of the prototypes and the GUI. Create visually appealing and user-friendly designs. Ensure consistency and usability throughout the project.
Yazan Jaber	AI Developer	Designs and builds intelligent software using machine learning and data to solve real-world problems across different industries.

2.3 Software Process Model

The goal is to develop a comprehensive exam system website featuring diverse independent features. Community feedback holds significant importance, and milestone specifications may fluctuate based on this input. Consequently, we'll adopt an incremental design and delivery strategy.

2.4 Tools and Techniques

Tools:

In the development of our website, we will leverage key programming languages including HTML, CSS, and JavaScript within the widely recognized web development framework, Express.js. Database management will be assigned to MySQL. Our design process will be facilitated by Figma, serving dual roles in prototyping, and refining the UI/UX design.

Techniques:

In our team, individuals bring valuable expertise from previous projects, and we will leverage this experience to gauge the effort required for the development of this project. Additionally, we plan to employ the state transition technique for testing our website. Lastly, we will carry out several reviews along the way to ensure and evaluate the ongoing quality of our work.

2.5 and 2.6 - Work breakdown and Assigning Team Members to Tasks

2.5.1 Project Tasks and Task Description

Table 9 Assigning Team Members to Tasks

Task	Description	Team Members	Dependencies and Constraints
T1	Project Management and Planning	All members	-
T2	Feasibility Studies	Nooraldeen Adileh	T1

T3	Software Requirements Specifications	All members	
T4	UML diagrams	Sohib AbuShmies	T3, Skill Constraints: This task requires experience with prototyping/design software.
T5	Architectural and Database Design	Mutaz Qutami	T4, Quick response to queries is necessary. T5, Developers must stick to the designs provided to them
T6	GUI Design / Prototyping	Mohammad Abu Addas	T5
T7	GUI Implementation	Amjad Salameh	T6
T8	Application & Database implementation	Yazan Jaber	T5,T7 Developers must stick to the designs provided to them
T9	User Manual preparation	Nooraldeen Adileh	T7
T10	Testing	Sohib AbuShmies Amjad Salameh	T8
T11	Presentation	All members	T9,T10

2.5.2 Deliverables and Milestones

Table 10 Deliverables and Milestones (Deliverables and Milestones)

Milestone	Deliverables
Milestone 1: Project Proposal Prepared (T1)	-
Milestone 2: Requirements Analysis (T2, T3)	-
Milestone 3: Design and Analysis (T4, T5, T6)	Send details to the marketing company

Milestone 4: Development, Promotion, and Hiring (T7, T8)	
Milestone 5: Finishing Up (T9, T10,11)	Deliver the website to the clients

2.5.3 Resources Needed

Table 11 Hardware (Hardware Needed)

Hardware	Quantity	Note
Server Hardware	1	For hosting applications, databases, or services
Computer	3	For development and design
Laptop	1	For client meeting and communication

Table 12 Software (Software Needed)

Tool	Purpose
Jira	Task tracking, collaboration, and project planning
GitHub	Managing source code versions and collaboration
Visual Studio Code	Code editing, debugging, and development
Microsoft Teams	Team communication and collaboration
Microsoft Word Online	Collaborative document editing and sharing
MySQL Workbench	Database design, administration, and querying
JUnit	Automated testing of software applications
Figma	Design and Prototyping

Table 13 Skills (Skills Needed)

Skills
Planning and Management
Development and Design
Database Administration
Communications Skills
Problem Solving

2.7 Project Schedule

Table 14 Project Schedule

Task	Start Date	End Date	Time	Dependencies
T1	15th April	21st April	7 days	-
T2	22nd April	26th April	5 days	T1
T3	27th April	6th May	10 days	-
T4	7th May	9th May	3 days	T3
T5	10th May	15th May	6 days	T4
T6	16th May	18th May	3 days	T5
T7	19th May	26th May	8 days	T6
T8	27th May	15th June	20 days	T5,T7
T9	16th June	18th June	3 days	T7
T10	19th June	30th June	12 days	T8
T11	1st July	3rd July	3 days	T9,T10

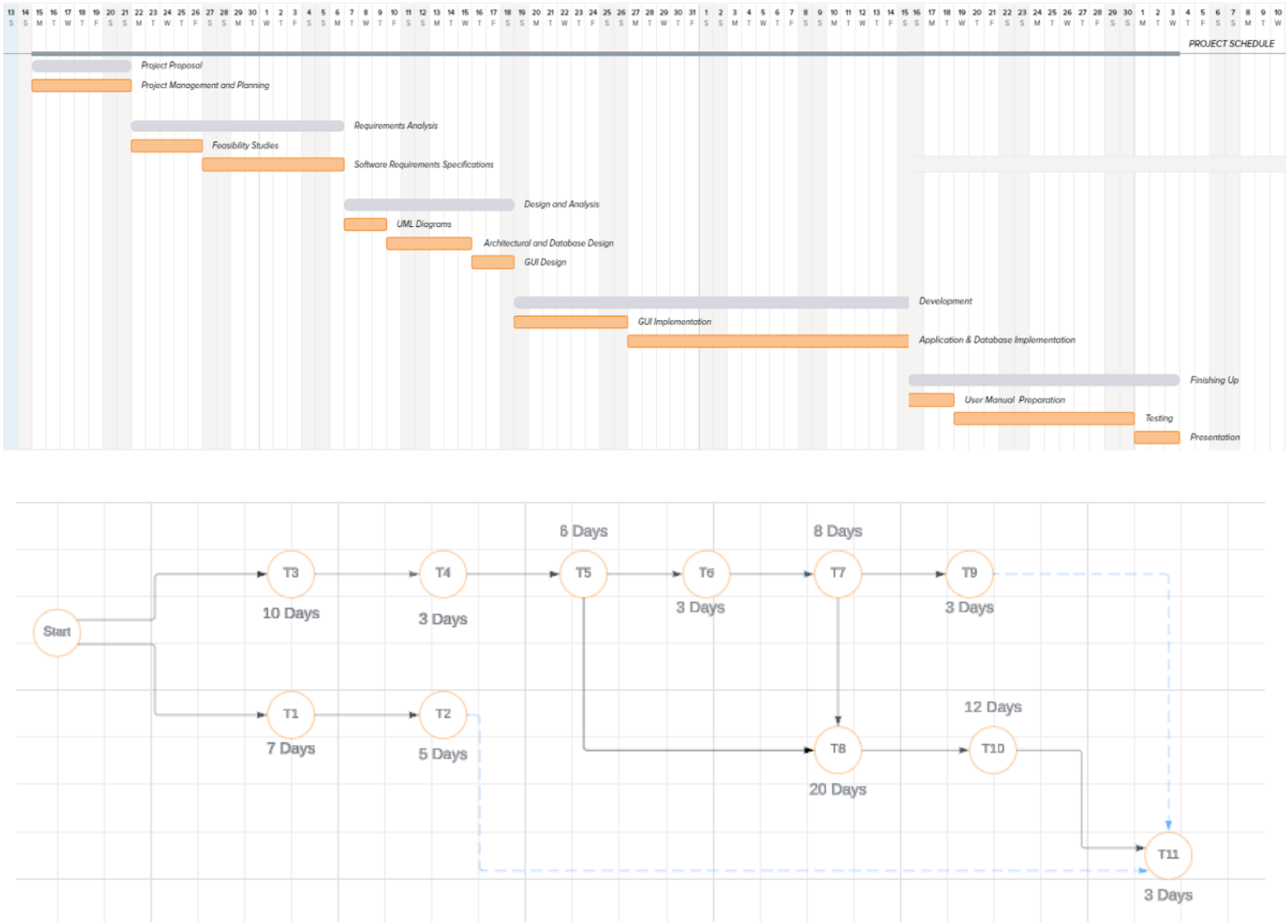


Figure 2 Project Schedule

2.8 Risk analysis and plans

RISKS:

Table 15 RISKS

RISK	RISK LIKELIHOOD	RISK SEVERITY	RISK PRIORITY	DESCRIPTION
Security Breaches	probable	undesirable	HIGH	Online exam platforms often deal with sensitive data, making them prime targets for hackers. Security breaches can lead to leaks of exam questions, cheating, or compromise of personal information.
Technical Issues	probable	undesirable	HIGH	System crashes, server downtimes, or software bugs can disrupt exams and lead to frustration among users.
Scalability	possible	tolerable	medium	If the platform experiences unexpected growth or a surge in users during peak times (such as exam seasons), it may struggle to handle the increased load, resulting in performance issues.
Cheating Prevention	probable	intolerable	extreme	Ensuring the integrity of exams and preventing cheating poses a significant challenge. Techniques like proctoring, plagiarism detection, and secure exam delivery need to be implemented effectively.
Data Integrity and Privacy	probable	intolerable	high	Data integrity must be maintained to prevent tampering with exam results or other critical information. Additionally, strict measures must be in place to safeguard users' personal data and ensure compliance with data protection regulations.

Legal and Regulatory Compliance	low	undesirable	medium	Online exam platforms must adhere to relevant laws and regulations, such as those related to data protection, accessibility, and intellectual property rights.
User Authentication and Authorization	possible	intolerable	medium	Ensuring that only authorized users can access exams and preventing impersonation or unauthorized access is crucial for maintaining exam integrity.

PLANS:

Table 16 PLANS

RISKS	STRATEGY
Security Breaches	Implement encryption protocols to protect data transmission. Conduct regular security audits and penetration testing to identify vulnerabilities. Employ multi-factor authentication to enhance user account security. Utilize firewalls and intrusion detection systems to monitor and prevent unauthorized access. Train staff on security best practices and ensure adherence to security protocols.
Technical Issues	Implement automated monitoring systems to detect and resolve technical issues promptly. Conduct thorough testing, including load testing, to ensure the platform's stability under different usage scenarios. Develop a disaster recovery plan to mitigate the impact of system failures or downtime.
Scalability	Employ robust hosting services with scalable infrastructure to handle fluctuations in user traffic.
Cheating Prevention	Integrate plagiarism detection tools to identify instances of academic dishonesty. Employ randomized question pools and adaptive testing algorithms to minimize the effectiveness of cheating strategies
Data Integrity and Privacy	Adhere to industry-standard encryption practices to safeguard sensitive data. Implement access controls and role-based permissions to restrict unauthorized access to user data.

Legal and Regulatory Compliance	Stay informed about relevant laws and regulations governing online education and assessment. Consult legal experts to ensure compliance with data protection, accessibility, and intellectual property laws.
User Authentication and Authorization	Implement a robust system that ca work dependently on an organizer to authenticate and give permission for exam access, or independently with certain parameters that can be provided by the organizer to help verify identities.

2.9 Monitoring, Reporting, and Controlling Mechanisms:

Monitoring, reporting, and control mechanisms are essential for effectively managing the risks for a software project, even so when the project is developing a platform for examining. Here's how these mechanisms can be implemented:

1. Monitor and control project work: the main and most essential mechanism in any development process to guarantee correct workflow.

2. Making a daily scrum meeting , and discussing progress.

3. Use Earned Value Management (EVM) management technique that tracks the schedule, costs, and scope to measure project performance.

4. reviewing daily process by every member using mechanisms such as version control tools like Git and GitHub for code implementations.

5. Conduct regular risk assessments to identify potential threats and vulnerabilities.

6. Keeping monthly regular checkups on project work to maintain schedule and ensure project meets deadlines.

7. Reviewing burden rates and support costs or other costs to ensure project stays within its intended budget.

8. Provide transparent and timely updates on the progress of risk mitigation activities and any changes to the risk landscape.

9. Maintain documentation of all changes made to the system and their associated risks and outcomes.

10. Implement mechanisms to track compliance with relevant laws, regulations, and industry standards.

Conduct periodic compliance audits to ensure adherence to data protection, security, and accessibility requirements.

3.0 Software Requirements Specifications (SRS)

3.1 System Stakeholders and Requirements Sources

Table 17 StackeHolders

Stakeholders	Description
Students	The primary beneficiaries of the system. They engage with various functionalities like logging in, registering, taking exams, and reviewing results. Their user experience is critical, and their feedback will significantly shape system usability enhancements.
Instructors	Key users who create, manage, and publish exams. They interact with the system to analyze exam results, provide feedback, and manage exam settings. Their requirements are critical for the administrative and content management aspects of the platform.
Administrators	Oversee the system at a higher level, concerned with user management, system security, and compliance with educational and

	privacy standards.
IT and Technical Support Staff	Responsible for maintaining system performance, implementing updates, and providing support to address technical issues encountered by users.
System Analysts and Developers	Engaged in the design and development of the platform. They translate stakeholder requirements into system functionalities, ensuring all technical and user specifications are met.

3.2 Information Gathering Techniques

Requirements Sources:

- **User Interviews and Surveys:** Structured interactions with students and instructors to gather direct feedback on existing systems and expectations for the new platform.
- **Workshops and Focus Groups:** Sessions conducted with educators and technical staff to determine functional needs and operational challenges.
- **Competitive Analysis:** Review of existing examination platforms to identify features that are well received and those that need improvement.
- **Regulatory Compliance Documents:** Guidelines and regulations that influence system requirements related to security, data handling, and privacy.
- **Technical Documentation Review:** Analysis of current system documentation and user guides to identify gaps and areas for enhancement.

3.2.1 Interviews

This section explores the potential of an online examination system with an AI model for creating exams. We will conduct interviews with various stakeholders to gather their perspectives and inform the development process.

Target Interviewees

- **Teachers:** We will interview teachers from different subject areas and grade levels to understand their current exam creation practices, challenges they face, and their expectations for an AI-powered exam system.

- **Students:** Students' perspectives on online examinations and feedback on potential benefits of AI-generated exams will be valuable.

- **Administrators:** School or institutional administrators can provide insights on exam logistics, security concerns, and the integration of the system within their existing infrastructure.

Preparing the Interviewees

We will provide interviewees with a brief overview of the project, explaining the concept of an AI model creating exams from uploaded PDFs. They will also receive a list of questions beforehand to allow for thoughtful responses.

Interview Questions

The interview will include a mix of open-ended and closed-ended questions categorized by the interviewee's role:

For Teachers:

- **Current Practices:** Can you describe your usual process for creating exams?
- **Challenges:** What are the biggest challenges you face when creating exams? (e.g., time constraints, finding diverse question types)
- **AI Model Integration:** How do you think an AI model could assist in creating exams?
- **Desired Features:** What functionalities would you find most useful in an online examination system?
- **Concerns:** Do you have any concerns about using an AI model to generate exams? (e.g., bias, creativity)

For Students:

- **Experience with Online Exams:** Have you ever taken online exams? If so, what was your experience like?
- **Benefits of AI-Generated Exams:** How do you think AI-generated exams could be beneficial for students? (e.g., standardized format, personalized difficulty)
- **Concerns:** Do you have any concerns about using AI for exams? (e.g., fairness, predictability)

For Administrators:

- **Logistical Considerations:** What are your current processes and policies regarding online examinations?
- **Integration with Existing Systems:** How would this AI-powered system integrate with your existing learning management system (LMS)?
- **Security Concerns:** What security measures would be necessary for an online examination system?
- **Scalability:** How important is the system's ability to handle a large number of exams and students?

Documenting the Answers

We will record the interviews with permission or take detailed notes. Afterward, the recordings will be transcribed or the notes reviewed and organized by interviewee role and question category.

Follow Up

Following the interviews, we will thank the participants for their time and contribution. If further clarification on any responses is needed, a follow-up email or brief call may be conducted.

By analyzing the interview data, we will gain valuable insights into user needs, expectations, and concerns. This information will be crucial in shaping the development process of the online examination system with AI model, ensuring it addresses the needs of all stakeholders.

3.2.2 Questionnaires

Questionnaires will be distributed to the following target audiences:

- **Students:** Understanding students' experiences and concerns with online examinations is crucial.
- **Educators:** The perspective of educators regarding online exams and potential AI integration will be valuable.
- **Administrators:** Input from administrators regarding the feasibility and potential benefits of AI-powered online exams in their institutions is important.

Questionnaires will be distributed using various methods to reach a broad range of participants:

- **Printed copies:** For those without easy online access, printed questionnaires may be distributed in designated locations.
- **Email distribution:** Targeted emails will be sent to relevant student groups, faculty, and administrative personnel.

Questionnaire Design The questionnaires will be designed to be clear, concise, and free of bias. A mix of question types will be used, including nominal scale, interval scale, and open-ended questions:

- Educational level.
- Age.
- Gender.
- How often do you take online examinations? (Never, Rarely, Occasionally, Frequently)
    - Never
    - Rarely
    - Occasionally
    - Frequently

- What are the biggest challenges you face when taking online examinations?
    - Technical issues
    - Time constraints
    - Exam anxiety
    - Others

- What features do you find most helpful in online examinations?
    - Multiple choice
    - Short answer
    - True or false questions
    - Descriptive questions

- How comfortable would you feel taking an online exam where the questions are generated by AI?
        - (Scale from 1 - Strongly Discomforting to 5 - Very Comfortable)

- Do you have any concerns about the potential misuse of AI in online examinations? If so, please explain.

- In your opinion, how could AI be used to improve the fairness and security of online examinations?

- How do you think the use of AI in online examinations might affect the way we learn and assess knowledge in the future?

- Would you be interested in receiving a mix of question formats on online exam? (Yes/No)

- How confident are you that AI can generate online exam questions that accurately assess your true understanding of the subject matter?
    - (Scale from 1 - Not Confident to 5 - Very Confident)

- How could AI be used to personalize the online exam experience based on your individual learning style or pace?

3.3 User requirements definition

The website is designed to provide a seamless experience for both employers and job seekers, facilitating the process of job searching and hiring. Upon sign-up, users will be prompted to choose between creating an employer's account or a job seeker's account, directing them to the appropriate sign-up process. Once logged in, users will be redirected based on their account type, with job seekers directed to the job browsing page and employers to their listed job openings. A convenient button located near the top of the website allows users to stay logged in or log out as needed.

For job seekers, the platform offers comprehensive job browsing and filtering options, enabling them to refine their search based on criteria such as experience, suitable disability category, education, and salary. With a simple click, job seekers can apply to suitable job positions and manage their applications with ease, including viewing, editing, and tracking their progress.

Employers have access to their home page where they can view and manage their listed job openings. The platform provides tools for employers to filter and review job applications,

facilitating efficient candidate selection. Employers can view, display, and ultimately decide whether to accept or reject applications, streamlining the hiring process and ensuring a seamless experience for both employers and job seekers alike.

3.4 Use Case Diagrams

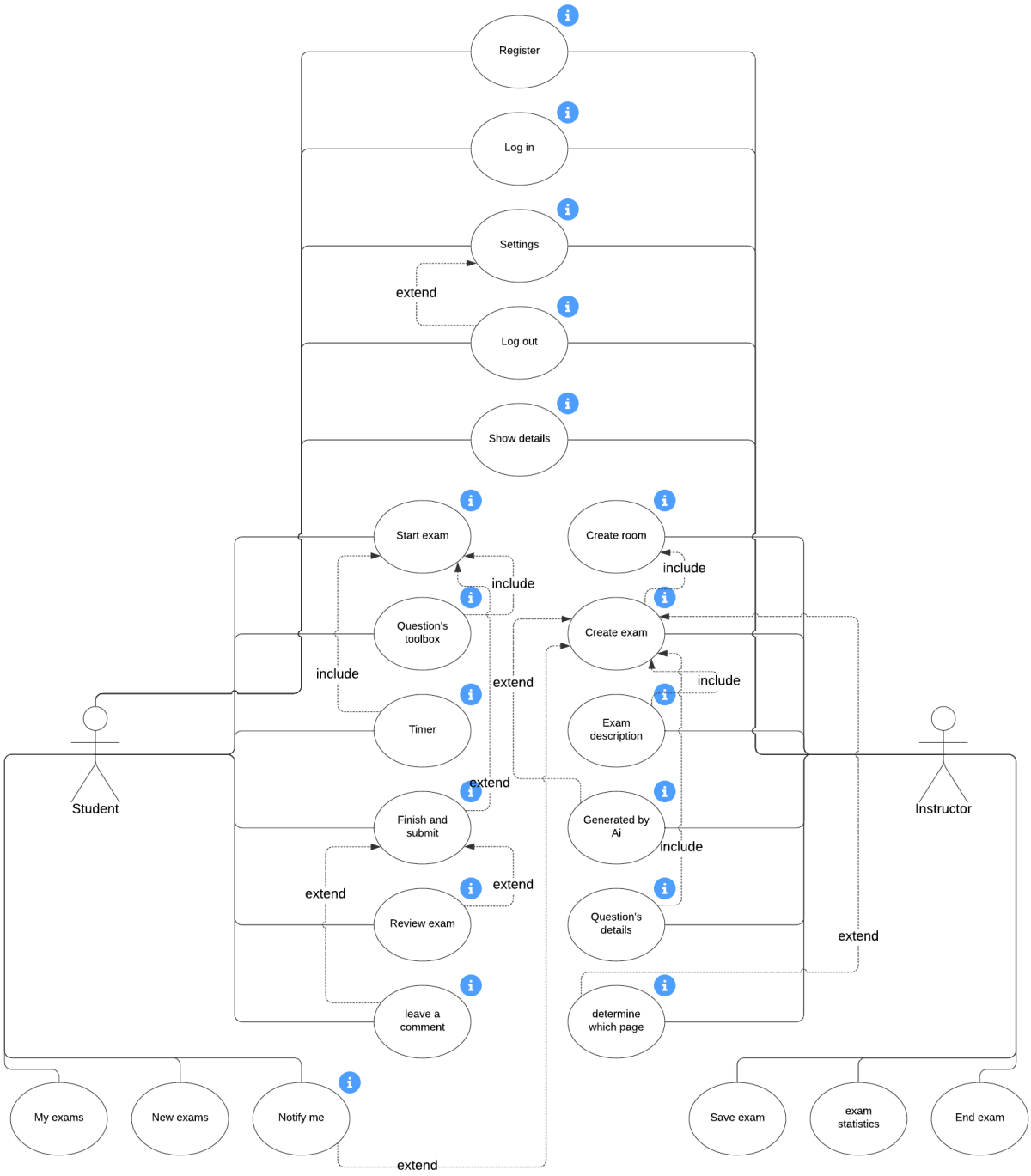


Figure 3 Use case Diagram

3.5 System Functional Requirement Specifications and Description

User case name	Log In
Actors	Student/Instructor
Description	Allow users to access their services on the website
Steps performed: • User enters his email and password • System validates email and password • if entered data are ok redirect to homepage if not error message will appear	- User email - Password - Users' records
Preconditions	user has an account
Postconditions	User logged to his account successfully
Triggering Event	user clicks login button
Success Guarantee	Redirection to homepage

User case name	Register
Actors	Student/Instructor
Description	Allow users to register on the website
Steps performed: • User enters his email and password and confirmation password • System validates email (if registered) password (meets requirements) confirmation password matches password • if validation is a success user redirected to login page if not error message appears	- Users' records
Preconditions	user entered the data correctly
Postconditions	User registered successfully
Triggering Event	user clicks register button
Success Guarantee	User record created/Redirection to login page

User case name	My exams
Actors	Student
Description	Allow users to access the exams they took
Steps performed: • user clicks my exams button system redirects user to his finished exams page	- users' finished exams
Preconditions	user is logged in as student
Postconditions	User redirected to finished exams page
Triggering Event	user clicks my exams button
Success Guarantee	Redirection to finished exams page

User case name	New exams
Actors	Student
Description	Allow user to access recent exams
Steps performed: • user clicks new exams button system redirects user to recent exams layout	- new exams records
Preconditions	----
Postconditions	User redirects to new popular exam page
Triggering Event	user clicks New popular exams button
Success Guarantee	Redirection to new popular exams page

User case name	Show details
Actors	Student/ instructor
Description	Allow user to access details for exams
Steps performed: • user clicks Show details button system redirects user to his exam details page	- exams records
Preconditions	user clicked on a specific exam
Postconditions	User redirects to details about selected exam page
Triggering Event	user clicks show details button
Success Guarantee	Redirection to details page

User case name	Notify me
Actors	Student
Description	Allow user to set reminders
Steps performed: • user enters a room and clicks on Notify me emoji button	
Preconditions	user is logged in and is in the room
Postconditions	When new activities or exams are launched the user gets a notification
Triggering Event	user chooses the time for the reminder
Success Guarantee	Gets notified when an activity happens

User case name	Settings
Actors	Student/Instructor
Description	Allow user to access the settings menu
Steps performed: • user clicks settings button system redirects users to their settings menu	
Preconditions	user is logged in
Postconditions	User redirects the settings menu
Triggering Event	user clicks settings button
Success Guarantee	Redirection to settings menu

User case name	Start exam
Actors	Student
Description	Allow user to start and take the exam
Steps performed: • System validates if users' records are linked to the exam or the users entered the correct room ID • user clicks start exam • system redirects user to exam page	-exams records -users' records

Preconditions	the exam supports user's record/ or user entered a valid room ID
Postconditions	User redirects to exam page
Triggering Event	user clicks Start exam button
Success Guarantee	Redirection to exam page

User case name	Question's toolbox
Actors	Student
Description	Shows answered flagged and not answered questions and the number of questions
Steps performed: • User is attending an exam, the Question's toolbox would appear in a suitable place within the exams question's page	
Preconditions	user entered an exam
Postconditions	-----
Triggering Event	User entered an exam
Success Guarantee	User is in an exam

User case name	Timer
Actors	Student
Description	Shows remaining time for an exam to end
Steps performed: • user enters an exam • system starts timer	-timer records; chose by instructor and saved within the system
Preconditions	user entered an exam
Postconditions	When the timer goes down to zero the layout after submitting the exam pops
Triggering Event	-----
Success Guarantee	Timer shows while answering the exam questions

User case name	Finish and submit
Actors	Student
Description	allows user to submit his answers in the exam with two checks
Steps performed: • user clicks on the submit button / a pop up to confirm appears • use clicks on the submit button in the pop up • system saves results and redirect student to result page	
Preconditions	User is in an exam
Postconditions	the exam ends and the user gets redirected to result page
Triggering Event	User clicks on the submit button twice
Success Guarantee	the exam ends the answers are saved and the user is redirected to the layout after submitting the exam

User case name	Review exam
Actors	Student
Description	allows users to review an exam and check their answers whether they’re correct or not
Steps performed: • user clicks on the review exam button • system redirects user to review exam page	-users' exam corrections
Preconditions	User finished the exam
Postconditions	redirect user to review page
Triggering Event	User clicks review exam button
Success Guarantee	the user gets redirected to review exam page

User case name	Leave a comment
Actors	Student
Description	User can enter feedback about the whole exam

Steps performed: • User enters feedback then clicks Enter • System saves feedback	
Preconditions	user finished the exam
Postconditions	Users gets redirected to homepage
Triggering Event	User enters feedback then saves it
Success Guarantee	feedback is saved

User case name	Create exam
Actors	Instructor
Description	Allows user to Create an exam
Steps performed: • User clicks Create exam button • system redirects user to Create exam page	
Preconditions	user is logged in as an instructor
Postconditions	User is redirected to create exam page
Triggering Event	User clicks the Create exam button
Success Guarantee	User gets redirected to Create exam page

User case name	Create room
Actors	Instructor
Description	Allows User to Create a public or private room for the exam
Steps performed: • User clicks on Create room button / System shows a window with choices for public or private room and main details about the exam • Users chooses either they want to create a public or a private room • System creates a room if the room is public system shows room ID if private system sets the room for a predefined database	-Predefined User records -Exams records
Preconditions	User is logged in as an instructor
Postconditions	room is created
Triggering Event	User clicks on create room button
Success Guarantee	a window appears with choices to create a public or private room

User case name	Exam description
Actors	Instructor
Description	Allows User to Enter details about the exam for ex. exam name, date, time, constraints, description, allow comments, show mark at the end of exam, the exam One way or two ways, etc.
Steps performed: • User enters the details • if the User clicks Create exam the details will be saved by the system	-Exams records
Preconditions	User is logged in as an instructor and clicked create exam
Postconditions	Exam details are filled
Triggering Event	User enters details
Success Guarantee	Exam created

User case name	Generate by AI
Actors	Instructor
Description	Allows User to insert the study material that the AI model will be basing the questions on
Steps performed: • User clicks generate by AI • system allocates user to AI generation page	
Preconditions	User is logged in as an instructor and clicked create exam
Postconditions	User is allocated to AI generation page
Triggering Event	User Clicks generate by AI
Success Guarantee	User is allocated to AI generation page

User case name	Add new questions, number of questions and types
Actors	Instructor
Description	Allows the user to insert the number of questions, their type whether it's fill in the black, multiple choice, yes/no questions, etc.
Steps performed: • User chooses the number of the questions and specify their types • user enters the questions	
Preconditions	User created a room, an exam and added a space for a new question
Postconditions	User question is entered
Triggering Event	User enters a question
Success Guarantee	question is valid

User case name	Determine which page for the question
Actors	Instructor
Description	Allows User to which question will be in which page and if the user didn't choose it will be default (the questions will be randomized)
Steps performed: • User chooses the questions to be distributed in pages • System saves the users' choices • User chooses which page the questions will be in	
Preconditions	User created a room and is creating an exam
Postconditions	Questions are distributed
Triggering Event	User determines questions distribution
Success Guarantee	questions are distributed

User case name	Save exam
Actors	Instructor
Description	Allows the user to save the exam as a whole

Steps performed: • User clicks save exam button • system saves the exam • System redirects the User to a predefined exams page	
Preconditions	User created a room and finished creating an exam
Postconditions	the exam is saved
Triggering Event	User click the save button
Success Guarantee	exam is saved in the predefined exams page

User case name	Exam statistics
Actors	Instructor
Description	allows the user to see statistics about the exam and compare it to other exams, who finished the exam, the room name, marks of the students, time spent in the exam and more
Steps performed: • User clicked exam statistics button • system redirects user to exam statistics page	-exam records -information about students in the exam
Preconditions	User has a finished exam
Postconditions	user is in the exam statistics page
Triggering Event	User clicked exam statistics button
Success Guarantee	user redirected to exam statistics page

User case name	end exam
Actors	Instructor
Description	allows the user to stop the current exam after pressing it
Steps performed: • user clicks the force stop button • system stops the exam	-exam records
Preconditions	User has an exam running
Postconditions	the exam is stopped
Triggering Event	user clicked the force stop button
Success Guarantee	exam stopped

User case name	Log Out
Actors	Student/Instructor
Description	Allow users to access to close their accounts on the website
Steps performed:	

• User clicks Settings • User clicks Log out • The system closes the account	
Preconditions	user is logged in
Postconditions	The sign in/ register page appears
Triggering Event	user clicks log out button
Success Guarantee	Redirection to sign in/ register layout

3.6 Non-Functional Requirements

3.6.1 Performance Requirements

1. **System Load Time**: The platform should load any user interface within 3 seconds under normal conditions.
2. **Response Time**: Actions initiated by users (e.g., starting an exam, submitting answers) must receive a response within 2 seconds.
3. **Scalability**: The system must support up to 10,000 simultaneous users without degradation in performance.

3.6.2 Dependability Requirements

1. **System Uptime**: The platform should guarantee 99% uptime, excluding planned maintenance.
2. **Data Backup**: Automatic daily backups of all user data with the ability to restore data to any point within the last 30 days.
3. **Error Handling**: System errors should be logged and provide users with a friendly notification without exposing system details.

3.6.3 Security Requirements

1. **Data Protection**: All data, including user information and exam content, must be protected using industry-standard encryption techniques during transit and at rest.

2. **Secure Access**: The platform must incorporate robust authentication mechanisms to ensure secure access to all user accounts and administrative functions. This includes options for multi-factor authentication to enhance security levels.
3. **Privacy Compliance**: The system must adhere to internationally recognized privacy standards to ensure user data is handled securely and ethically, with periodic security audits to maintain compliance over time.

3.6.4 Usability Requirements

1. **Interface Consistency**: The user interface must maintain consistency in terms of font, color, and layout across all pages.
2. **Accessibility**: The system must comply with WCAG 2.1 AA standards to ensure accessibility for users with disabilities.

3.6.5 Operational and Environmental Requirements

1. **Browser Compatibility**: The platform must be compatible with the latest versions of Chrome, Firefox, Safari, and Edge.
2. **Mobile Responsiveness**: The user interface must be responsive and functional on mobile devices including tablets and smartphones.

3.6.6 Maintainability and Supportability Requirement

1. **Update Downtimes**: Scheduled system updates should occur during off-peak hours with prior notification to all users.
2. **Documentation**: Comprehensive developer and user documentation must be provided and regularly updated with system changes.

3.6.7 Regulatory Requirements

1. **Data Protection**: The platform must adhere to local and international data protection laws applicable to the regions it operates in, including compliance checks and audits.

3.7 Data Requirements.

Table 18 Data Requirements

Data Requirement ID (DR)	Description
DR1	Each student can enroll in many exams. Attributes of Student include User ID (primary key), Email, Password.
DR2	Each exam can be taken by many students. Attributes of Exam include Exam ID (primary key), Exam Title, Subject, Date, Time, Duration.
DR3	Each exam consists of multiple questions. Attributes of Question include Question ID (primary key), Content, Type (e.g., multiple choice, true/false), Points.
DR4	Each question in an exam can have multiple answers, and each answer is linked to one student. Attributes of Answer include Answer ID (primary key), Student ID (foreign key), Question ID (foreign key), Submitted Answer, Is Correct.
DR5	Each student can view their exam results. Attributes of Exam Result include Result ID

	(primary key), Student ID (foreign key), Exam ID (foreign key), Score, Pass/Fail Status.
DR6	Each exam can have many scheduled reminders. Attributes of Reminder include Reminder ID (primary key), Exam ID (foreign key), Reminder Time, Description.
DR7	Each instructor can view and analyze exam performance. Attributes of Exam Analysis include Analysis ID (primary key), Exam ID (foreign key), Average Score, Pass Rate.
DR8	Each student can submit feedback for each exam. Attributes of Feedback include Feedback ID (primary key), Exam ID (foreign key), Student ID (foreign key), Content, Submission Date.
DR9	Each exam can be configured with different settings by the instructor. Attributes of Exam Settings include Settings ID (primary key), Exam ID (foreign key), Time Limit, Allowed Attempts, Visibility.
DR10	Each instructor can create and manage multiple exams. Attributes of Instructor include User ID (primary key), Email, Password, Department.

4.0 Design and Analysis

4.1 Activity Diagrams

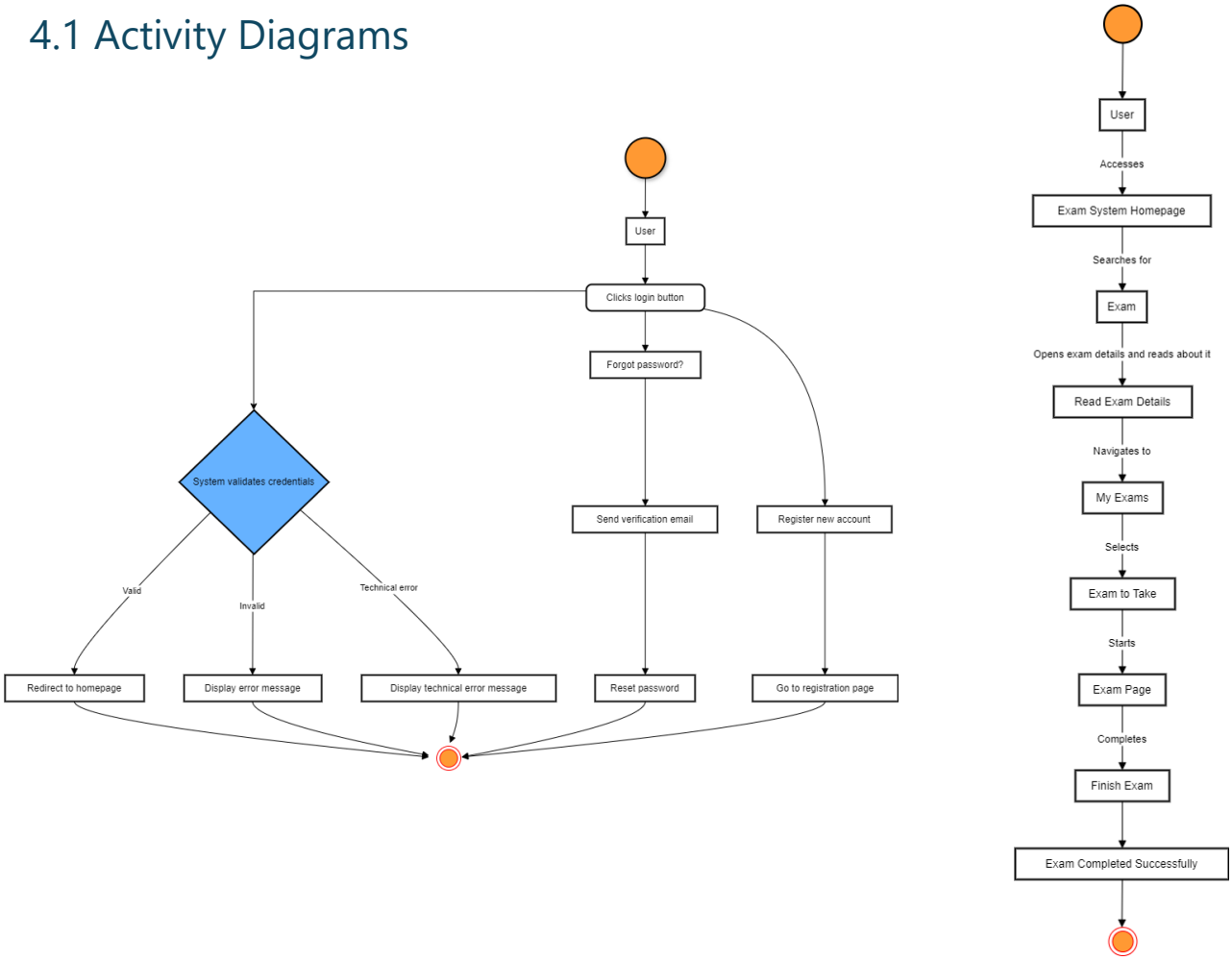


Figure 4 Activity Diagrams

4.2 Sequence Diagrams

1) Create Room

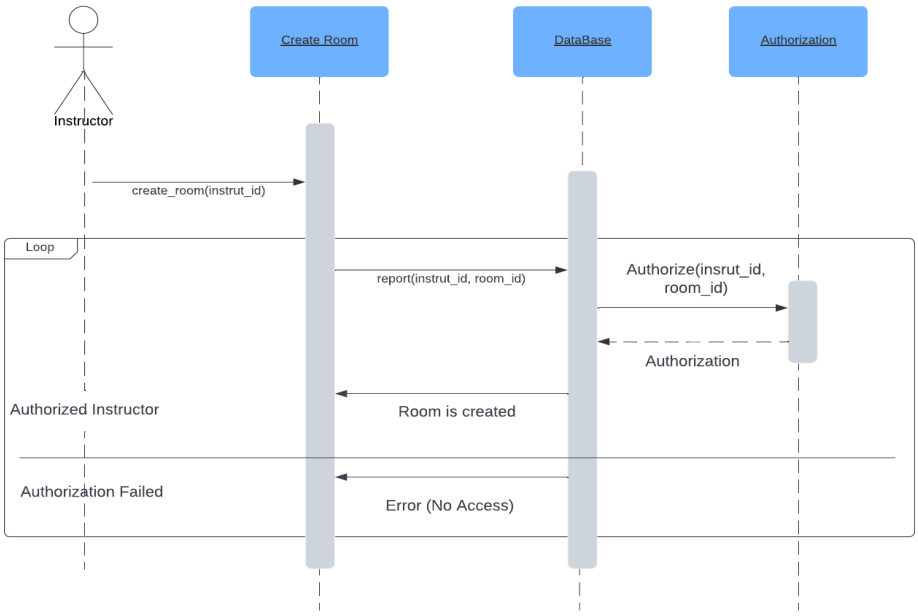


Figure 5 Sequence Diagram1

2) Create Exam

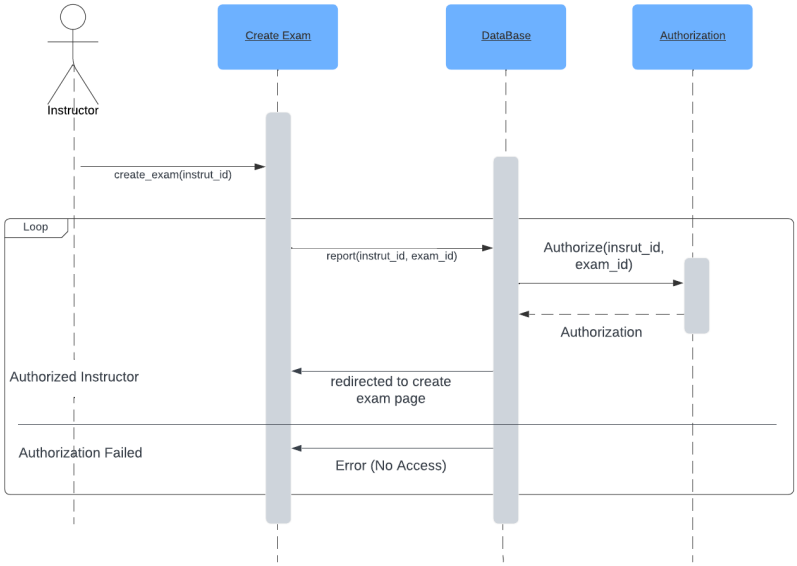


Figure 6 Figure 5 Sequence Diagram2

3)Add new Questions

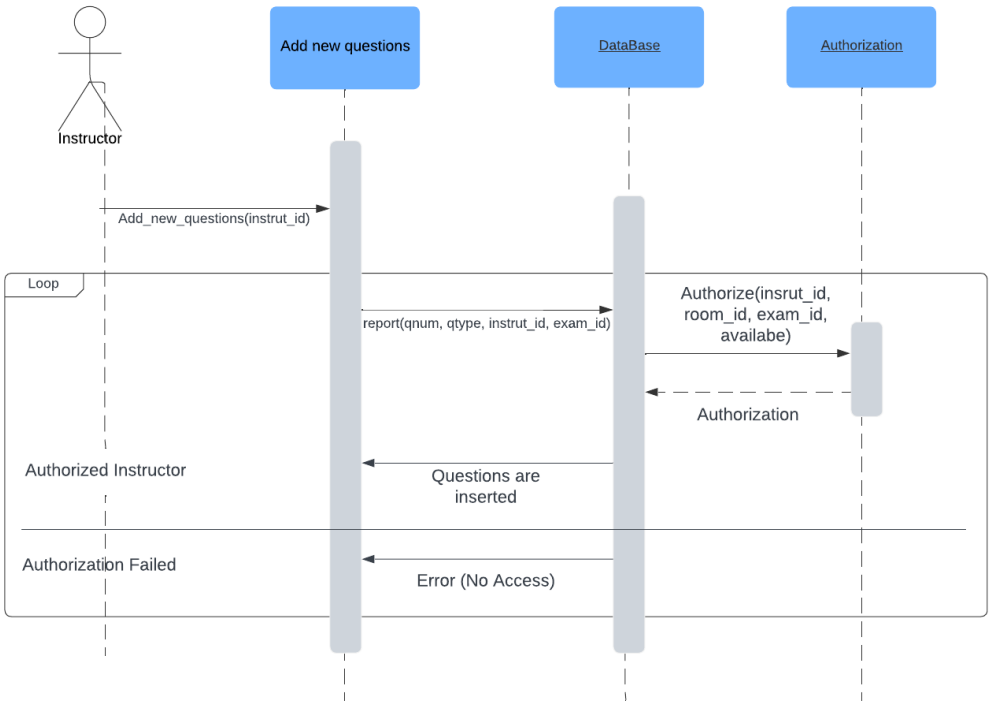


Figure 7 Sequence Diagram3

4) Generate by AI:

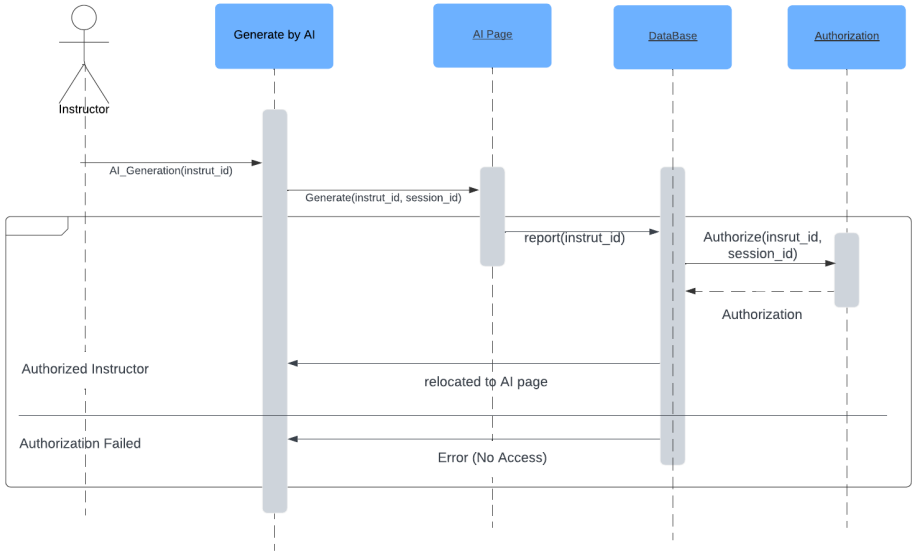


Figure 8 Sequence Diagram4

5)End exam:

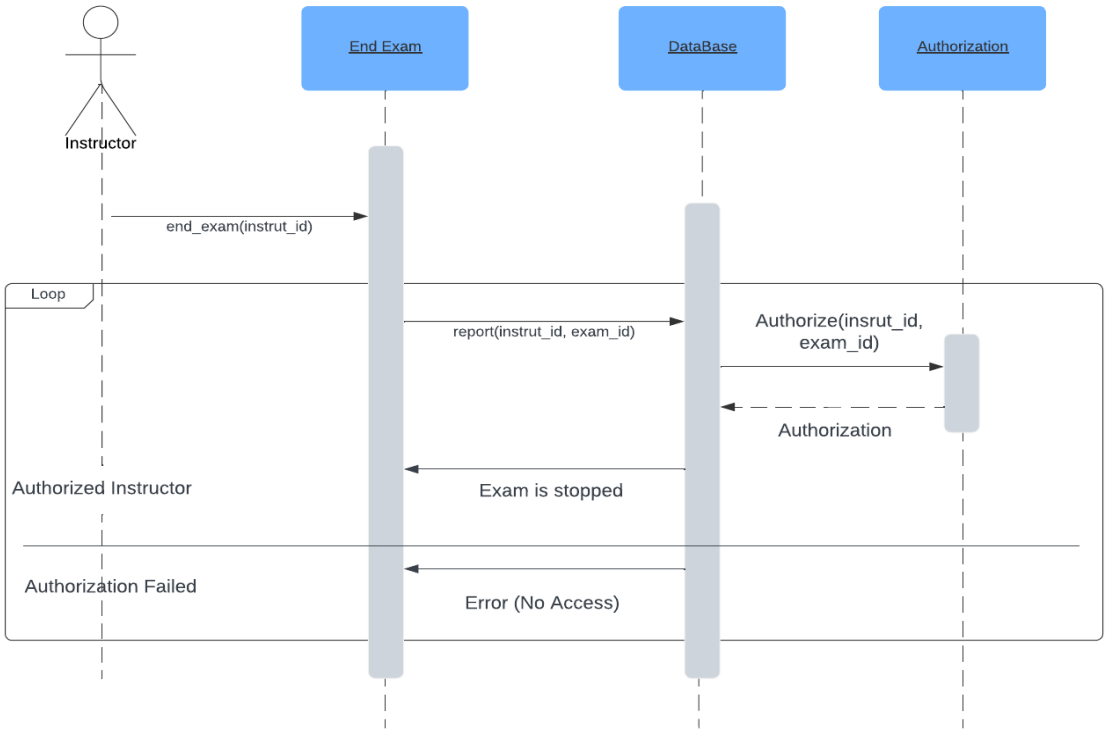


Figure 9 Sequence Diagram5

6) Finish All and submit:

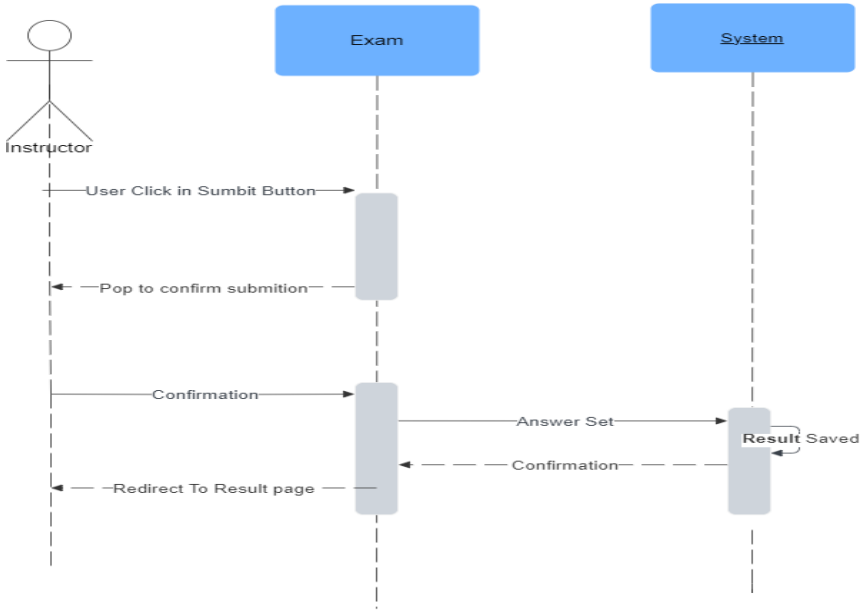


Figure 10 Sequence Diagram6

7)log in page

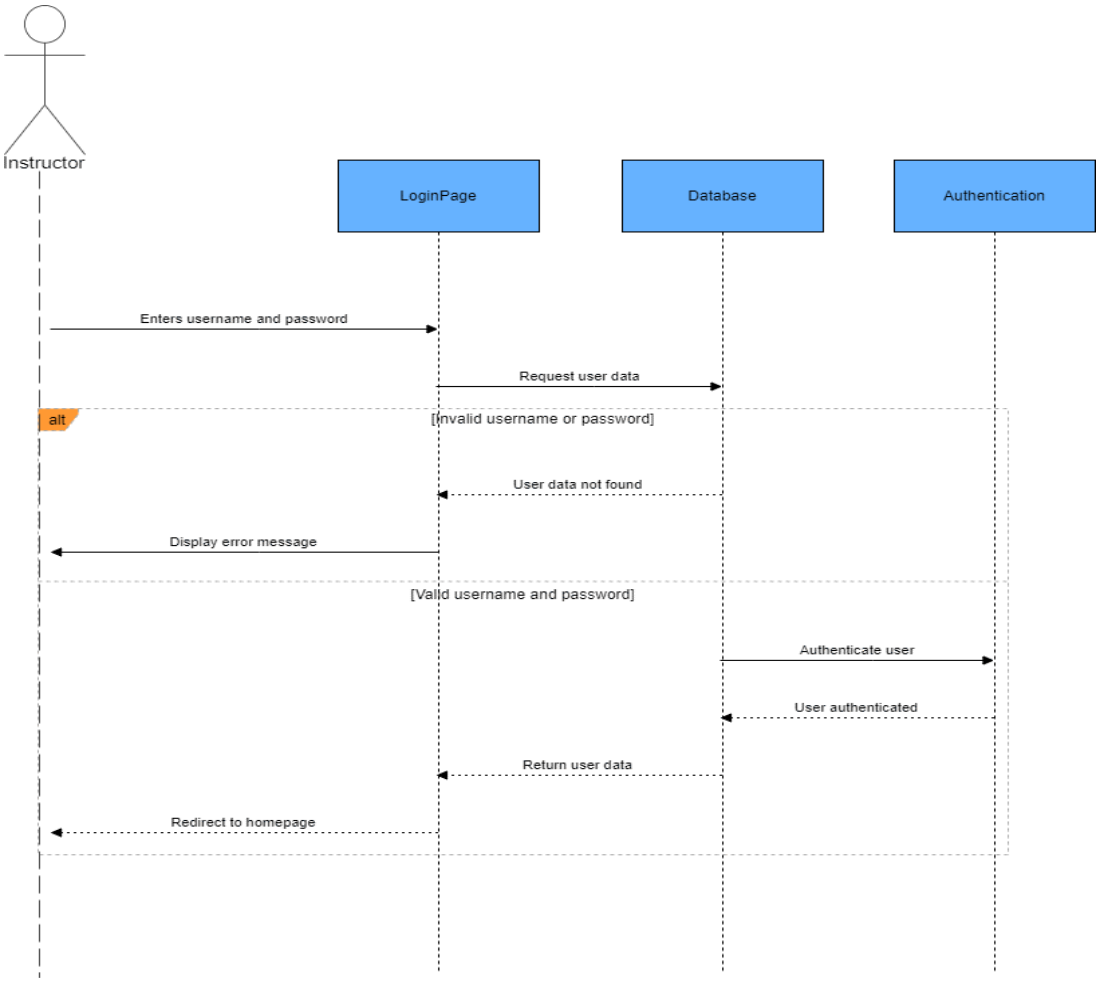


Figure 11 Sequence Diagram7

8) Notify Me

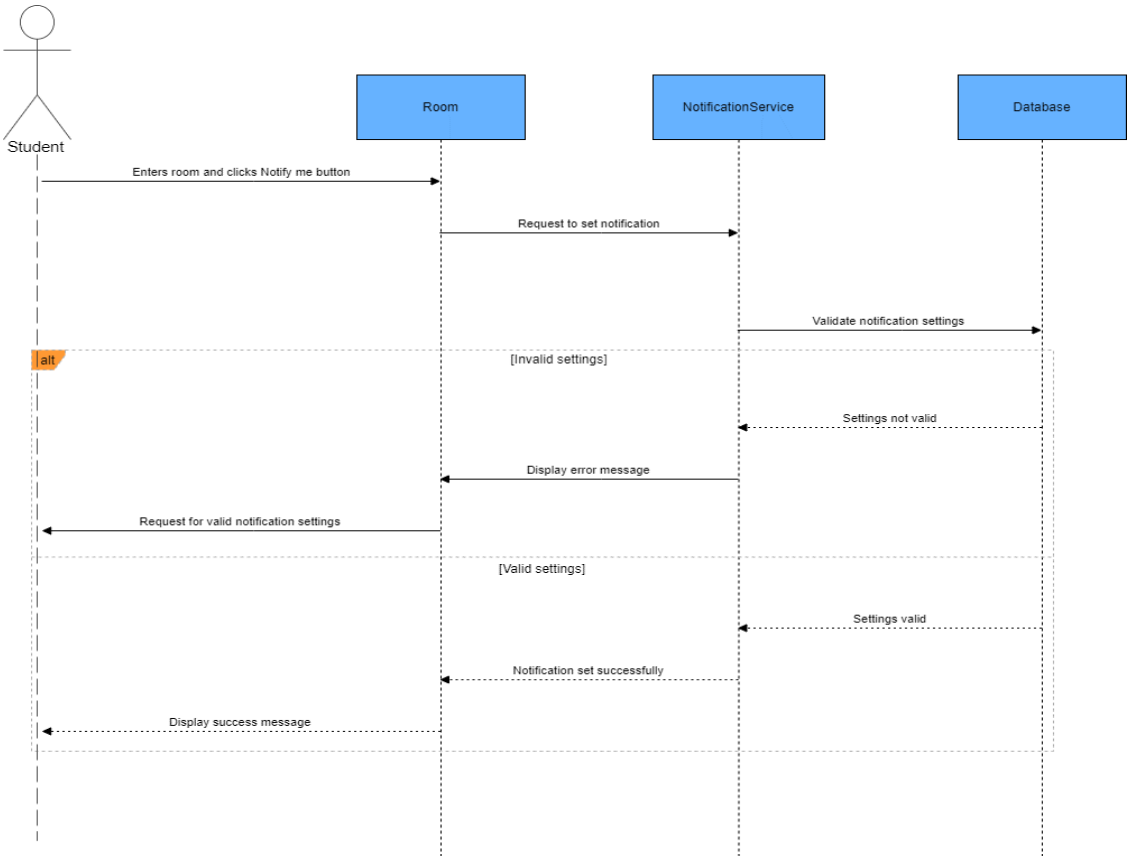


Figure 12 Sequence Diagram8

9) review exam:

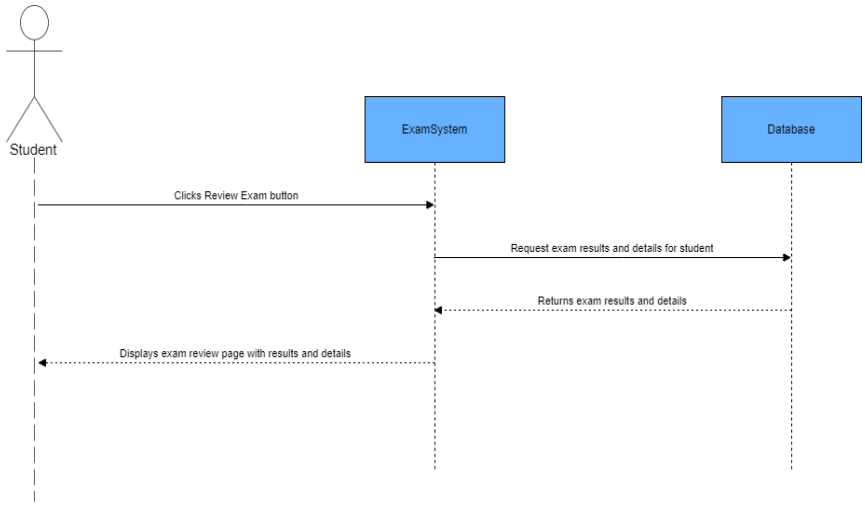


Figure 13 Sequence Diagram9

10) Start exam:

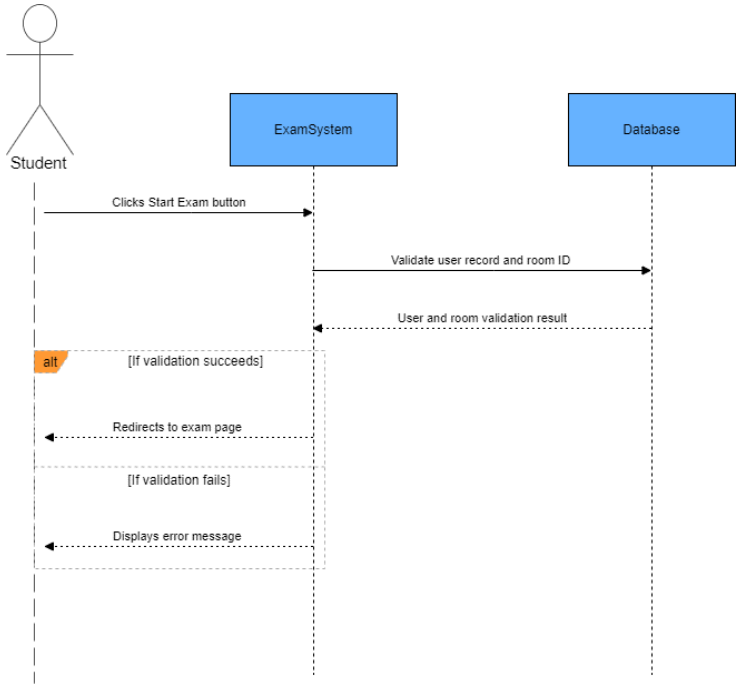


Figure 14 Sequence Diagram10

4.3 Class Diagram

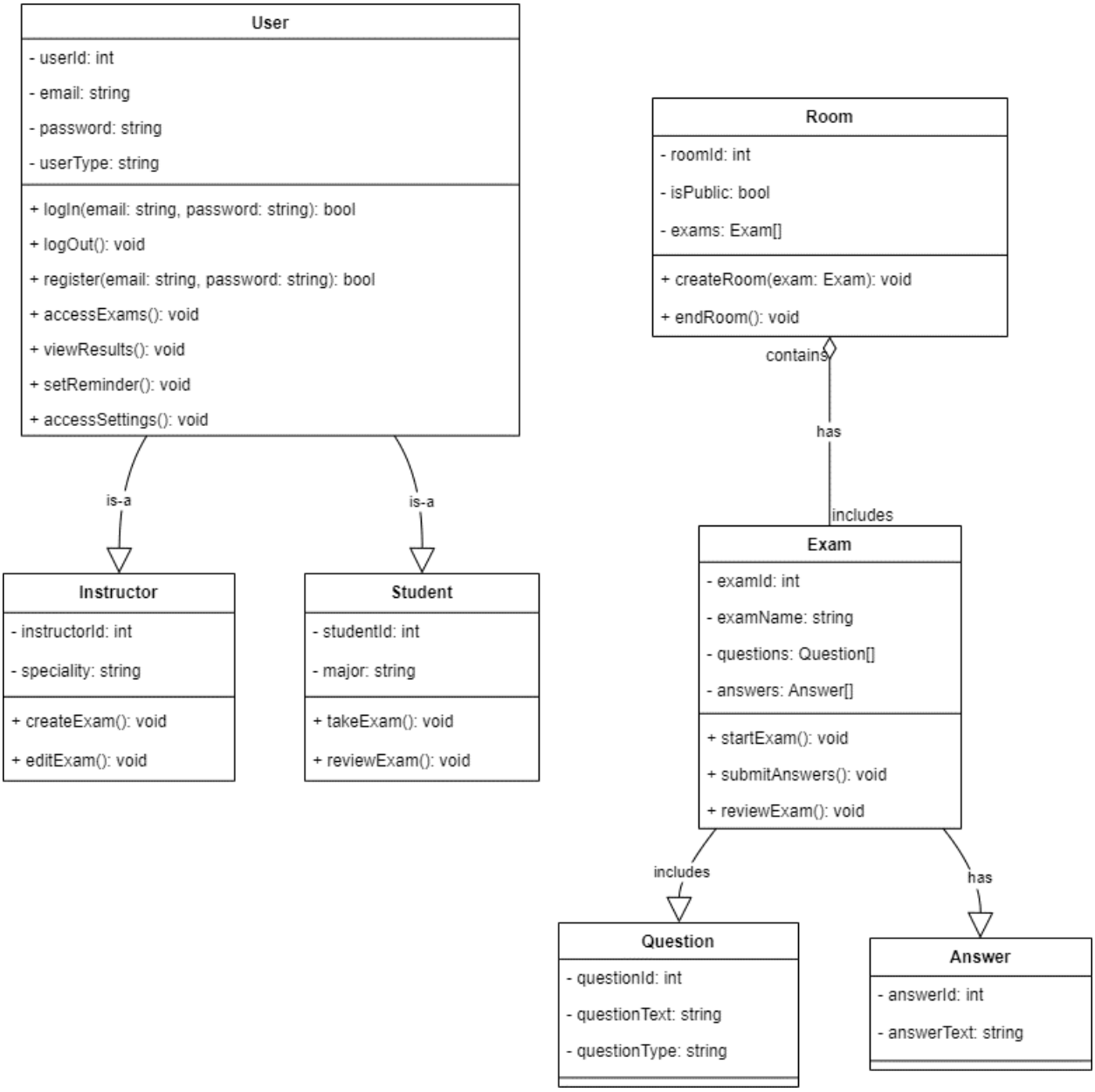


Figure 15 Object Diagram

4.4 Architecture Design

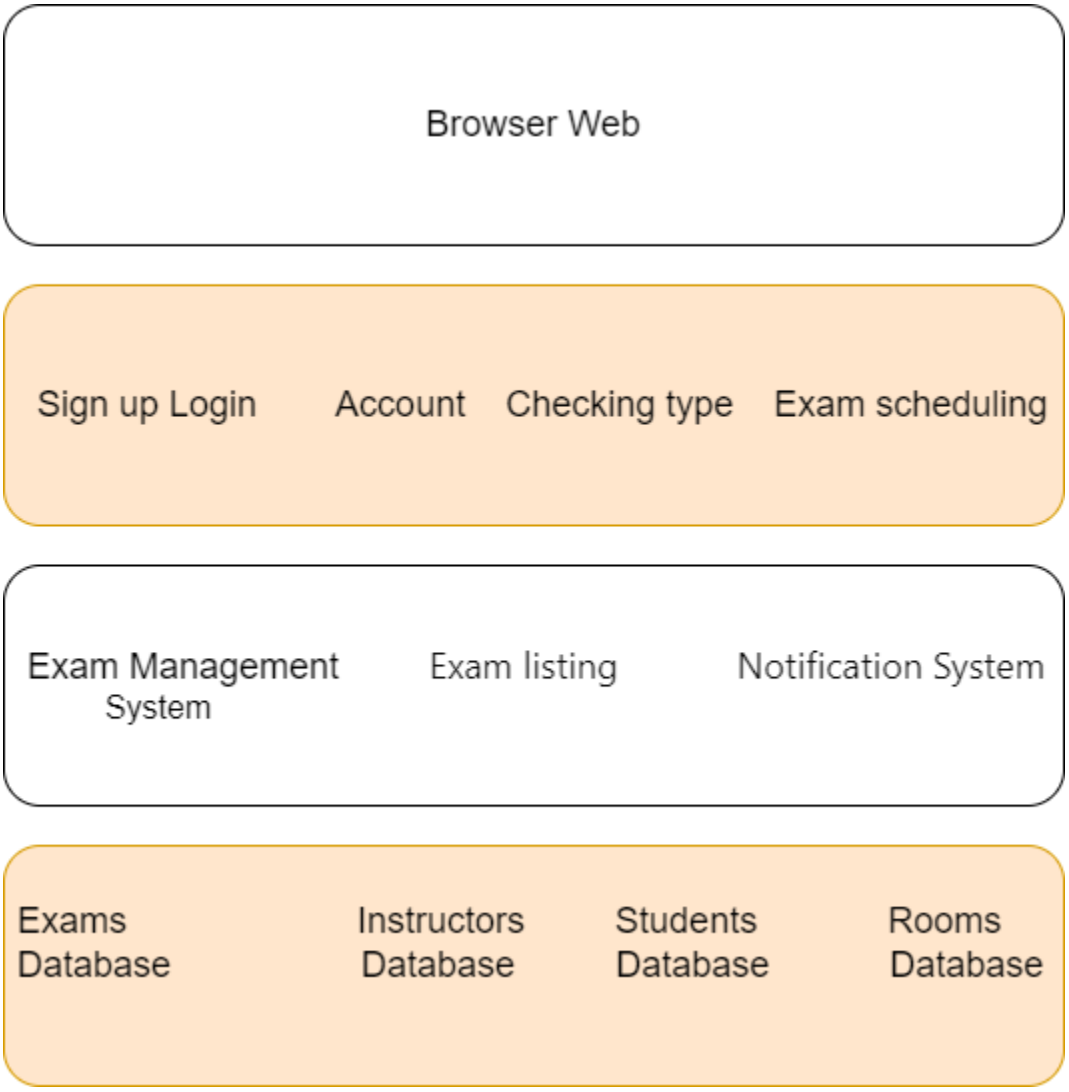


Figure 16 Architecture Design

5.0 Graphical User Interface Design and Implementations and User Manual

Login Page:

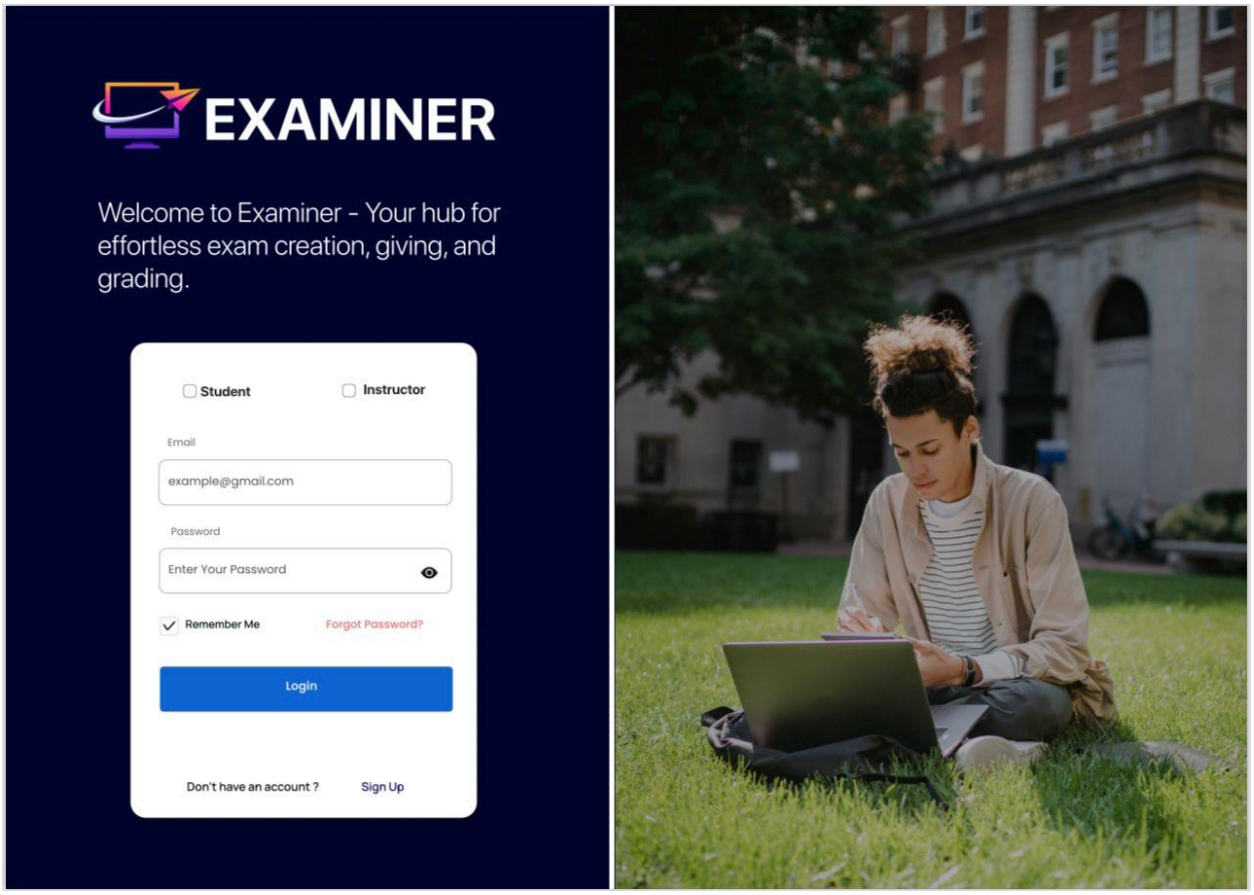


Figure 17 GUI Design

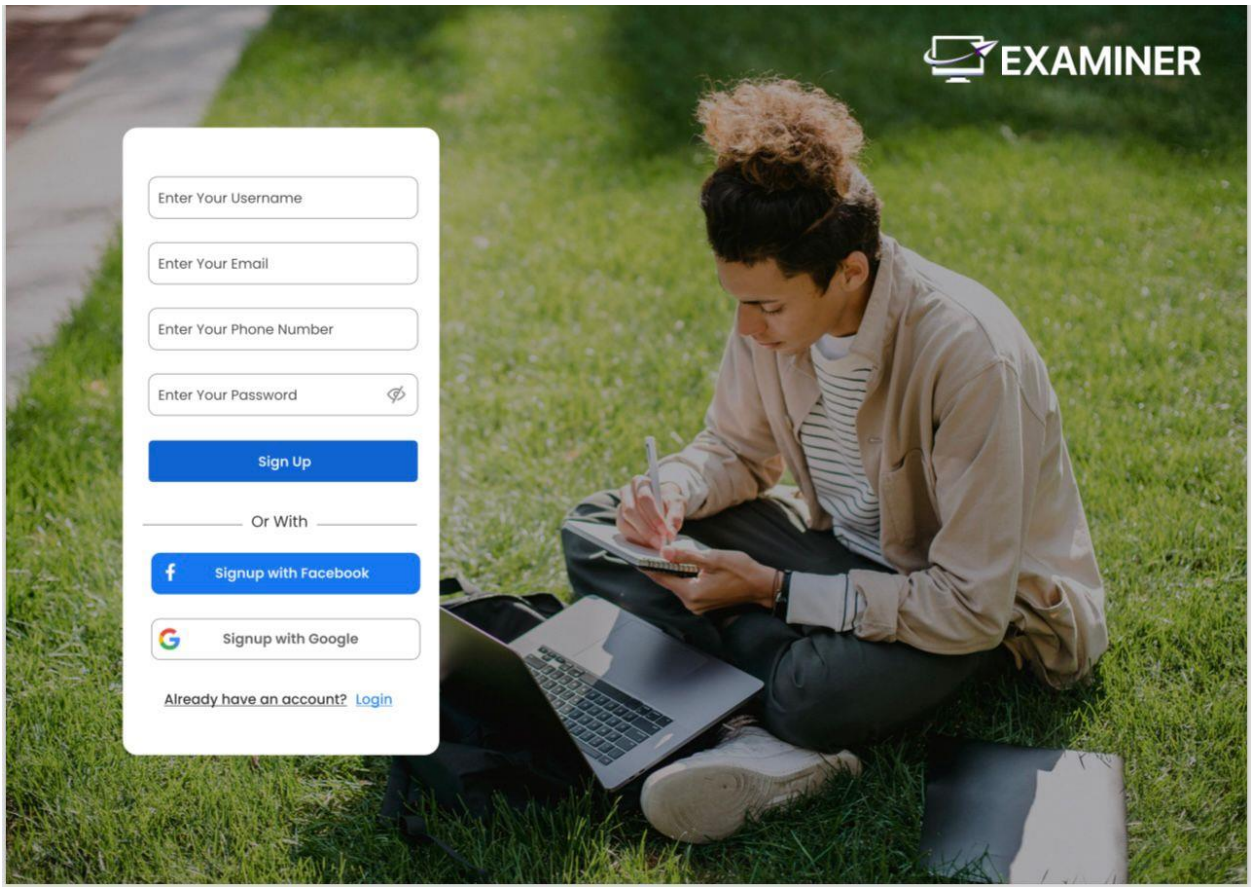
Login page contains:

1- **Login box:** instructors and students can login with the following required data:
   a. Email
   b. Password

2- **Remember Me**: to not insert the data again if the website gets closed.

3- **Sign up button:** takes the user to Examiner register page to create a new account:

Register page:



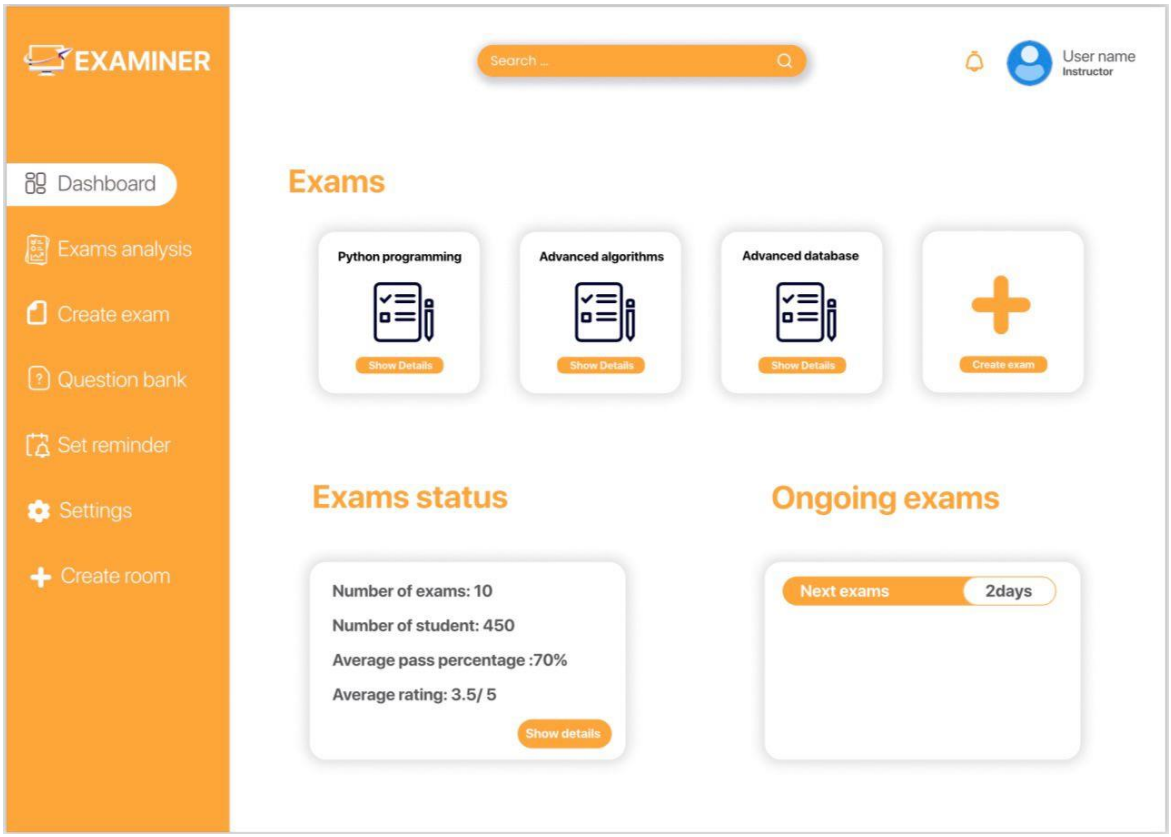
Register page contains:

1- Sign up directly on the website, the following information are required:
   a. Username
   b. Email address
   c. Phone number
   d. Password

2- Sign up button: creates a new account and takes the user to the homepage.

3- Sign up using Facebook or Google.

Instructor's homepage:



Instructor's homepage contains:

1- Slide nav bar:

a- **Dashboard:** the main homepage

b- **Exams analysis:** gives specific analysis and statistics related to a certain exam

c- Create exam: creates a new exam.

d- **Questions bank:** saved questions by the instructor.

e- **Set reminder:** sets an alarm or sends notifications at a specific time or after an event had taken a place.

f- **Settings:** settings page includes personal information and settings related to the layout and the website in general.

g- **Create room:** create a new room for new students whether a public or private.

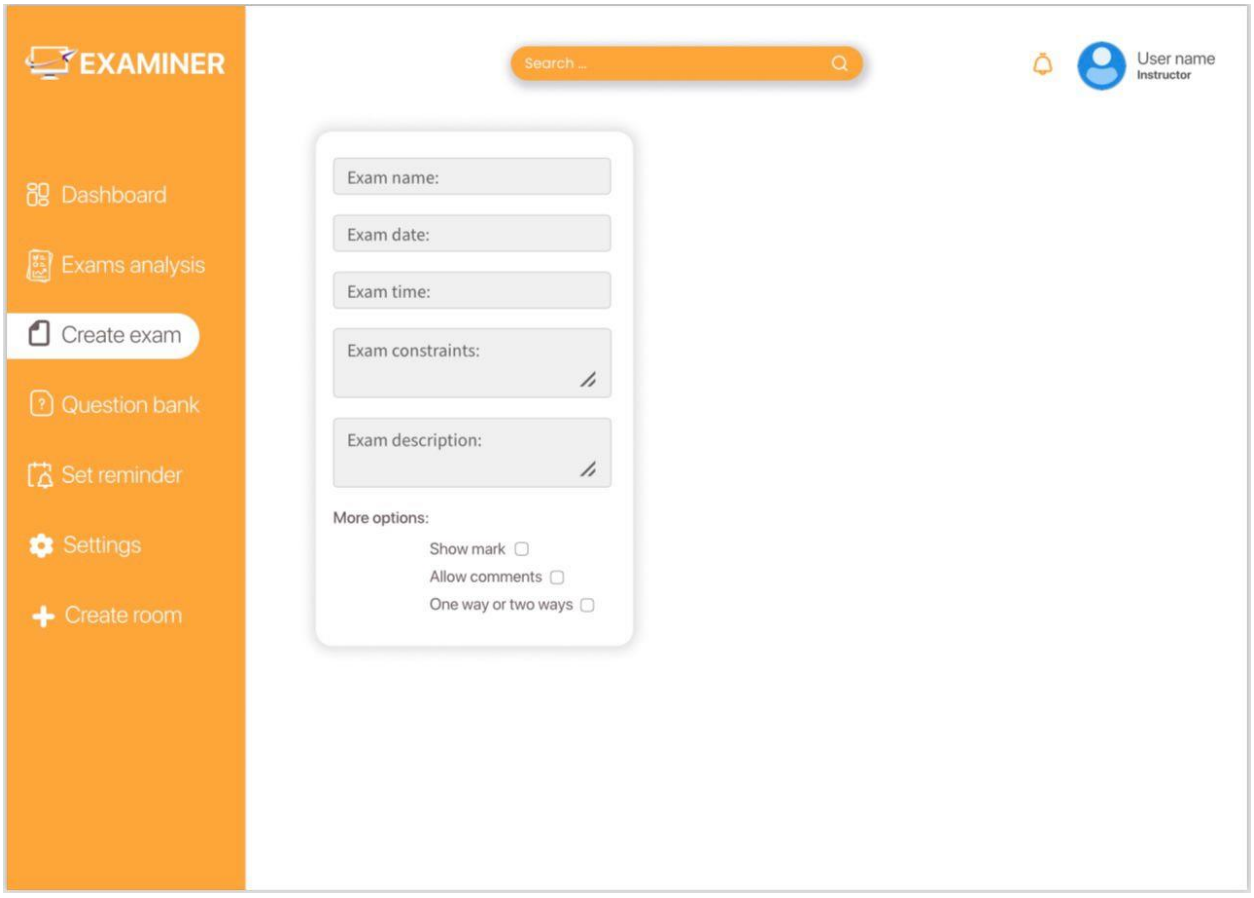
2- The exams which the instructor has created:
    a. **Show details:** shows the exam's details

3- Exams status:
    Shows basic details about the exams such as the number of students that have passed and the number of the exams

4- Ongoing exams: exams that will be launched at a specific time.

5- Search bar: searching for a specific exam.

Create exam:

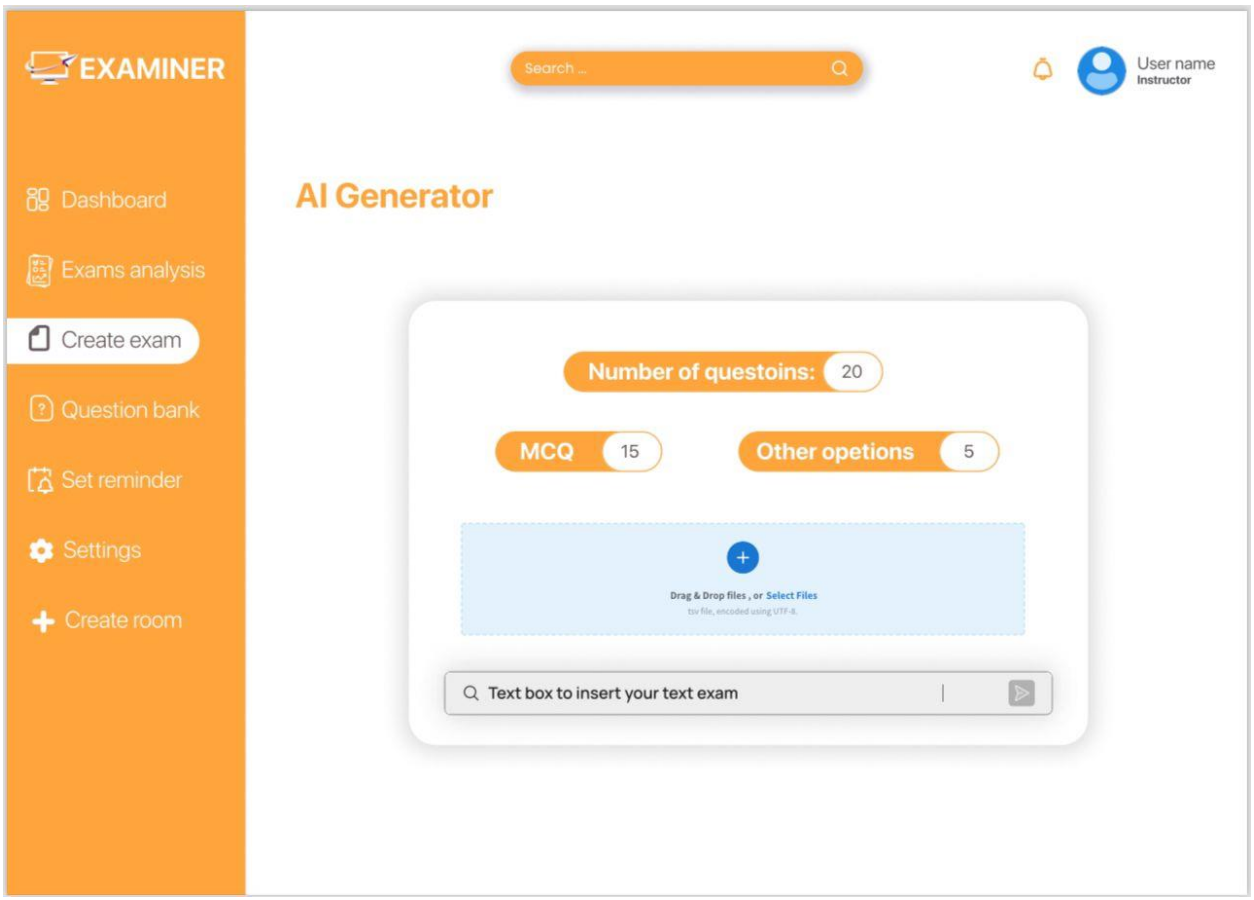


Create exam contains:

1- **Exam name:** inserts the exam's name
2- **Exam date:** inserts the date the exam will start
3- **Exam time:** the time for the exam to end (timer)
4- **Exam constraints:** specific terms and rules related to the exam

5- **Exam description:** basic information about the exam such as the material that is required
6- **More options:**
    a- Show mark
    b- Allow comments
    c- One way or two ways

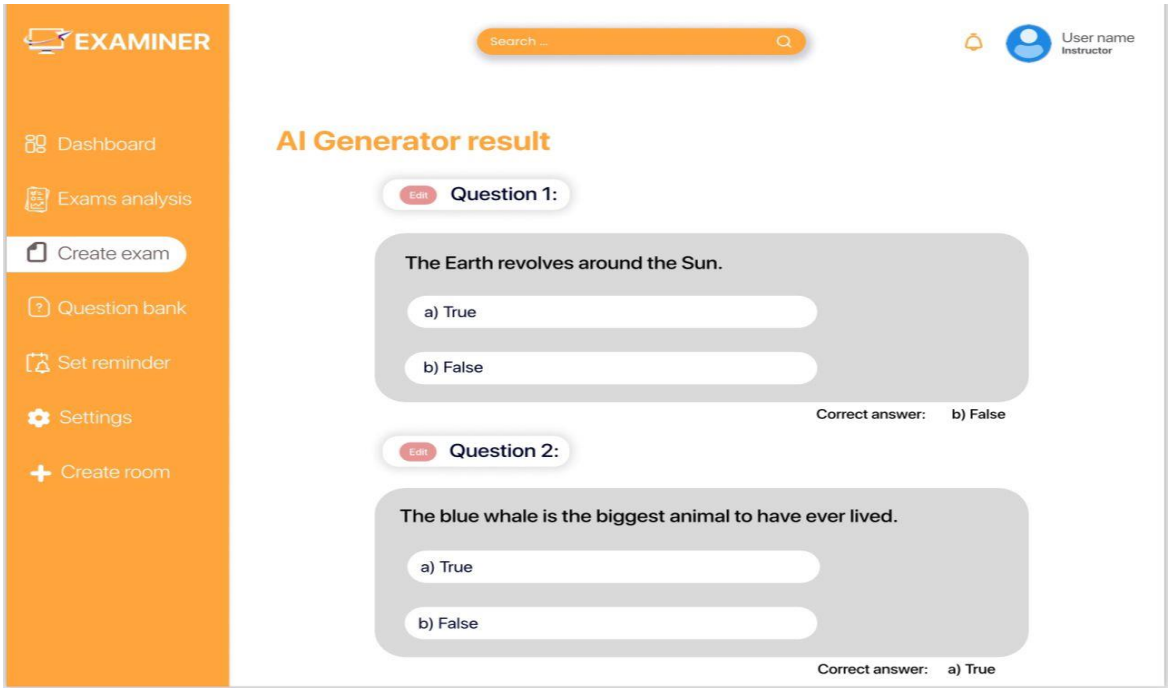
Create exam using Ai:



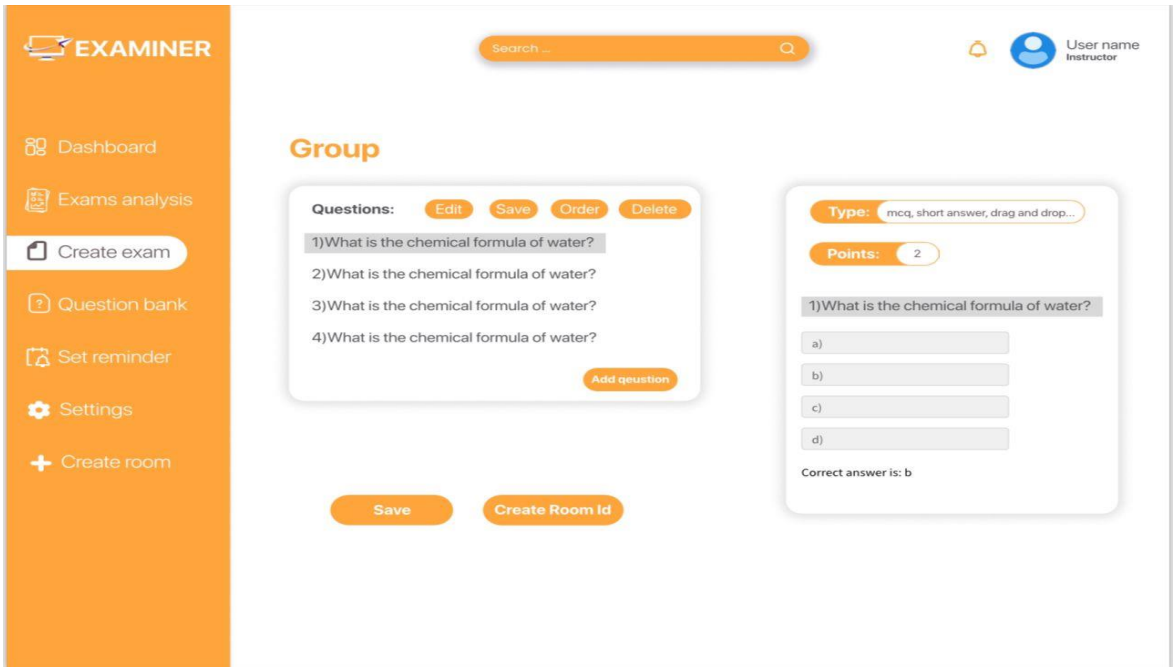
Ai generator page contains:

1- Inserting the material needed to create an exam either as a raw text or as a file.
2- The number of questions the instructor wants to generate.
3- Specify the types of the questions.

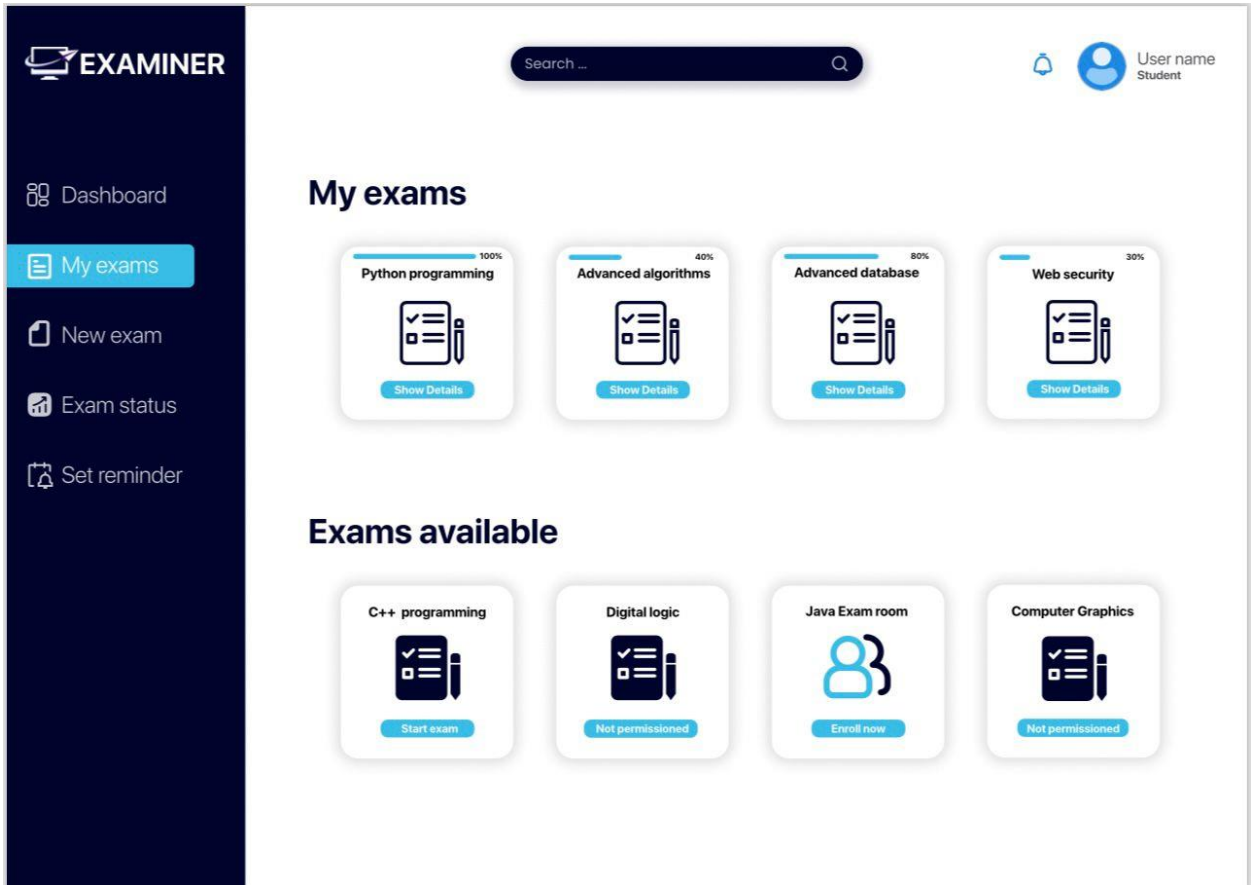
Once the exam is generated using AI, the instructor can review the questions.



The instructor has the ability to edit or remove any questions he dislikes and then save the exam or publish it immediately.



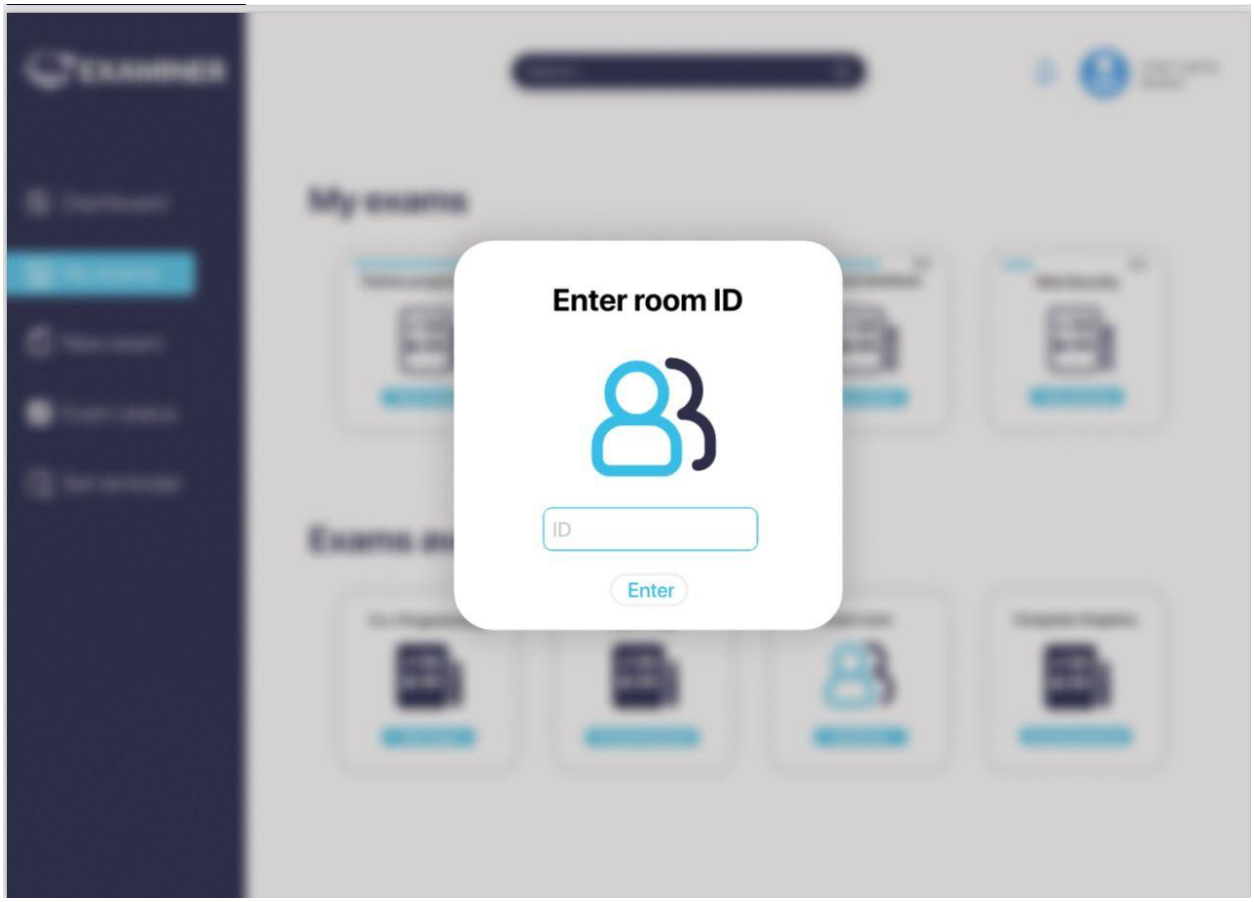
Student's page:



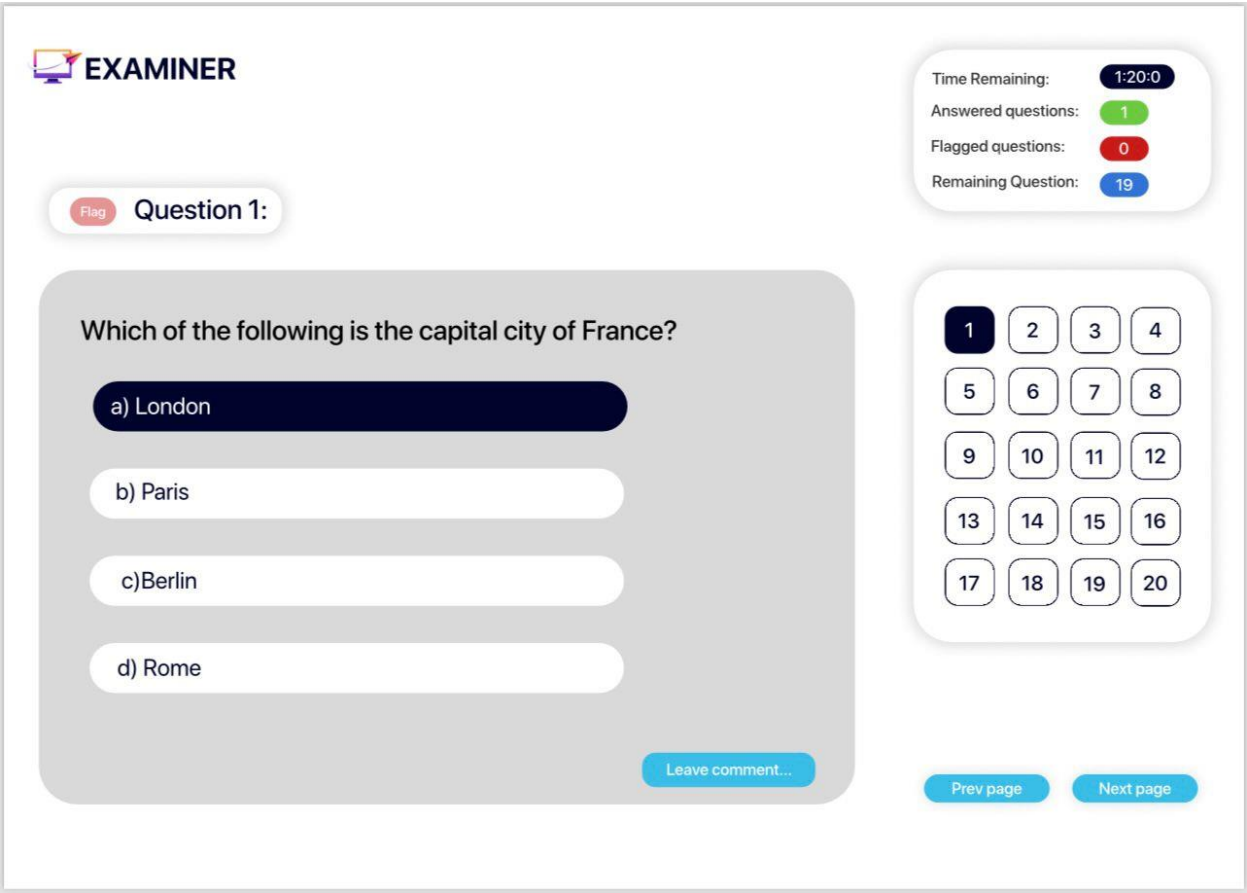
Student's page contains:

1- Slide nav bar:
   a- **Dashboard:** the main homepage
   b- **My exams:** the exams that are related to the students or the exams he had taken.
   c- **New exam:** allows the student to search for new exams and enroll them
   d- **Exam status:** shows basic details about the exams' history the student had taken and the average of his marks with a developmental scale
   e- **Set reminder:** sets an alarm or sends notifications at a specific time or after an event had taken a place
2- My exams and Exams available

Enrolling a public exam requires the room’s ID:



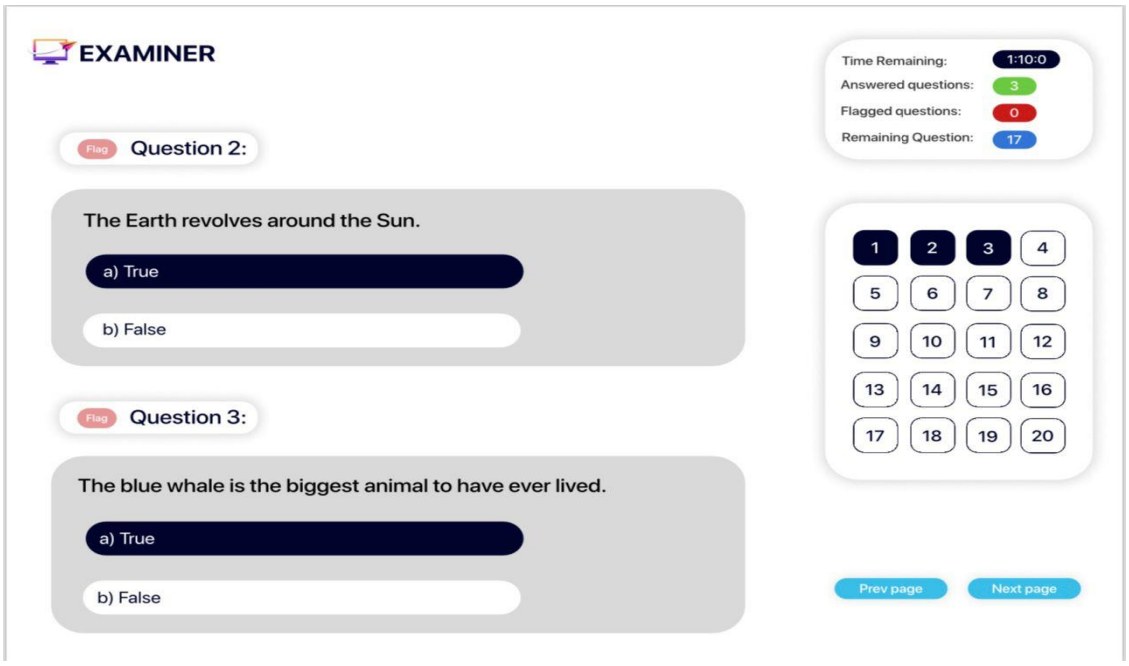
Exam page:



Exam's page contains:

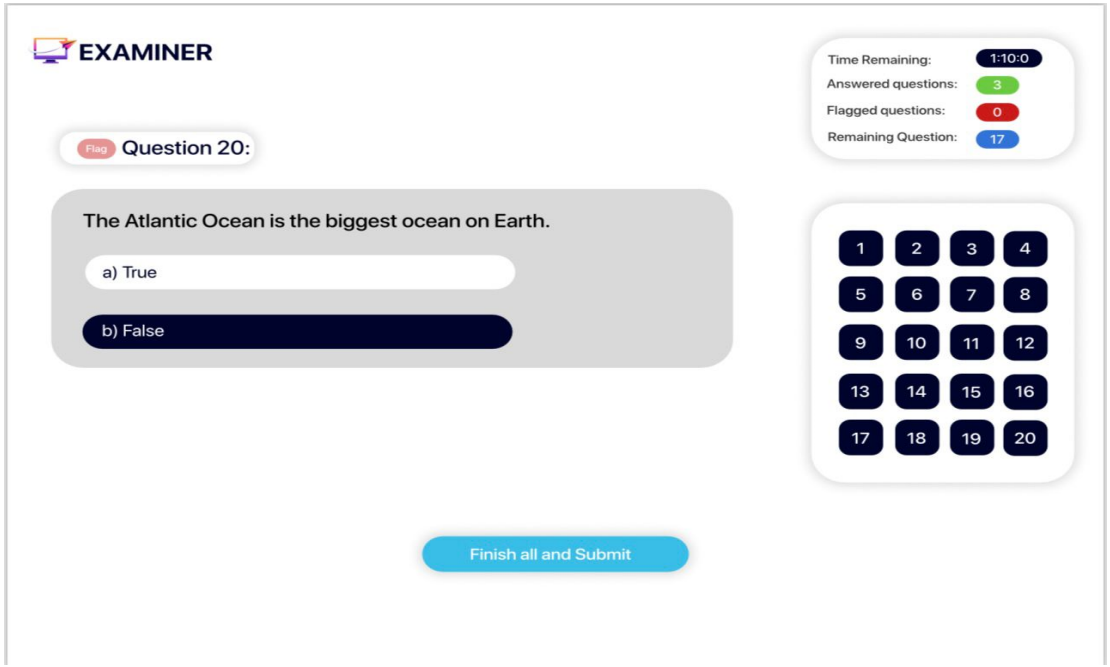
1- The question.
2- Questions box.
3- Timer, answered, remaning and flagged questions .
4- Leave a comment about the question.
5- Prev and next page.

Inserting more than one question in the same page:

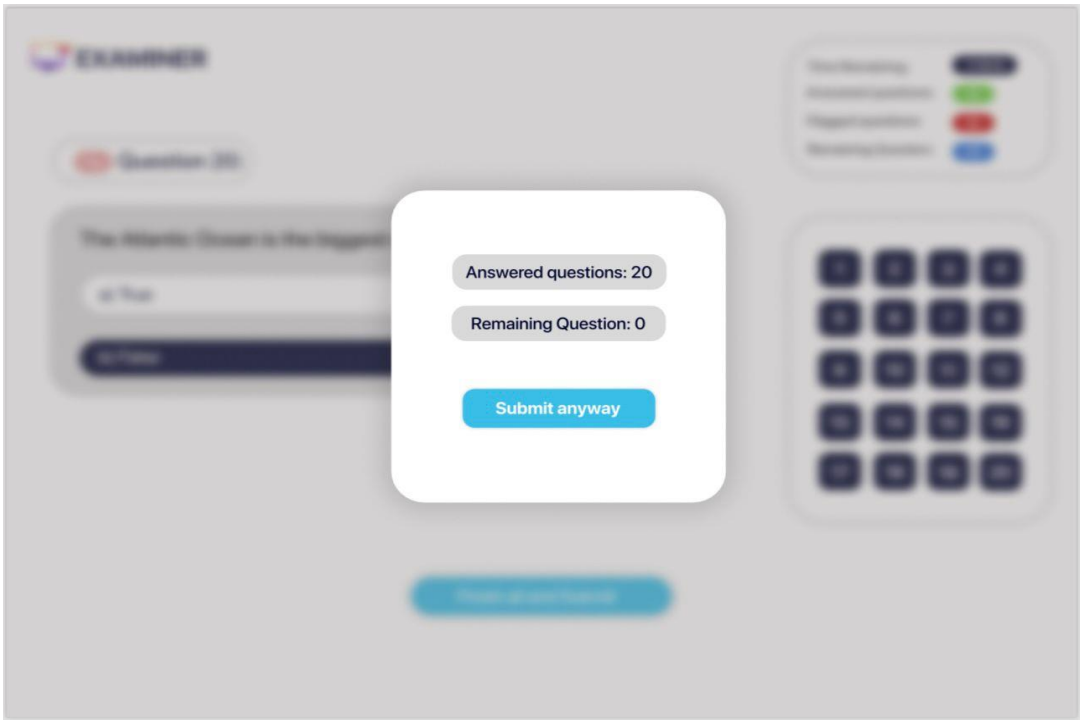


Finish all and submit

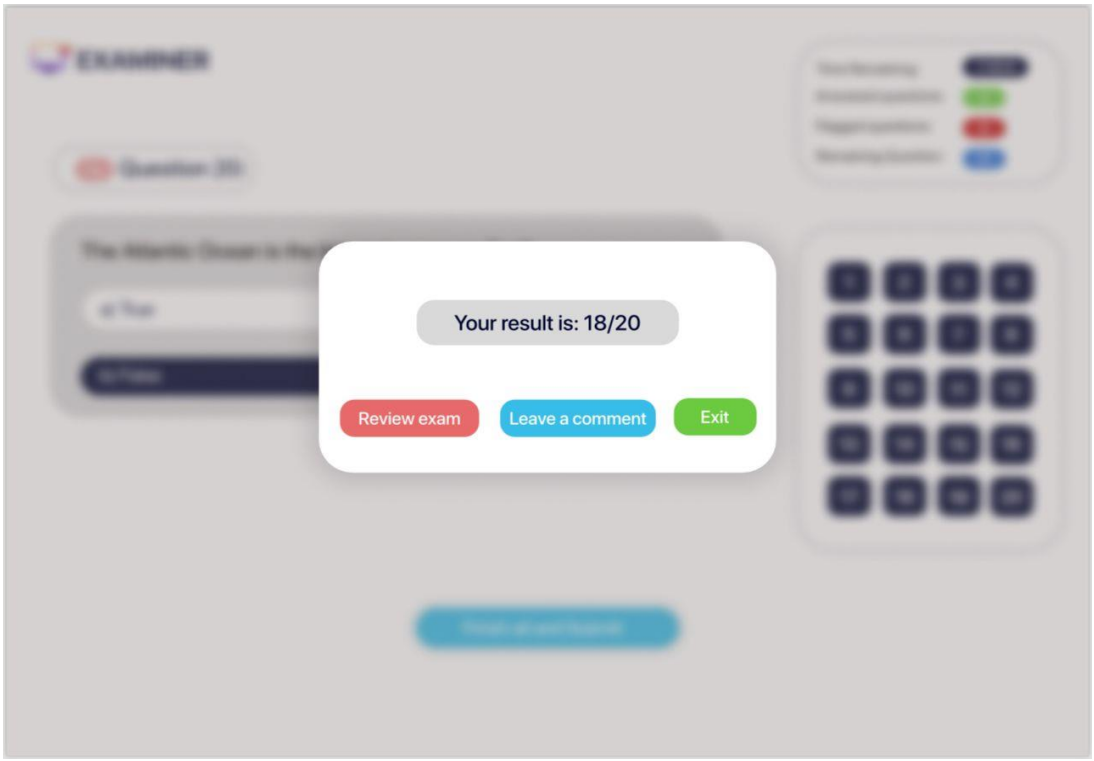
appears only after reaching the last question:



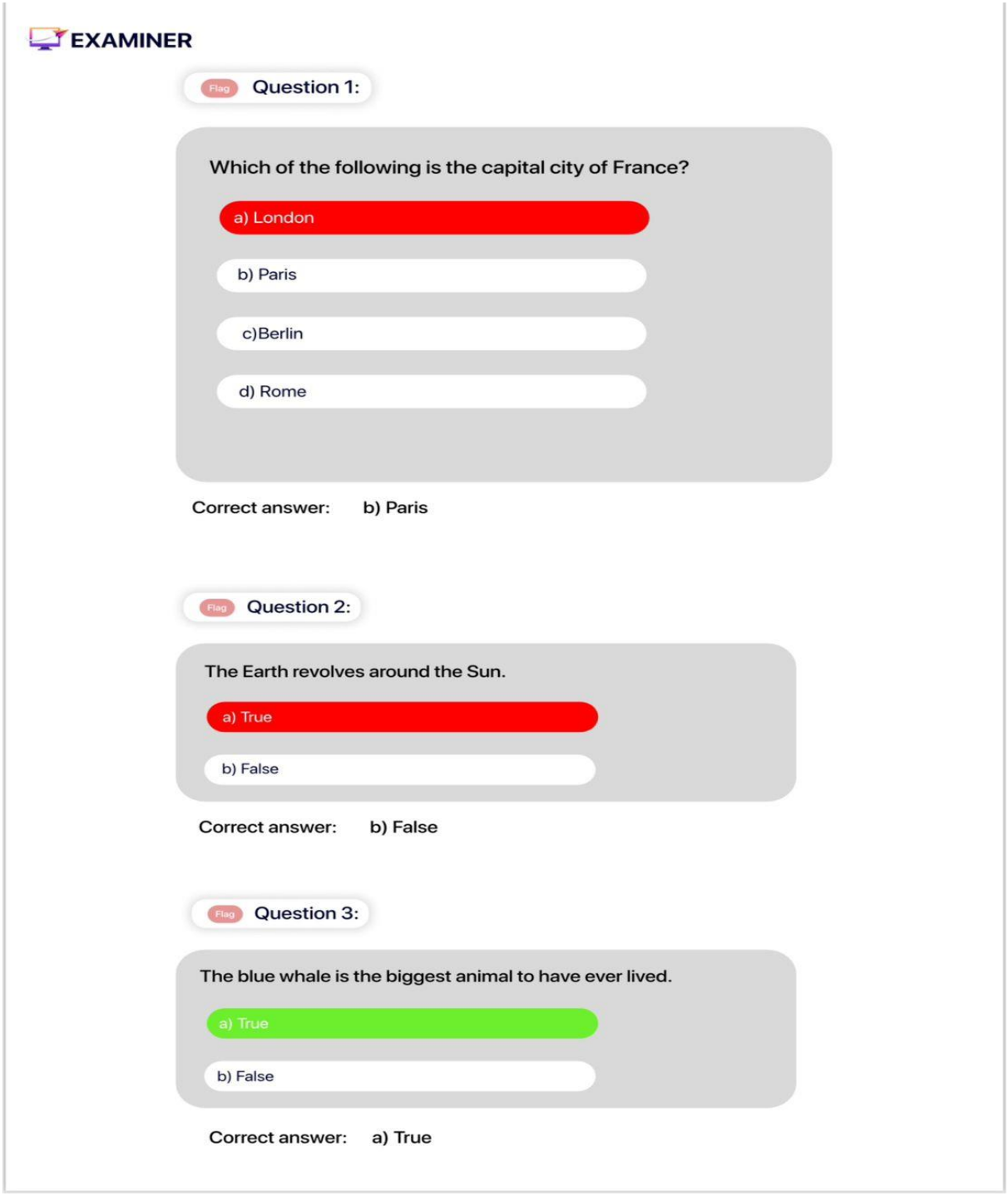
Two steps submiting for more accuracy:



After submitting: the user can leave a feedback or review his answers:



Reviewing the results:



6.0 References and Tools

References:

"Software Engineering” by Ian Sommerville.

Tools:

- GitHub
- Microsoft Project
- StarUML
- Drawio 43
- ERDPlus
- Figma