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QUIZ WEB APPLICATION

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California State University - San Bernardino

QUIZ WEB APPLICATION

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Computer Science

---

by

Dipti Rathod

December 2023

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Approved by:

Dr. Ronald Salloum, Advisor, Computer Science and Engineering

Dr. Jennifer Jin, Committee Member

Dr. Yan Zhang, Committee Member

ABSTRACT

The Quiz web application is designed to facilitate the process of quiz creation and participation. This web application mainly consists of three roles: Admin, Instructor, and Student. Each role has specific features, functionalities, and permissions. With a user-friendly interface, the admin role can handle the departments, courses, and instructors. This web application also ensures smooth quiz management, allowing the instructors to schedule the upcoming quizzes, create the questions, and manage the students with ease. Student roles have features like taking quizzes and seeing their results. Additionally, this web application includes a significant feature to prevent cheating during online tests, ensuring a fair and accurate assessment of student’s knowledge.

ACKNOWLEDGEMENTS

I want to express my gratitude to Dr. Ronald Salloum for helping as my project advisor for the quiz web application. Dr. Ronald Salloum provided continuing support to complete my project successfully. I am also grateful to Dr. Jennifer Jin and Dr. Yan Zhang for assisting as committee members.

I want to express my sincere gratitude for the effort and invaluable support that each of the three committee members contributed to allow me to implement the project successfully.

Thanks to my family and friends for their incredible support during the development of the quiz web application. Without their encouragement, this project would not have been possible.

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CHAPTER ONE:

INTRODUCTION

Background

During the COVID pandemic, educational institutions had to arrange online classes but had limited options to evaluate students' knowledge through online web applications. To address this problem, I developed a quiz web application for educational institutions seeking efficient ways to manage departments, courses, instructors, students, and quizzes.

Significance

The primary significance of the quiz web application is to simplify the process of quiz management for instructors by allowing them to create quizzes and questions according to their courses. The quiz web application provides an automated evaluation functionality, and with this feature, instructors need not worry about evaluating student’s responses for each quiz. The web application automatically assesses the student’s answers and calculates a score based on the quiz’s marking criteria. The user interface of this project is straightforward so that any regular user can use it very efficiently. Moreover, the quiz web application also provides a feature that offers prevention of cheating during the online test, ensuring academic integrity.

CHAPTER TWO:

SYSTEM REQUIREMENTS

Hardware Requirements

Memory (RAM): 4GB

Storage: 64GB

Hard Disk: 160 GB

Processor: Intel i3 Processor

Software Requirements

Operating System: Windows

IDE: Visual Studio Code

Programming Languages: React, Node.js, JavaScript, HTML, SCSS

Database: MySQL

ORM: Sequelize

Tools: XAMPP, phpMyAdmin, npm, npx, GitHub, nodemon

Server: Apache Tomcat

CHAPTER THREE:
TOOLS AND TECHNOLOGIES

React

A JavaScript package called React renders user interfaces (UI). The user interface comprises small components like buttons, text, and graphics [1]. Everything on the website’s screens can be broken into components. I have used the 16.8.4 version of React, initialized the development with npx (Node Package Executes), and installed the required libraries using npm (Node Package Manager). I developed single-page web applications using a component-based structure that provides the virtual DOM (Document Object Model) and implemented user-friendly navigation using the react-router-dom library.

Node.js

The JavaScript runtime environment Node.js is cross-platform and open-source. The V8 JavaScript engine used by Google Chrome is operated outside the browser by Node.js. This makes Node.js extremely robust. A Node.js application does not generate a new thread for each request but operates in a single process. JavaScript code cannot block running servers due to a set of asynchronous I/O primitives included in Node.js's standard library. Node.js performs I/O operations like reading from a network and accessing a database or filesystem without blocking the thread or wasting CPU cycles [2].

I have used Node LTS 18.18.0 version for a quiz web application. Node.js allows the implementation of a robust backend server. I also used the nodemon package for the contiguous development of the server.

Express.js

Express.js is a Node.js online application framework that is simple to use and adaptable and provides powerful functionalities for web applications. I can quickly build a robust API using various HTTP utility methods and middleware. Express.js maintains Node.js characteristics while offering an essential layer of web application functionality [3]. In the quiz web application, I utilized Express.js to implement Restful APIs, routing, and the MVC (Model View Controller) architecture for the backend.

Sequelize

Sequelize is the latest ORM (Object Relational Mapping) for Oracle, Postgres, MySQL, MariaDB, SQLite, and SQL Server, which runs on TypeScript and Node.js. It supports read replication, eager and lazy loading, relations, and transactions. It easily defines the models and makes automatic database synchronization optional. It also establishes associations between models and handles the heavy lifting of data [4]. I used Sequelize with MySQL database for implementing models and their relations to design and implement a scalable database.

MySQL

A robust, multithreaded, multiuser, and fast SQL (Structured Query Language) database server is provided by the MySQL software. MySQL Server is designed to be embedded into widely distributed software and used in essential, high-load production systems [5].

I used MySQL database in the quiz web application because it provides a reliable relational database management system. MySQL follows the ACID (Atomicity, Consistency, Isolation, and Durability) property, which ensures consistent data in the database even during system failures.

PhpMyAdmin

An open-source software tool called phpMyAdmin was created in PHP to manage MySQL remotely. Several types of MySQL operations are supported by phpMyAdmin. Using the user interface, any SQL query can be quickly executed while managing databases, tables, columns, relations, indexes, users, and permissions [6].

I can quickly check the data, tables, and their relations using phpMyAdmin for the quiz web application (Figure 1).

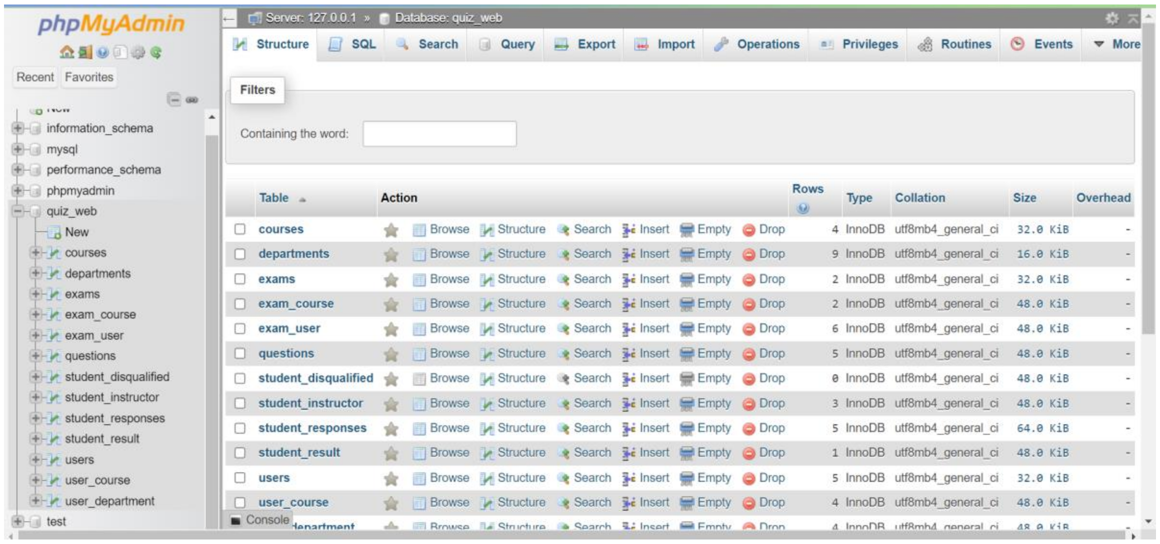
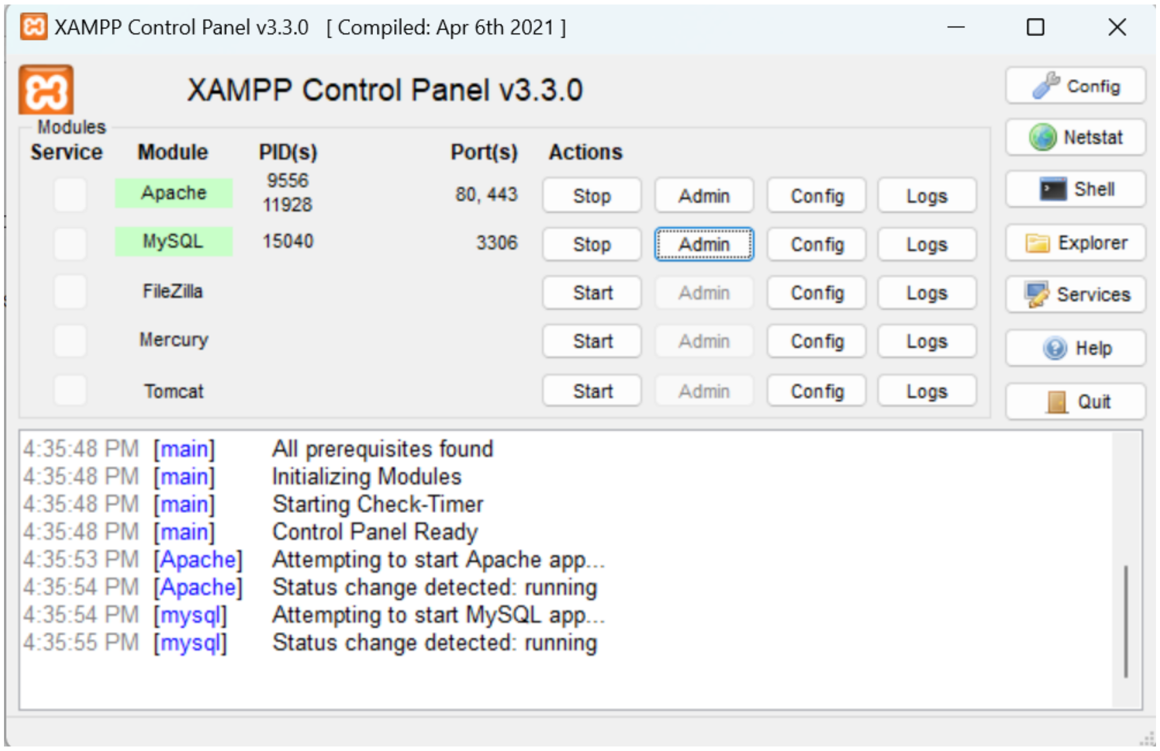


Table	Action							Rows	Type	Collation	Size	Overhead
courses	★	Browse	Structure	Search	Insert	Empty	Drop	4	InnoDB	utf8mb4_general_ci	32.0 KiB	-
departments	★	Browse	Structure	Search	Insert	Empty	Drop	9	InnoDB	utf8mb4_general_ci	16.0 KiB	-
exams	★	Browse	Structure	Search	Insert	Empty	Drop	2	InnoDB	utf8mb4_general_ci	32.0 KiB	-
exam_course	★	Browse	Structure	Search	Insert	Empty	Drop	2	InnoDB	utf8mb4_general_ci	48.0 KiB	-
exam_user	★	Browse	Structure	Search	Insert	Empty	Drop	6	InnoDB	utf8mb4_general_ci	48.0 KiB	-
questions	★	Browse	Structure	Search	Insert	Empty	Drop	5	InnoDB	utf8mb4_general_ci	48.0 KiB	-
student_disqualified	★	Browse	Structure	Search	Insert	Empty	Drop	0	InnoDB	utf8mb4_general_ci	48.0 KiB	-
student_instructor	★	Browse	Structure	Search	Insert	Empty	Drop	3	InnoDB	utf8mb4_general_ci	48.0 KiB	-
student_responses	★	Browse	Structure	Search	Insert	Empty	Drop	5	InnoDB	utf8mb4_general_ci	64.0 KiB	-
student_result	★	Browse	Structure	Search	Insert	Empty	Drop	1	InnoDB	utf8mb4_general_ci	48.0 KiB	-
users	★	Browse	Structure	Search	Insert	Empty	Drop	5	InnoDB	utf8mb4_general_ci	32.0 KiB	-
user_course	★	Browse	Structure	Search	Insert	Empty	Drop	4	InnoDB	utf8mb4_general_ci	48.0 KiB	-
department	★	Browse	Structure	Search	Insert	Empty	Drop	4	InnoDB	utf8mb4_general_ci	48.0 KiB	-

Figure 1. PhpMyAdmin

Xampp

Xampp is a user-friendly Apache distribution that includes MariaDB, PHP, and Perl. The Xampp open-source software is designed to be extremely simple to use and install [7]. In this project, I used MySQL and Apache Moules (shown in Figure 2).



```
4:35:48 PM  [main]     All prerequisites found
4:35:48 PM  [main]     Initializing Modules
4:35:48 PM  [main]     Starting Check-Timer
4:35:48 PM  [main]     Control Panel Ready
4:35:53 PM  [Apache]   Attempting to start Apache app...
4:35:54 PM  [Apache]   Status change detected: running
4:35:54 PM  [mysql]    Attempting to start MySQL app...
4:35:55 PM  [mysql]    Status change detected: running
```

Figure 2. Xampp

CHAPTER FOUR:

SYSTEM DESIGN

UML Representation

UML, or Unified Modeling Language, is standard visualization for software design. The quiz web application's overall architecture is shown in Figure 3 [8].

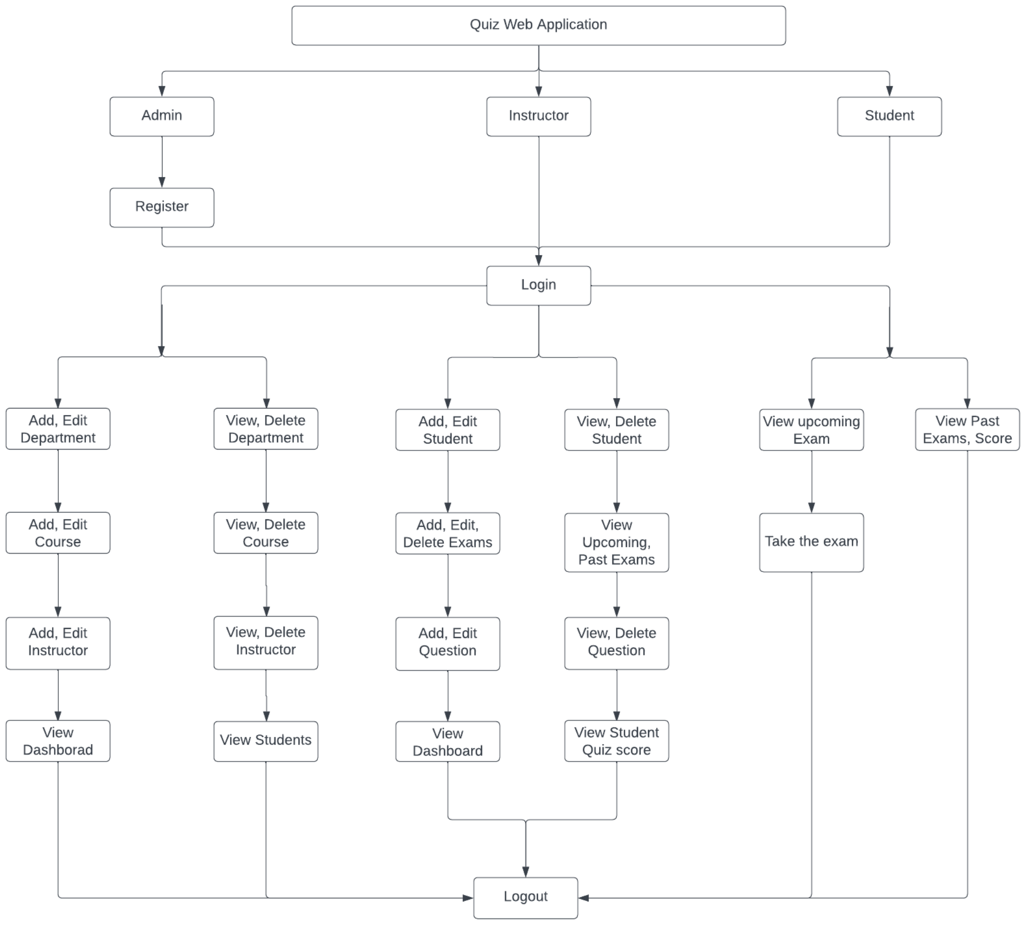


Figure 3. Architecture Diagram

Use Case Representation

The interactions between a user and a system can be represented with the help of a use case diagram. Figure 4 shows the interactions of three leading roles in the quiz web application [8].

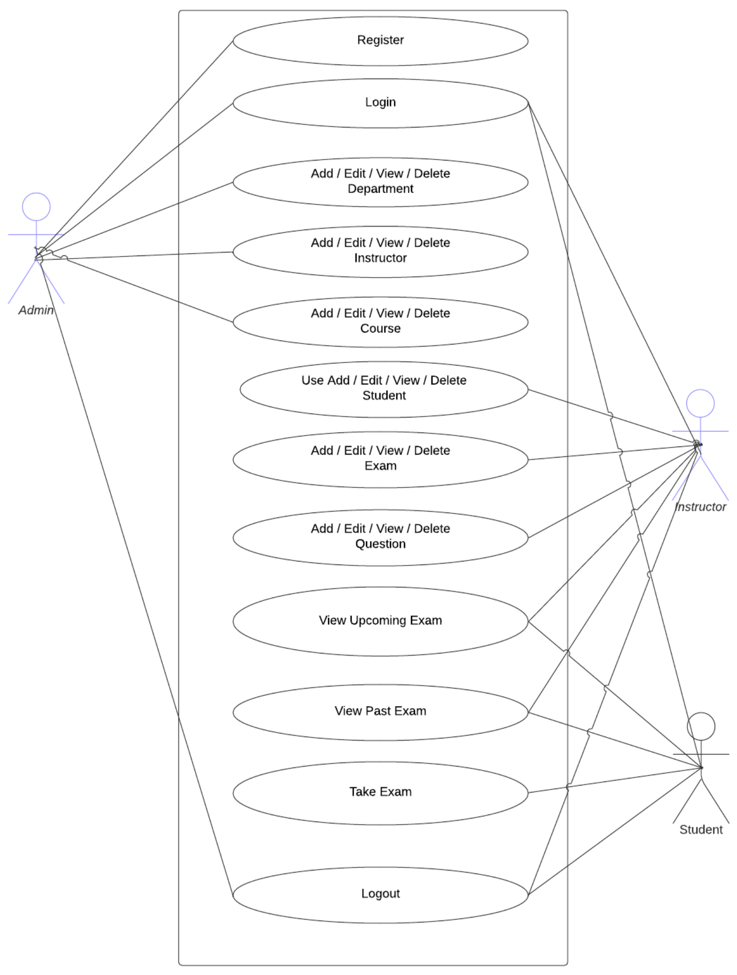

Register
Login
Add / Edit / View / Delete Department
Add / Edit / View / Delete Instructor
Add / Edit / View / Delete Course
Use Add / Edit / View / Delete Student
Add / Edit / View / Delete Exam
Add / Edit / View / Delete Question
View Upcoming Exam
View Past Exam
Take Exam
Logout
Admin
Instructor
Student

Figure 4. Use Case Diagram

Activity Representation

Activity diagrams are graphical presentations of workflows of step-by-step activities and actions. Figure 5 demonstrates all activities and actions in the quiz web application [8].

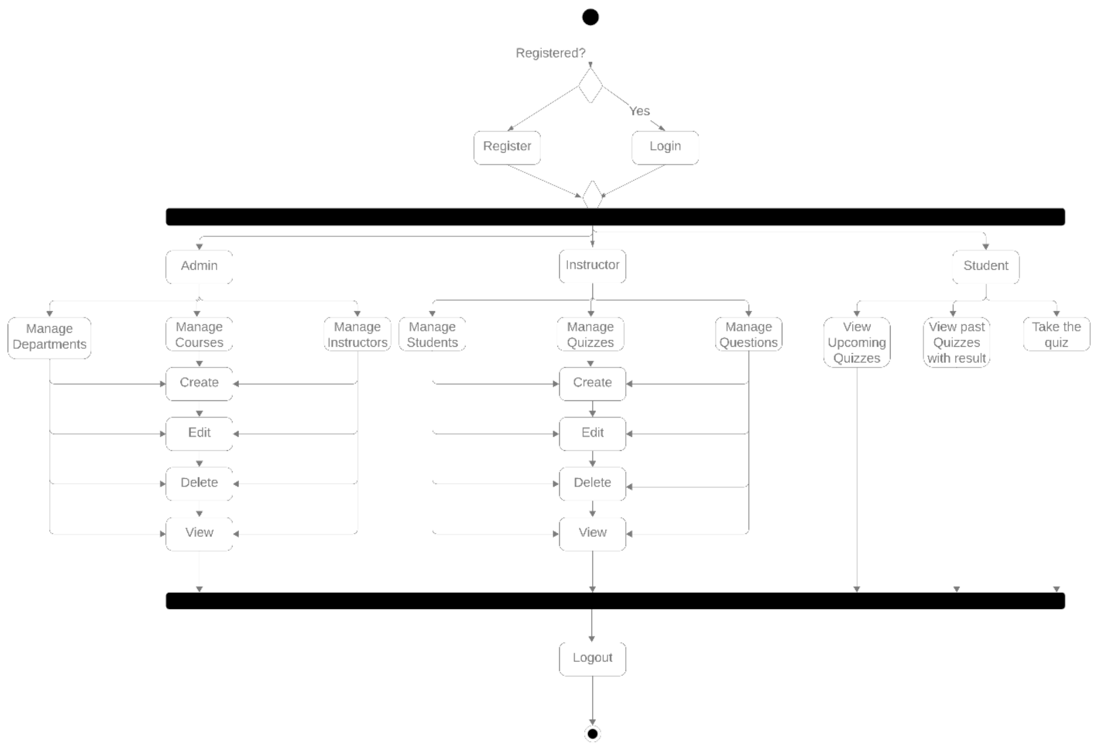
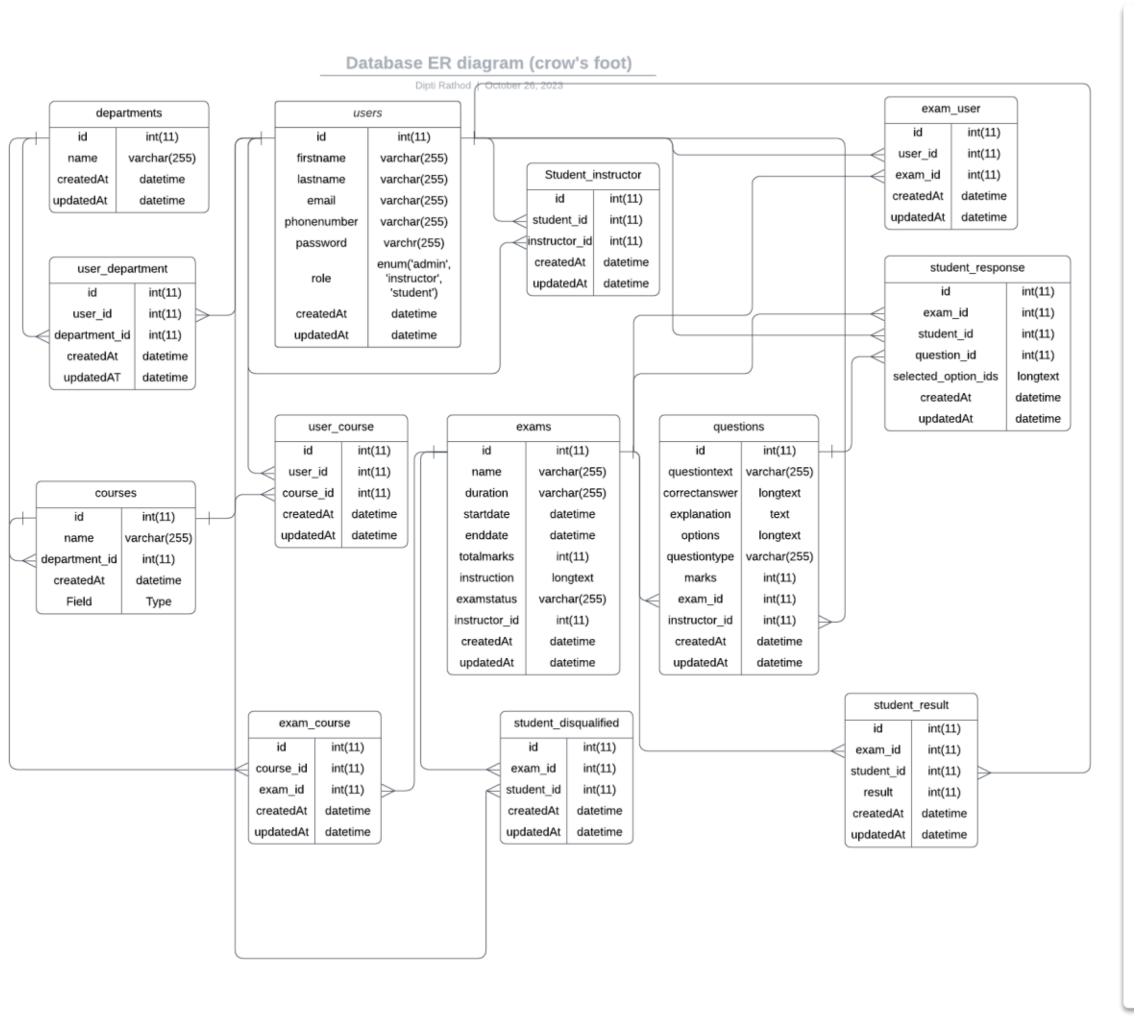


Figure 5. Activity Diagram

ER Diagram

An ER mode is also known as entity–relationship model or ER model, which describes relations between entities. Entities are represented by the tables or models in a database. Figure 6 illustrates the relations of each entity in the quiz web application database [8].


Database ER diagram (crow's foot)
Dipti Rathod / October 26, 2023

departments	
id	int(11)
name	varchar(255)
createdAt	datetime
updatedAt	datetime

users	
id	int(11)
firstname	varchar(255)
lastname	varchar(255)
email	varchar(255)
phonenumber	varchar(255)
password	varchr(255)
role	enum('admin', 'instructor', 'student')
createdAt	datetime
updatedAt	datetime

exam_user	
id	int(11)
user_id	int(11)
exam_id	int(11)
createdAt	datetime
updatedAt	datetime

Student_instructor	
id	int(11)
student_id	int(11)
instructor_id	int(11)
createdAt	datetime
updatedAt	datetime

user_department	
id	int(11)
user_id	int(11)
department_id	int(11)
createdAt	datetime
updatedAT	datetime

student_response	
id	int(11)
exam_id	int(11)
student_id	int(11)
question_id	int(11)
selected_option_ids	longtext
createdAt	datetime
updatedAt	datetime

user_course	
id	int(11)
user_id	int(11)
course_id	int(11)
createdAt	datetime
updatedAt	datetime

exams	
id	int(11)
name	varchar(255)
duration	varchar(255)
startdate	datetime
enddate	datetime
totalmarks	int(11)
instruction	longtext
examstatus	varchar(255)
instructor_id	int(11)
createdAt	datetime
updatedAt	datetime

questions	
id	int(11)
questiontext	varchar(255)
correctanswer	longtext
explanation	text
options	longtext
questiontype	varchar(255)
marks	int(11)
exam_id	int(11)
instructor_id	int(11)
createdAt	datetime
updatedAt	datetime

courses	
id	int(11)
name	varchar(255)
department_id	int(11)
createdAt	datetime
Field	Type

exam_course	
id	int(11)
course_id	int(11)
exam_id	int(11)
createdAt	datetime
updatedAt	datetime

student_disqualified	
id	int(11)
exam_id	int(11)
student_id	int(11)
createdAt	datetime
updatedAt	datetime

student_result	
id	int(11)
exam_id	int(11)
student_id	int(11)
result	int(11)
createdAt	datetime
updatedAt	datetime

Figure 6. ER Diagram

CHAPTER FIVE:

SYSTEM ANALYSIS

Proposed System

The quiz web application has three roles: Admin, Student, and Instructor. Each role has specific permissions to access the platform. The admin role in the quiz web application includes managing various aspects of the educational institution, such as departments, courses, and instructors. The instructor organizes students, quizzes, and questions with their respective courses and departments. The students can see the upcoming quizzes, past quizzes, and scores of the past quizzes and take quizzes.

Web Application

Features for Admin

Since the admin's information already exists in the quiz web application database, I implemented a login component using the JWT authentication package to make sure that the admin can easily log in to the quiz web application. The admin will define Department (create department, edit department, view department, delete department), Course (add course, edit course, view course, delete course), and Instructor (add instructor, edit instructor, view instructor, delete instructor). Additionally, Admin can view the list of students with their respective courses and departments. Having this feature, the admin can easily manage the various modules of the educational institution and ensure smooth functioning.

Features for Instructor

I used a login component for Instructors whose information is already in the quiz web application database. Here, the Instructor will define Student (add student, edit student, view student, delete student), Quiz (add quiz, edit quiz, view quiz, delete quiz), Question (add question, edit question, view question, delete question). Instructors can access the results of each quiz with student details.

Features for Student

I used a login component for Students whose information is already in the quiz web application database. Here, the Student will see the upcoming quizzes, view past quizzes with scores, and give the quiz response within the respective time limits of the quiz. One of the features of the quiz web application is that if a student changes their active tab while taking the quiz, the web application automatically redirects to the login page. It disqualifies the student from the current exam. Another feature of the quiz web application is that if students take a quiz and the time runs out, their responses will be automatically submitted. This eliminates the need for the student to worry about manually submitting their quiz.

CHAPTER SIX:

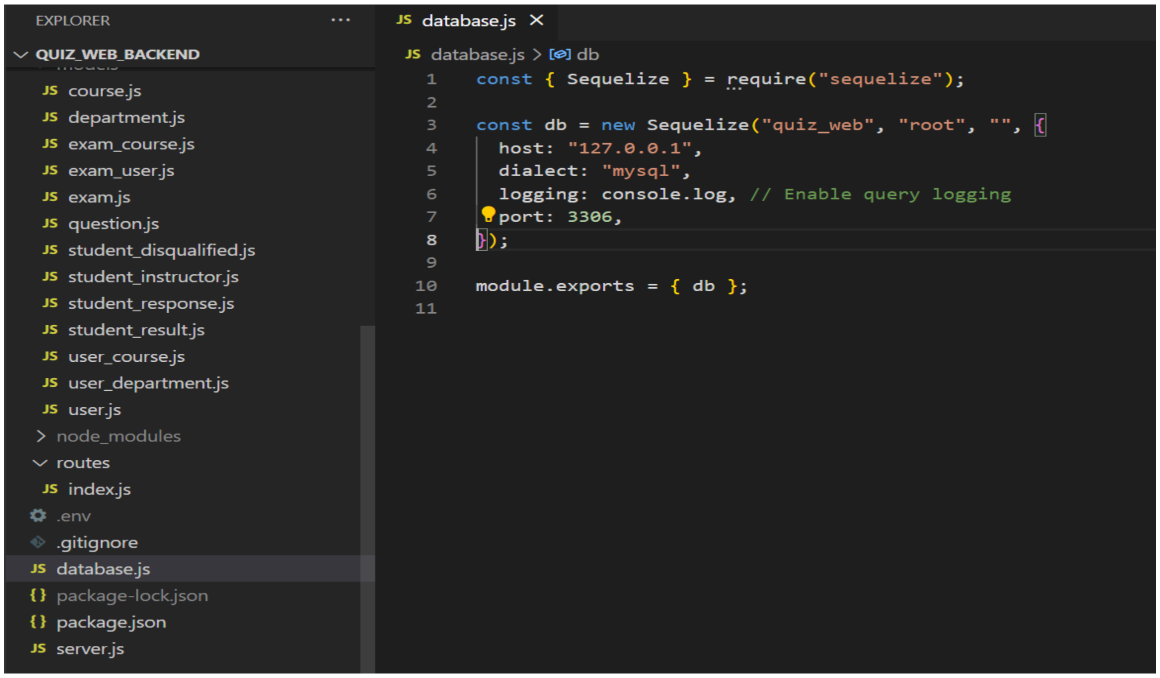
IMPLEMENTATION

Primary Implementation

Initially, I installed Node.js version v18.18.0 from the official website and set up the development environment for the project. Next, launch the command prompt and execute "npx create-react-app quiz_web" to install and set up React. After that, set up Apache, MySQL, and PHP components in Xampp installation.

To design the user interface, I created the components and stylesheets using HTML, SCSS, React Router Dom, Redux, Axios, and React Bootstrap packages to build business logic for the front end with a user-friendly interface.

Using Node.js and Express.js, I developed RESTful APIs for backend setup that could carry out a variety of operations, such as maintaining departments, courses, authentications, and additionally, while also defining their routes in the appropriate file. Additionally, I ensure that backend APIs handle authorization and authentication correctly. I established the connection between the backend server and database to carry out the CRUD (Create, Read, Update, and Delete) operations utilizing the Sequelize drivers in the quiz web application. (shown in Figure 10).



```
const { Sequelize } = require("sequelize");

const db = new Sequelize("quiz_web", "root", "", {
  host: "127.0.0.1",
  dialect: "mysql",
  logging: console.log, // Enable query logging
  port: 3306,
});

module.exports = { db };
```

Figure 7. Database Connection

I utilized the "HTTP" module to send requests from the frontend to the backend APIs in order to establish a connection between the frontend and backend. The AXIOS package, which allows for the execution of asynchronous activities within API calls, is what I used to develop Restful API services.

In addition, to use the database, configure the Apache and MySQL servers in the Xampp program to enable localhost website development and testing.

Database Design

Figure 8 demonstrates the overall database with tables and their respective attributes, constraints, and relations.

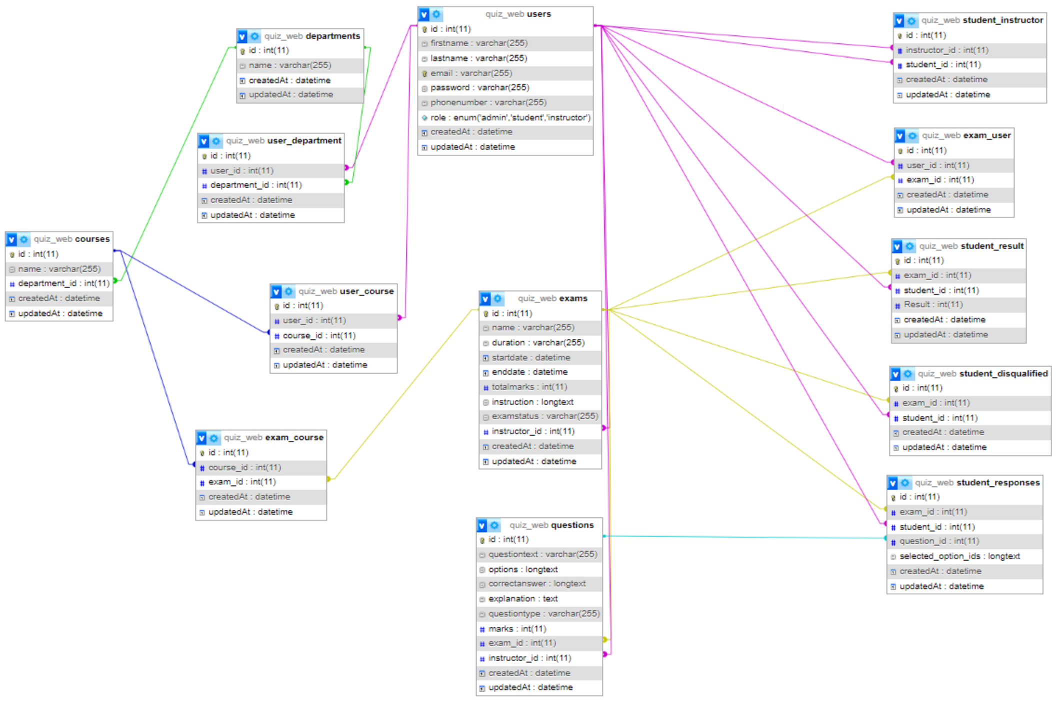


Figure 8. Database

CHAPTER SEVEN:

USER INTERFACE

Login/Register

Open the quiz web portal in the web browser by navigating to “localhost:3000/register”. Figure 9 indicates the register page for the admin. I used the datta [9], a react template, to achieve an effective user interface.

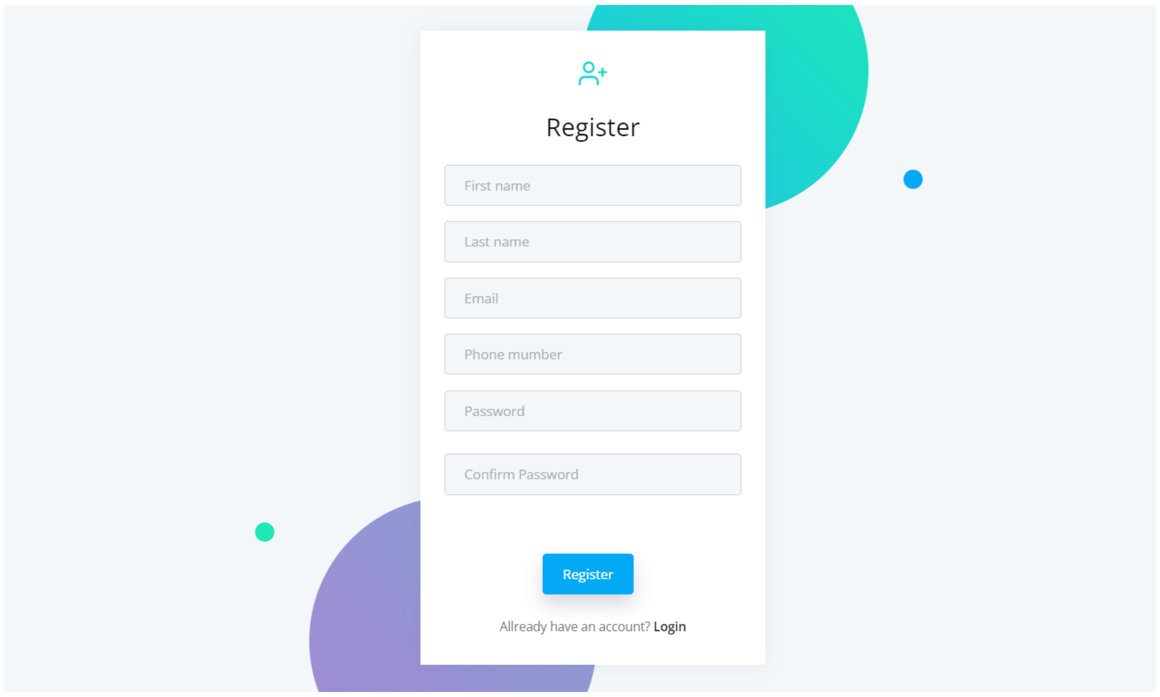


Figure 9. Admin Register Page

Figure 10 indicates the login page for the admin, instructor, and student below, and Figure 11 shows the authentication failed error when a user enters the wrong email or password.

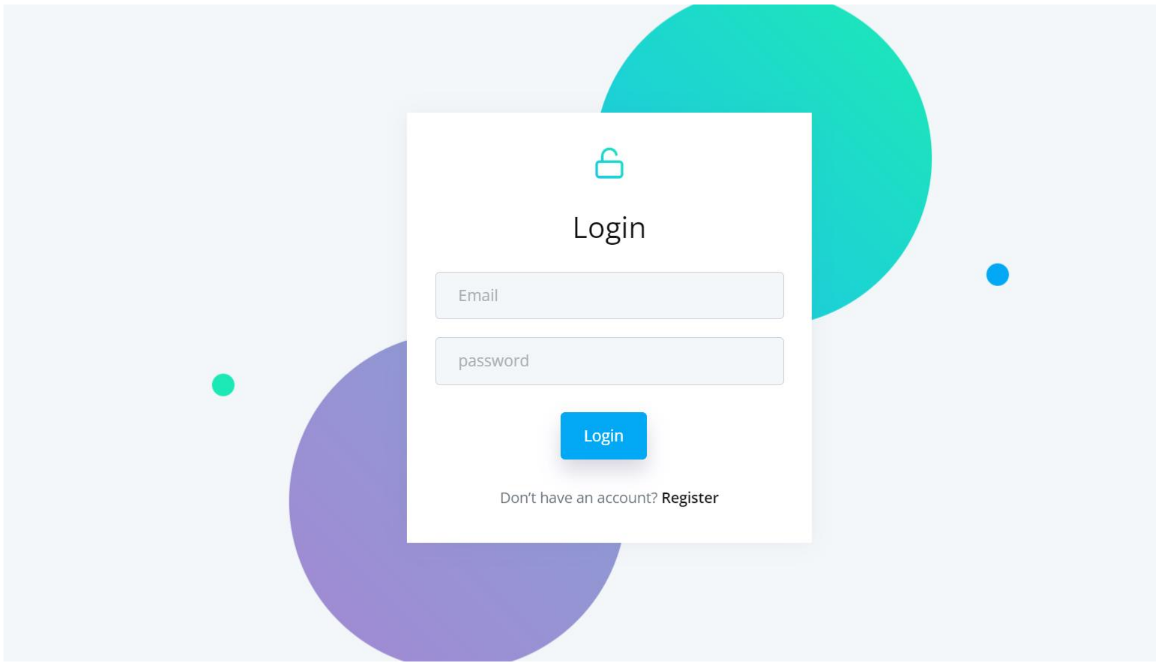


Figure 10. Login Page

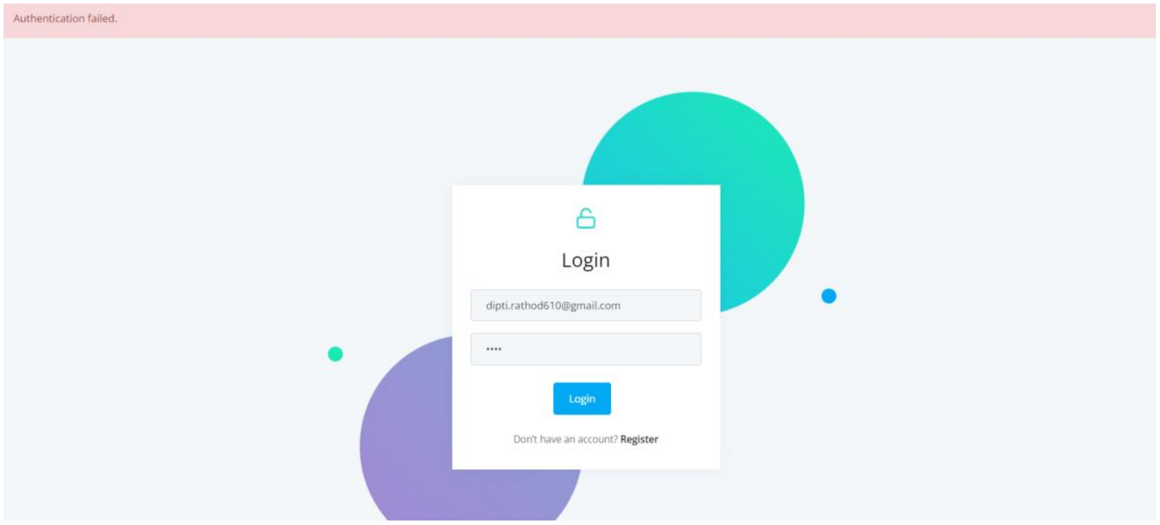

Authentication failed.

Figure 11. Login Page (Authentication Fail)

Admin

Once the admin successfully logs in, they will be automatically directed to the Dashboard screen. The admin can access various options such as courses, departments, instructors, and students on this screen using the dynamic sidebar. For example, the admin can view and delete courses (as shown in Figure 13) or create and edit courses (as shown in Figure 14). Similarly, the admin can manage departments by viewing and deleting departments (as shown in Figure 15) or creating and editing departments (as shown in Figure 16). The admin can also check and delete the information of instructors (as shown in Figure 17) and create and edit instructors (as shown in Figure 18). Additionally, the admin can view all students (as shown in Figure 19) and log out from the quiz web application by clicking the logout button (as shown in Figure 20).

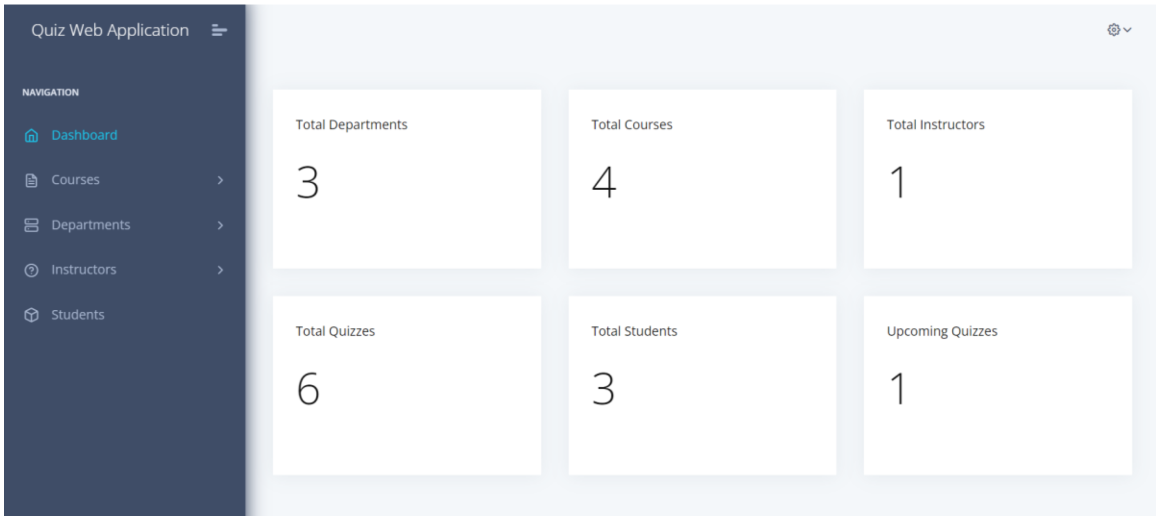
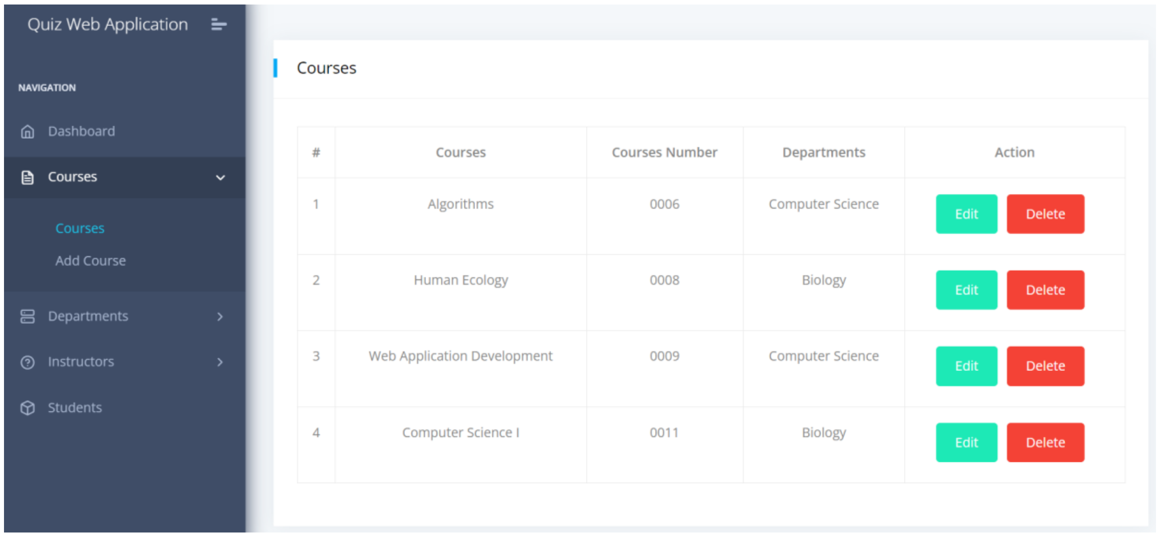
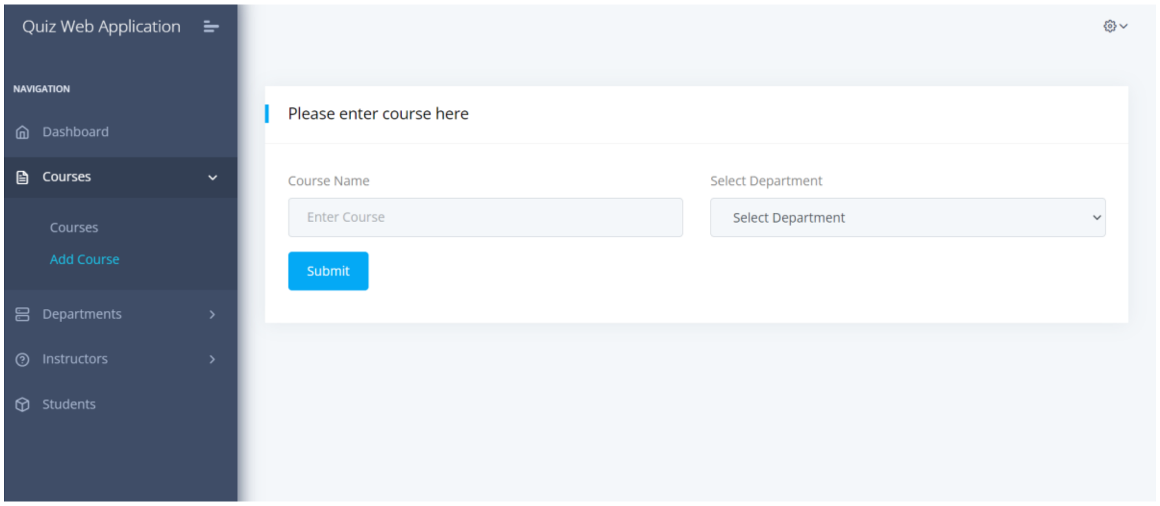


Figure 12. Admin Dashboard



#	Courses	Courses Number	Departments	Action
1	Algorithms	0006	Computer Science	Edit Delete
2	Human Ecology	0008	Biology	Edit Delete
3	Web Application Development	0009	Computer Science	Edit Delete
4	Computer Science I	0011	Biology	Edit Delete

Figure 13. View / Delete Courses



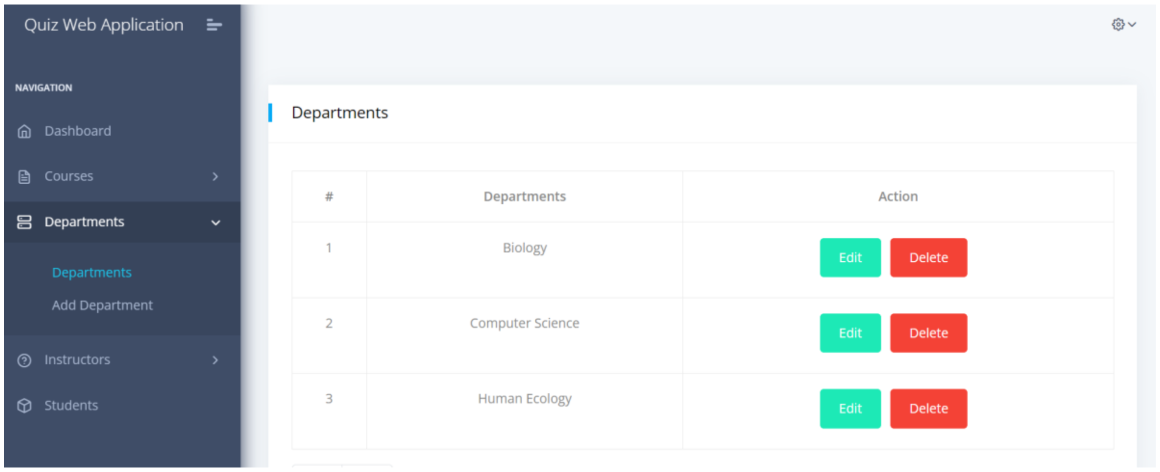
Please enter course here

Course Name: Enter Course

Select Department: Select Department

Submit

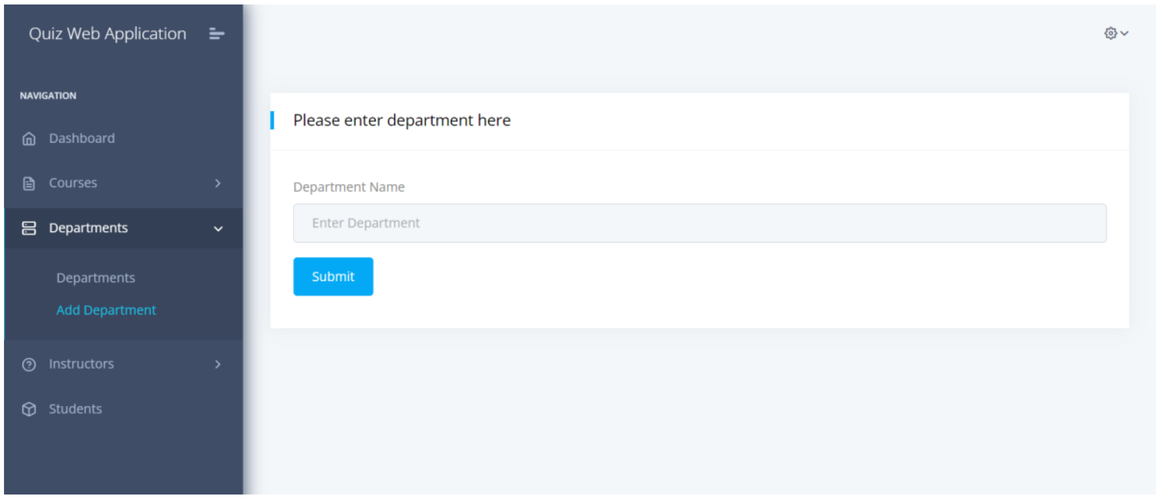
Figure 14. Add / Edit Courses



Departments

#	Departments	Action
1	Biology	Edit Delete
2	Computer Science	Edit Delete
3	Human Ecology	Edit Delete

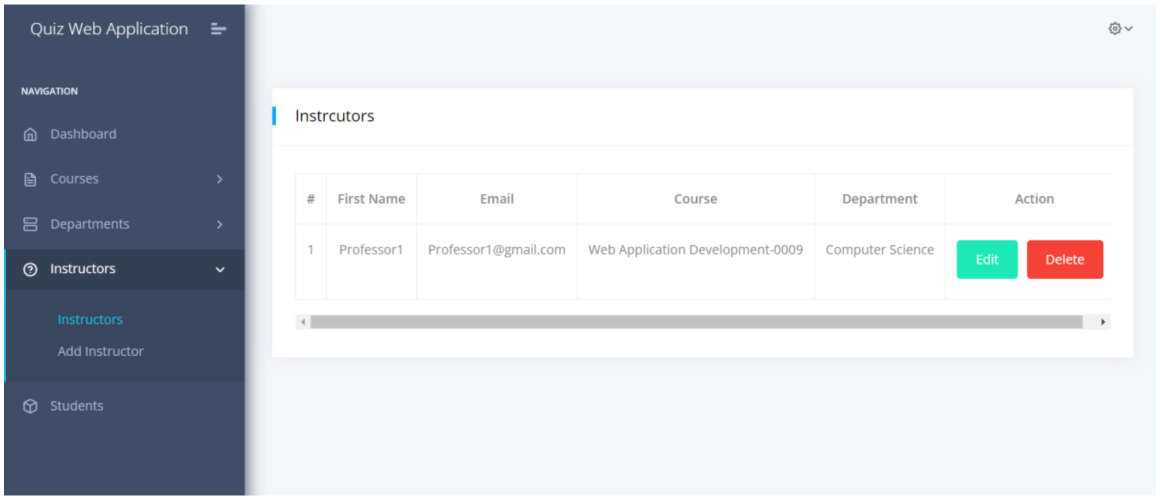
Figure 15. View/ Delete Department



Please enter department here

Department Name: Enter Department

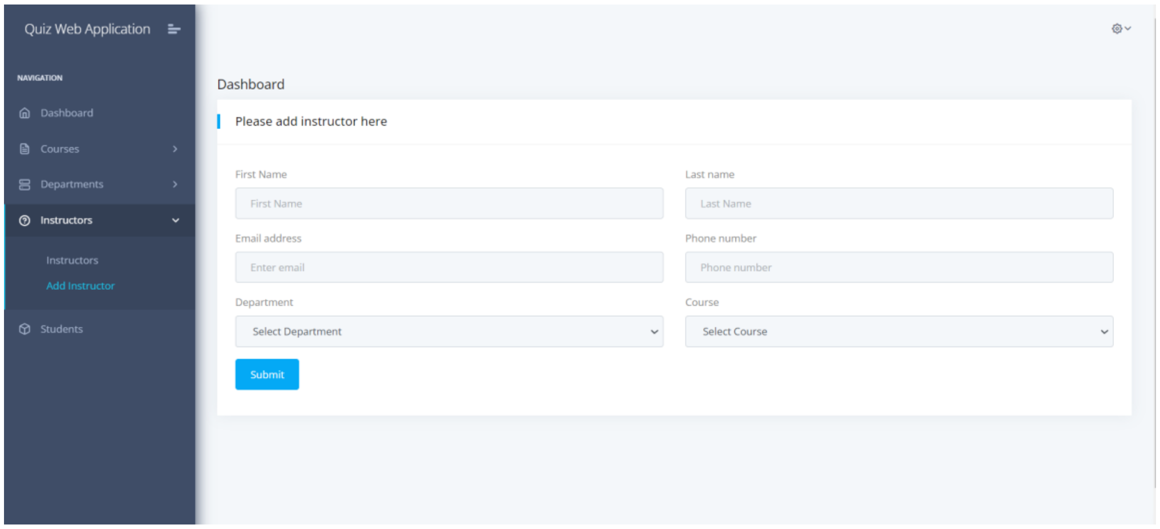
Figure 16. Add/ Edit Department



Instrcutors

#	First Name	Email	Course	Department	Action
1	Professor1	Professor1@gmail.com	Web Application Development-0009	Computer Science	Edit Delete

Figure 17. View / Delete Instructor



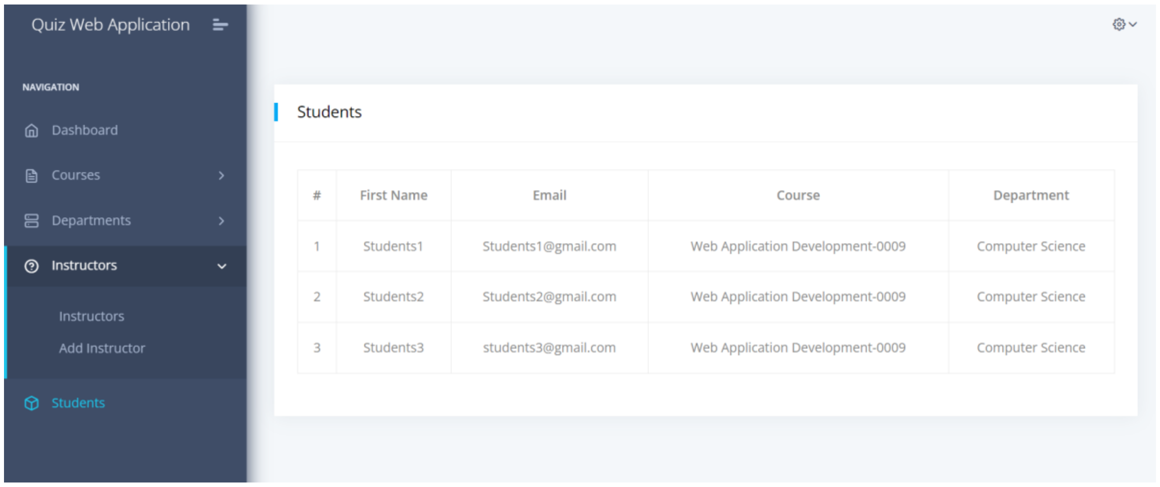
Dashboard

Please add instructor here

First Name: First Name
Last name: Last Name
Email address: Enter email
Phone number: Phone number
Department: Select Department
Course: Select Course

Submit

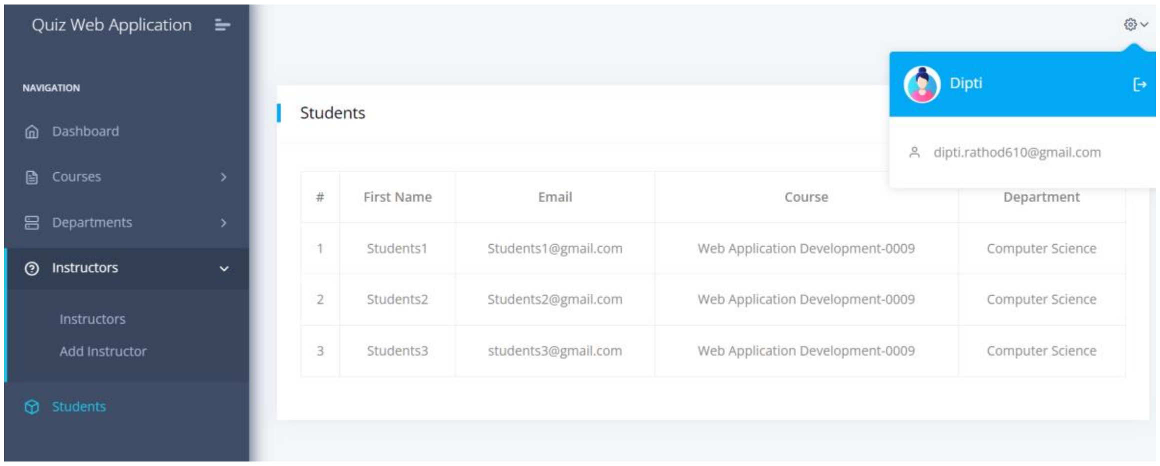
Figure 18. Add/ Edit Instructor



Students

#	First Name	Email	Course	Department
1	Students1	Students1@gmail.com	Web Application Development-0009	Computer Science
2	Students2	Students2@gmail.com	Web Application Development-0009	Computer Science
3	Students3	students3@gmail.com	Web Application Development-0009	Computer Science

Figure 19. View Students



Students

#	First Name	Email	Course	Department
1	Students1	Students1@gmail.com	Web Application Development-0009	Computer Science
2	Students2	Students2@gmail.com	Web Application Development-0009	Computer Science
3	Students3	students3@gmail.com	Web Application Development-0009	Computer Science

Figure 20. Logout Component

Instructor

Once the instructor successfully logs in, they will be automatically directed to the Dashboard screen (as shown in Figure 21). The instructor can access various screens, such as students, quizzes, and questions, using the dynamic sidebar on this screen. The instructor can create and edit students (as shown in Figure 22) or view and delete students (as shown in Figure 23). Similarly, the instructor can manage quizzes by creating and editing quizzes (as shown in Figure 24), viewing past quizzes (as shown in Figure 25), seeing the student's results of each quiz (as shown in Figure 26), or checking the upcoming quizzes and delete quizzes (as shown in Figure 27). The instructor can also create and edit the information of each question (as shown in Figure 28), see the questions, or delete questions (as shown in Figure 29).

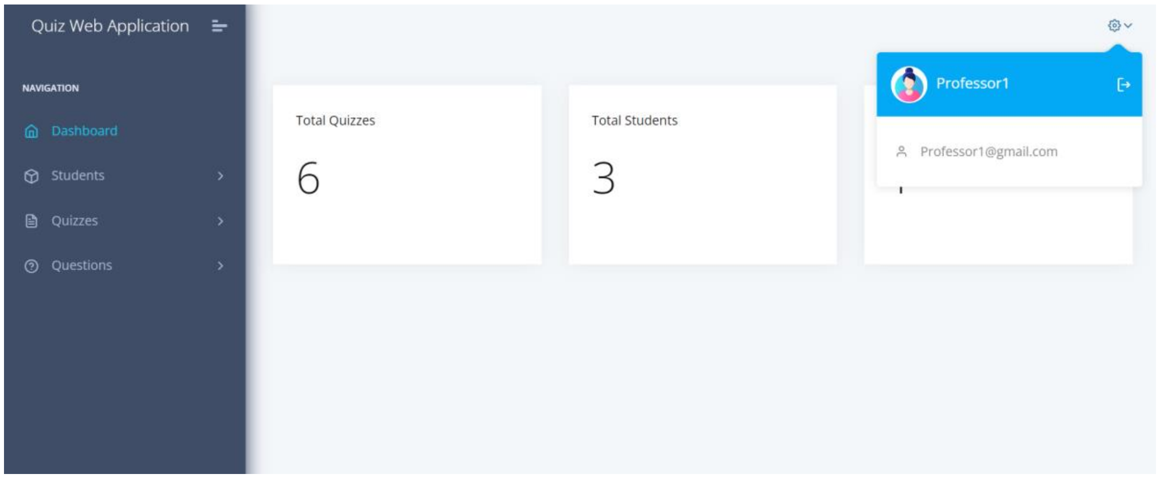
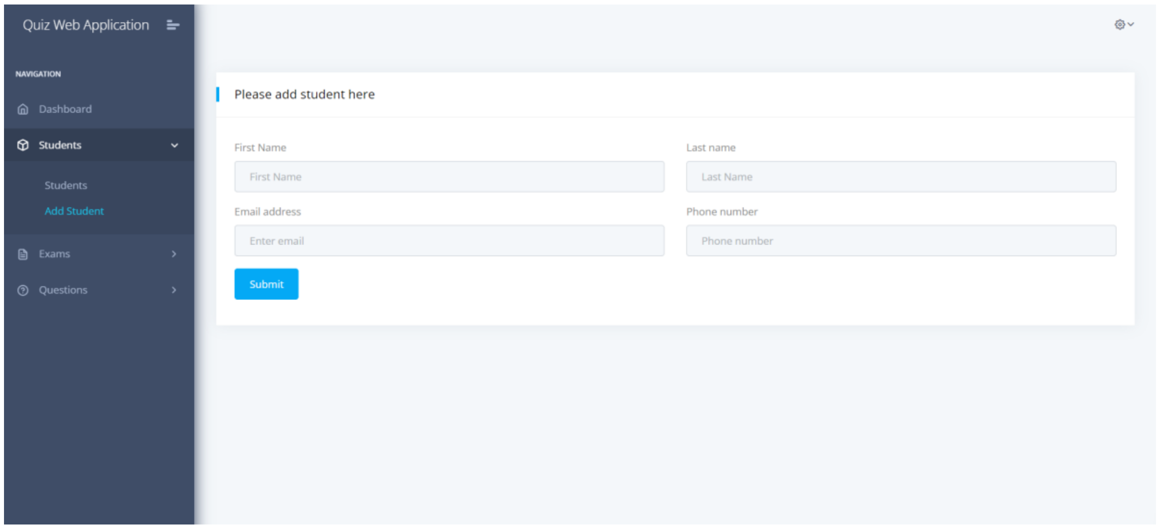


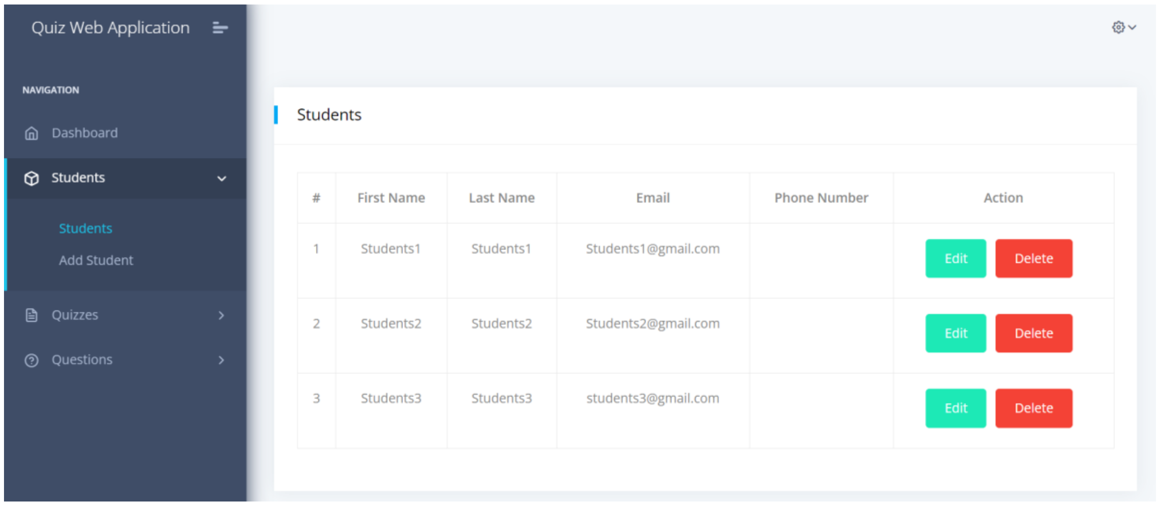
Figure 21. Instructor Dashboard



Please add student here

First Name	Last name
First Name	Last Name
Email address	Phone number
Enter email	Phone number

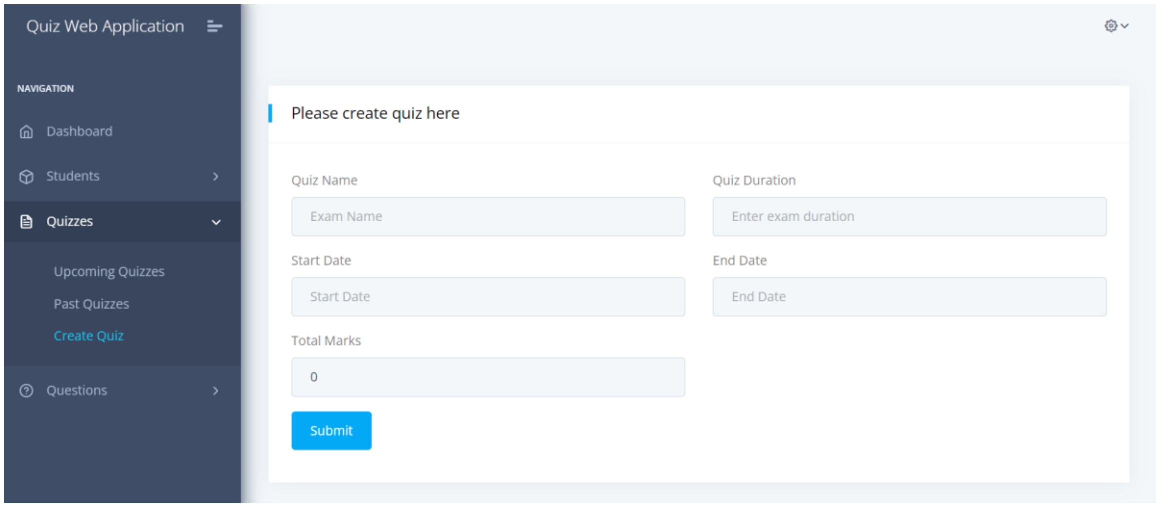
Figure 22. Add/ Edit Student



Students

#	First Name	Last Name	Email	Phone Number	Action
1	Students1	Students1	Students1@gmail.com		Edit Delete
2	Students2	Students2	Students2@gmail.com		Edit Delete
3	Students3	Students3	students3@gmail.com		Edit Delete

Figure 23. View / Delete Student

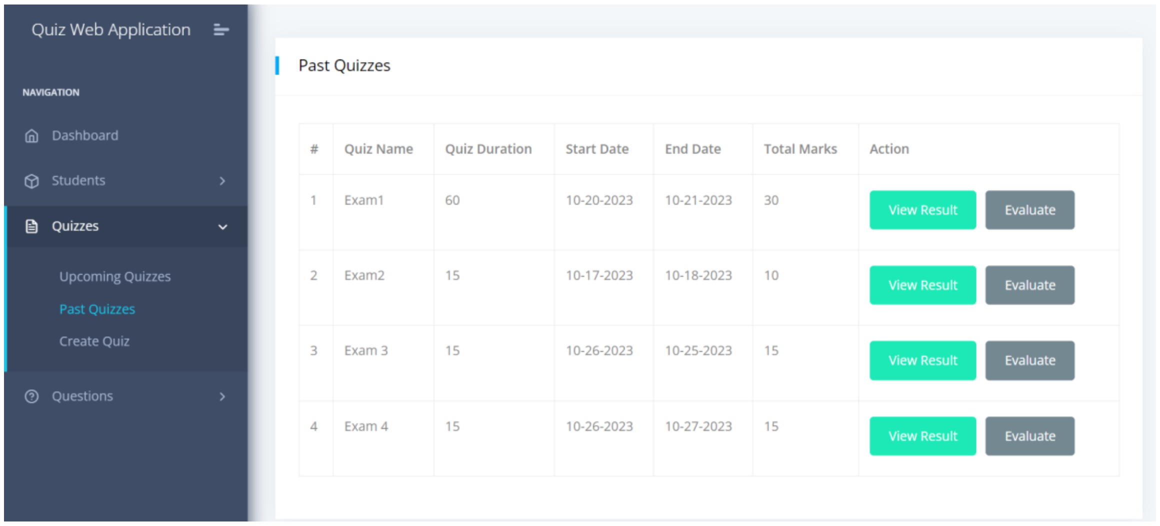


Please create quiz here

Quiz Name: Exam Name	Quiz Duration: Enter exam duration
Start Date: Start Date	End Date: End Date
Total Marks: 0	

Submit

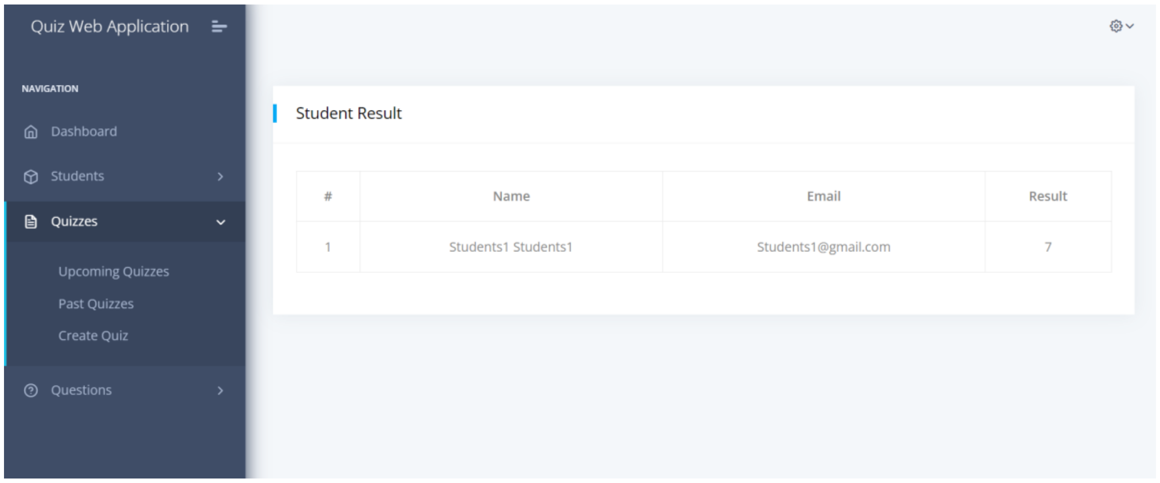
Figure 24. Add / Edit Quiz



Past Quizzes

#	Quiz Name	Quiz Duration	Start Date	End Date	Total Marks	Action
1	Exam1	60	10-20-2023	10-21-2023	30	View Result Evaluate
2	Exam2	15	10-17-2023	10-18-2023	10	View Result Evaluate
3	Exam 3	15	10-26-2023	10-25-2023	15	View Result Evaluate
4	Exam 4	15	10-26-2023	10-27-2023	15	View Result Evaluate

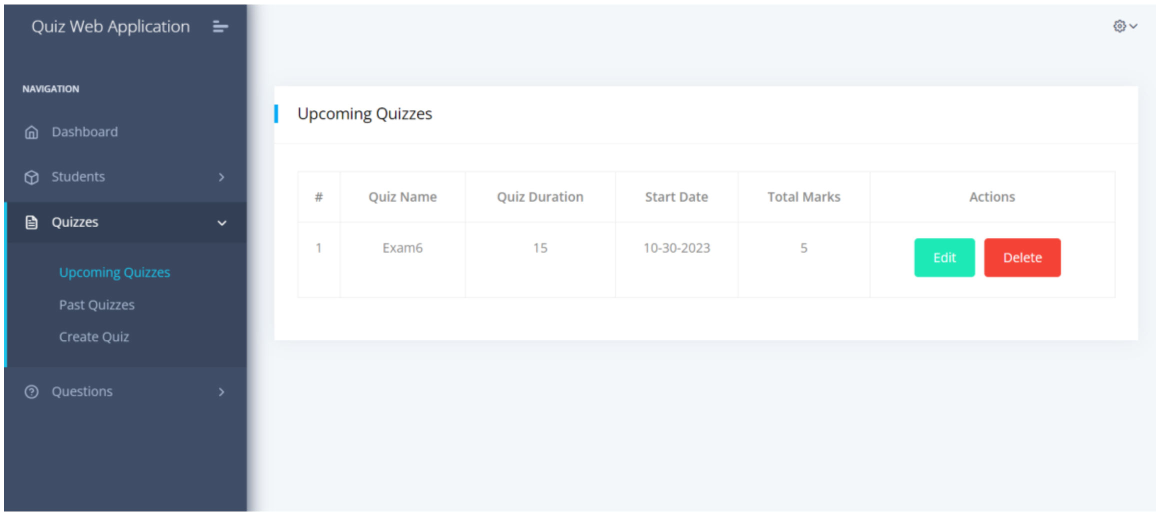
Figure 25. View Past / Evaluate Quiz



Student Result

#	Name	Email	Result
1	Students1 Students1	Students1@gmail.com	7

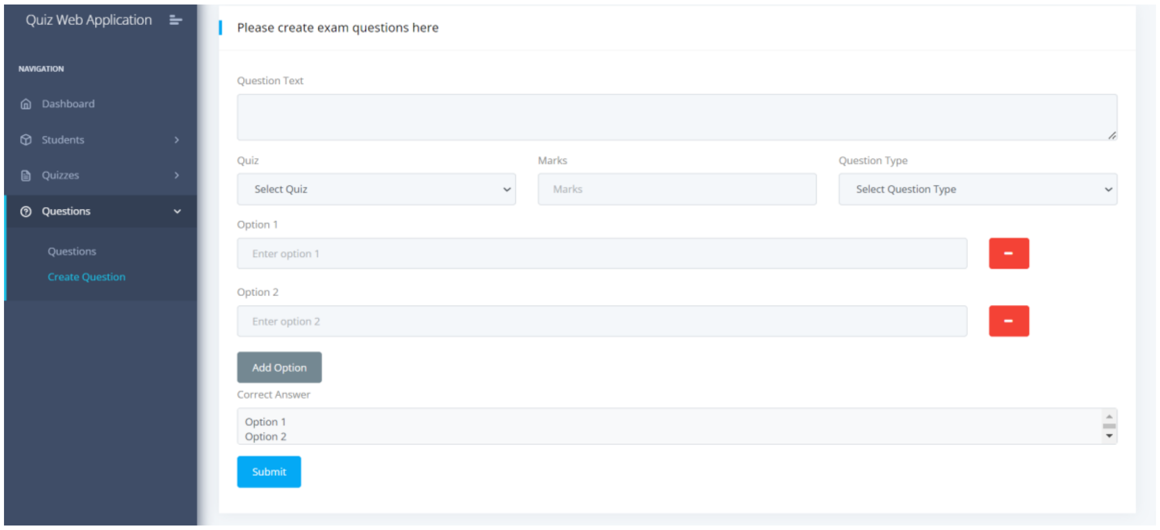
Figure 26. View the Result of the Student



Upcoming Quizzes

#	Quiz Name	Quiz Duration	Start Date	Total Marks	Actions
1	Exam6	15	10-30-2023	5	Edit Delete

Figure 27. View / Delete Upcoming Quiz



Please create exam questions here

Question Text:

Quiz: Select Quiz

Marks: Marks

Question Type: Select Question Type

Option 1: Enter option 1

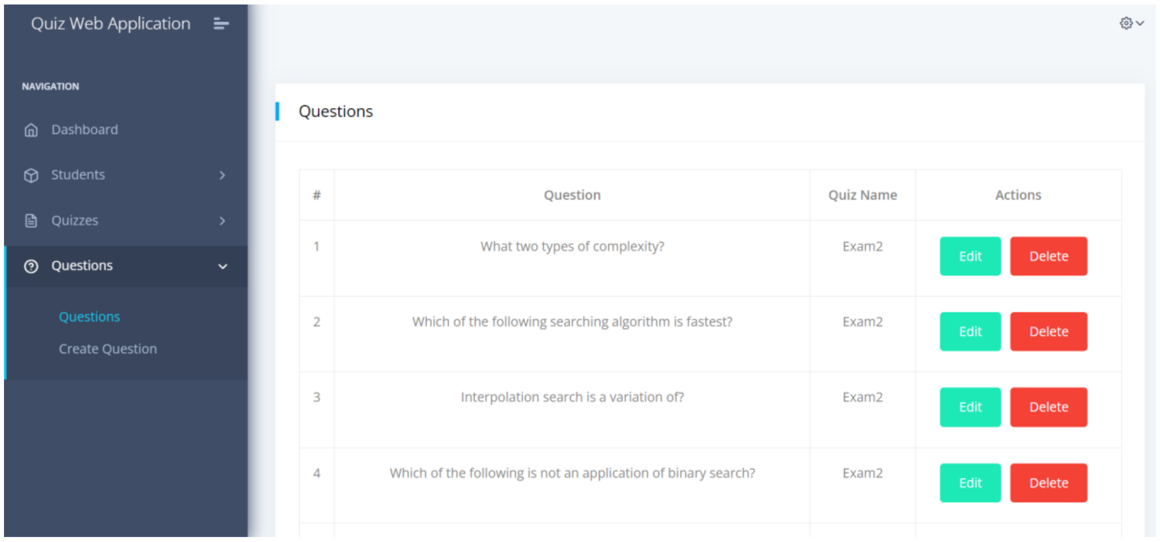
Option 2: Enter option 2

Add Option

Correct Answer:
Option 1
Option 2

Submit

Figure 28. Add / Edit Question



Questions

#	Question	Quiz Name	Actions
1	What two types of complexity?	Exam2	Edit Delete
2	Which of the following searching algorithm is fastest?	Exam2	Edit Delete
3	Interpolation search is a variation of?	Exam2	Edit Delete
4	Which of the following is not an application of binary search?	Exam2	Edit Delete

Figure 29. View/Delete Question

Student

Once the student successfully logs in, they will be automatically directed to the Dashboard screen (as shown in Figure 30). Using the dynamic sidebar, students can access upcoming quizzes screens (as shown in Figure 31), past quizzes (as shown in Figure 32), and take quizzes (as shown in Figure 33). Figure 34 indicates the screen that appears after the student successfully submits the quiz.

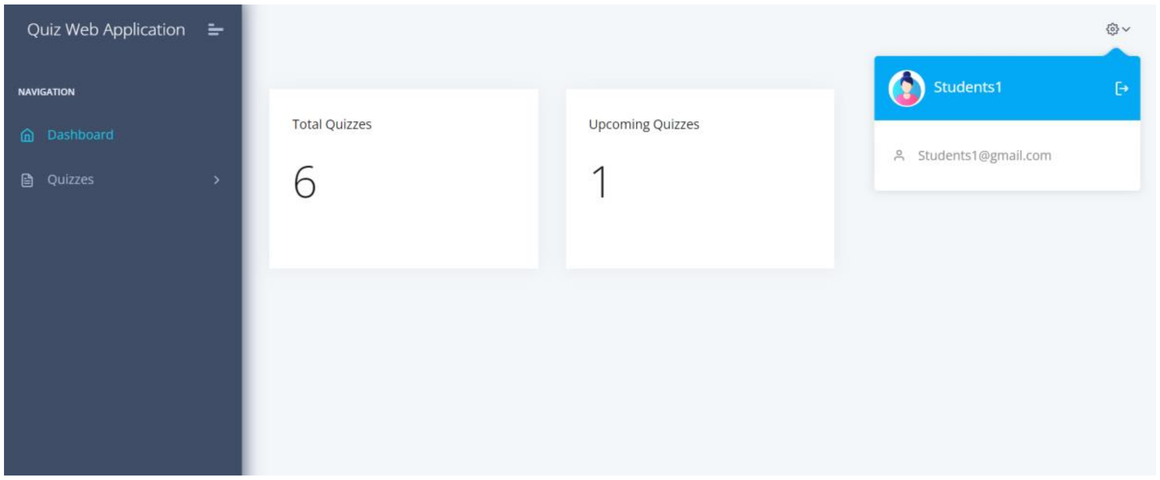
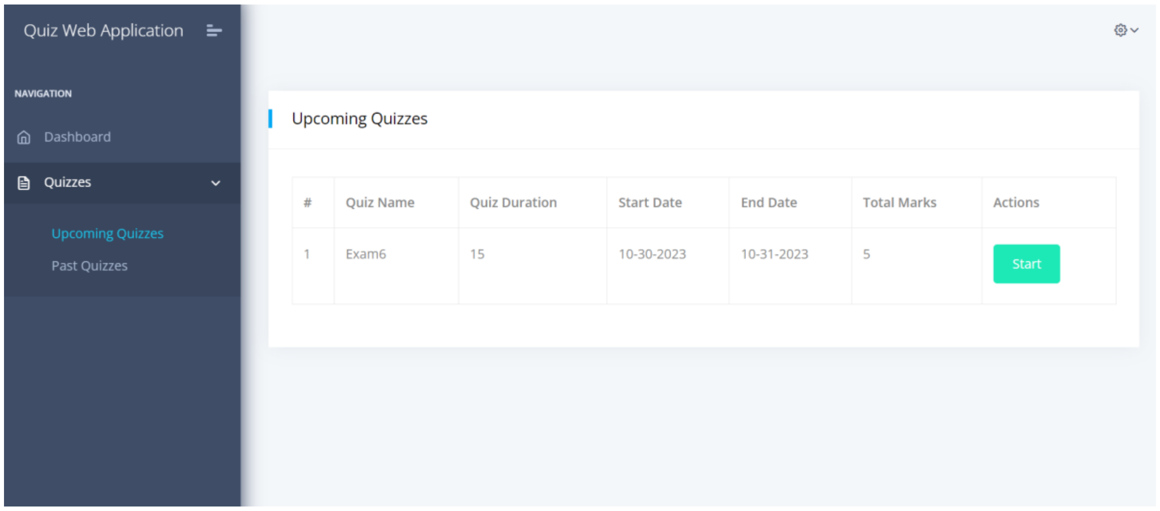


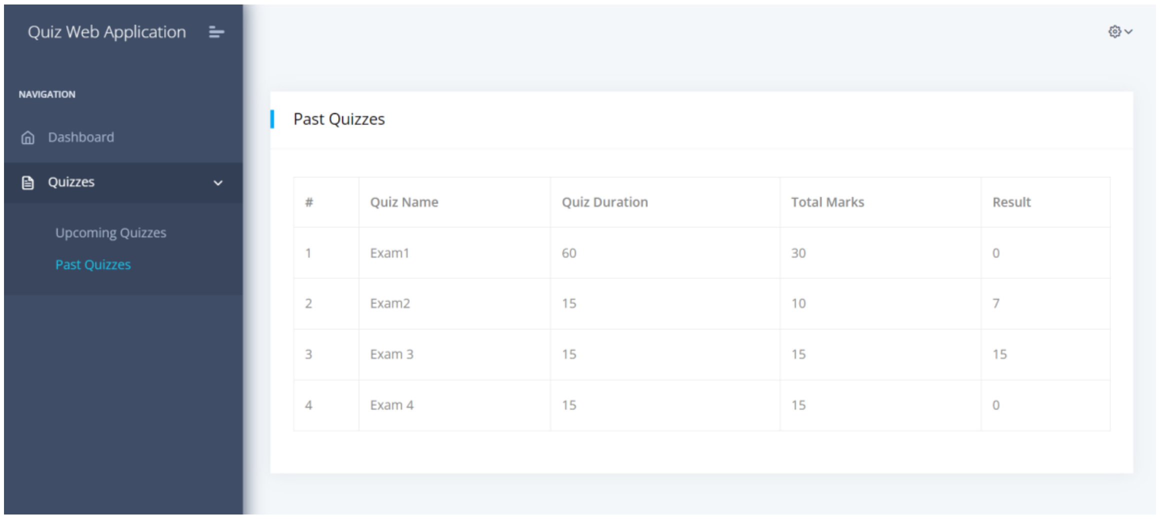
Figure 30. Student Dashboard



Upcoming Quizzes

#	Quiz Name	Quiz Duration	Start Date	End Date	Total Marks	Actions
1	Exam6	15	10-30-2023	10-31-2023	5	Start

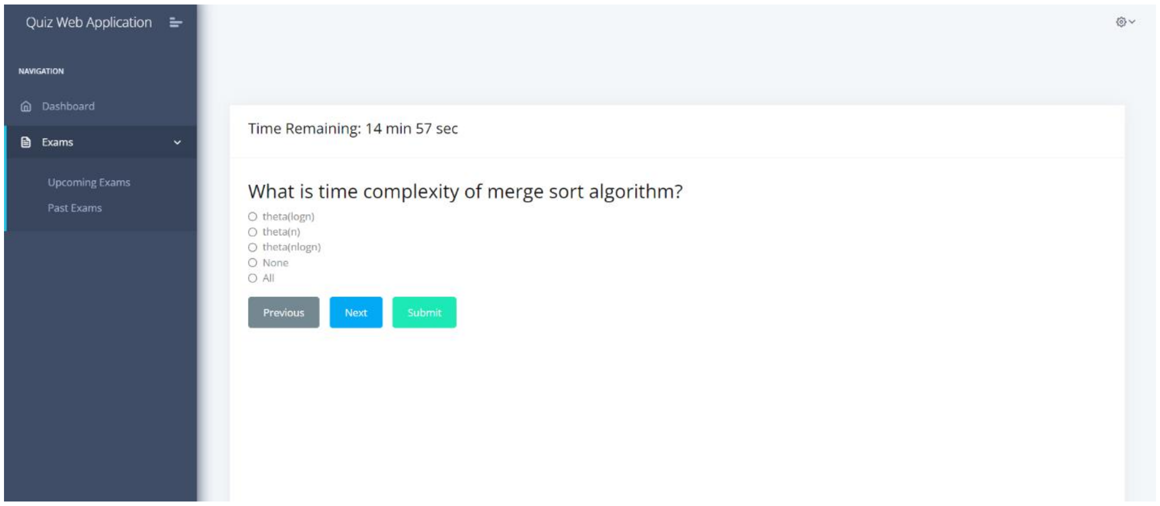
Figure 31. View Upcoming Quiz



Past Quizzes

#	Quiz Name	Quiz Duration	Total Marks	Result
1	Exam1	60	30	0
2	Exam2	15	10	7
3	Exam 3	15	15	15
4	Exam 4	15	15	0

Figure 32. View Past Quiz

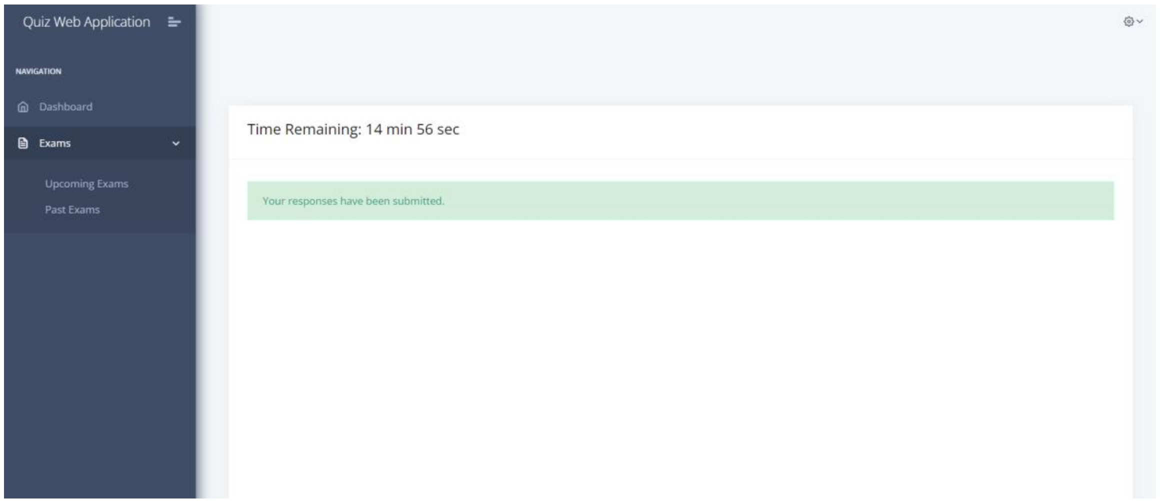


Time Remaining: 14 min 57 sec

What is time complexity of merge sort algorithm?

- theta(logn)
- theta(n)
- theta(nlogn)
- None
- All

Figure 33. Take Quiz



Time Remaining: 14 min 56 sec

Your responses have been submitted.

Figure 34. After submitting the Quiz

CHAPTER EIGHT:

CONCLUSION

The web application's robust and compatible backend technology allows instructors to create and customize quizzes effectively. An automatic evaluation feature, which ensures accuracy in the evaluation process, is an essential benefit for instructors.

The quiz web application addresses cheating in online tests by implementing strategic measures such as time limitations and tracking the test screen, which indicates that students' knowledge can be evaluated fairly. With a responsive and user-friendly interface, students gain access to a convenient and accessible system.

The quiz web application is a valuable solution for remote learning and online education, breaking geographical barriers. By leveraging modern technology, instructors can engage students dynamically, shaping a more interactive and engaging future for education.

CHAPTER NINE:

FUTURE ENHANCEMENT

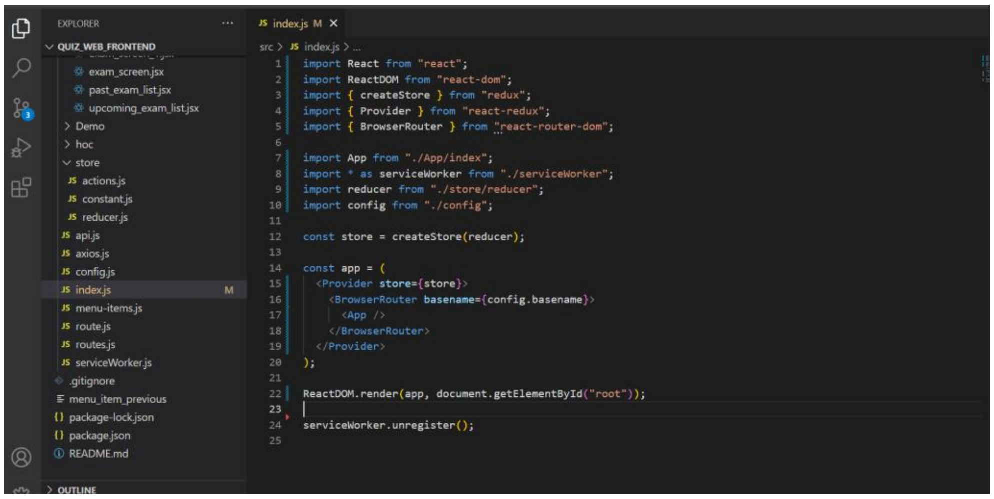
Currently, students can only see their results in the quiz web application. However, for future enhancement, it may be possible for students to see their quiz answers after the results are determined and get feedback from the instructor for their wrong answers, which might assist students in recognizing their areas of weakness and enhancing their knowledge of the course. Additionally, the web application could be implemented using cloud services as a SAAS-based web portal.

Another potential enhancement for the quiz web application is implementing additional security measures to prevent cheating during online tests. One solution could be to track students' movements while taking the quiz and flag any suspicious behavior. This could help ensure the integrity of the assessment process and provide a more secure testing environment for students.

APPENDIX A:

BASIC CODE

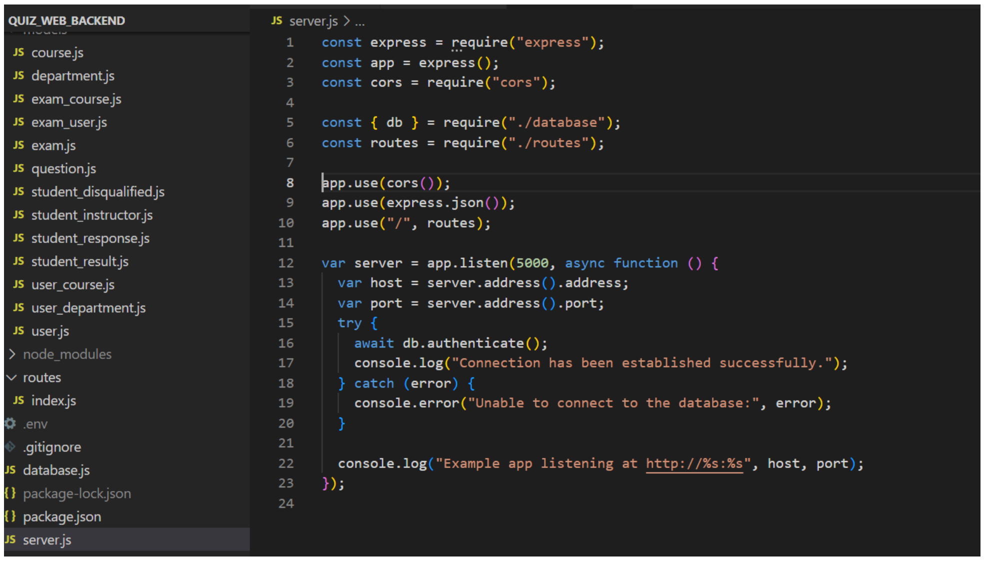
Figure 35 indicates the Index.js file of a quiz web application, which is the root file in the component-based structure that allows all child components to execute with user-specific requirements.



```
import React from "react";
import ReactDOM from "react-dom";
import { createStore } from "redux";
import { Provider } from "react-redux";
import { BrowserRouter } from "react-router-dom";

import App from "./App/index";
import * as serviceWorker from "./serviceWorker";
import reducer from "./store/reducer";
import config from "./config";

const store = createStore(reducer);

const app = (
  <Provider store={store}>
    <BrowserRouter basename={config.basename}>
      <App />
    </BrowserRouter>
  </Provider>
);

ReactDOM.render(app, document.getElementById("root"));

serviceWorker.unregister();

```

Figure 35. Frontend index.js

Figure 36 indicates the server.js file of the quiz web application, which is the root file in the backend project, starts the server and establishes the connection with the database.



```
const express = require("express");
const app = express();
const cors = require("cors");

const { db } = require("./database");
const routes = require("./routes");

app.use(cors());
app.use(express.json());
app.use("/", routes);

var server = app.listen(5000, async function () {
  var host = server.address().address;
  var port = server.address().port;
  try {
    await db.authenticate();
    console.log("Connection has been established successfully.");
  } catch (error) {
    console.error("Unable to connect to the database:", error);
  }

  console.log("Example app listening at http://%s:%s", host, port);
});

```

Figure 36. Backend server.js

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