ONLINE EXAMINATION SYSTEM

A PROJECT REPORT

Submitted by

VAISHALI A (2303811724322118)

in partial fulfillment of requirements for the award of the course

CGB1221-DATABASE MANAGEMENT SYSTEMS

in

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

K. RAMAKRISHNAN COLLEGE OF TECHNOLOGY

(An Autonomous Institution, affiliated to Anna University Chennai and Approved by AICTE, New Delhi)

SAMAYAPURAM – 621 112

JUNE-2025

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K. RAMAKRISHNAN COLLEGE OF TECHNOLOGY (AUTONOMOUS)

SAMAYAPURAM – 621 112

BONAFIDE CERTIFICATE

Certified that this project report on **"ONLINE EXAMINATION SYSTEM "** is the bonafide work of **VAISHALI A (2303811724322118)** who carried out the project work during the academic year 2024 - 2025 under my supervision.

SIGNATURE   **SIGNATURE**

Dr.T. AVUDAIAPPAN, M.E., Ph.D.,   Mrs.S. GEETHA, M.E.,

HEAD OF THE DEPARTMENT   **SUPERVISOR**

ASSOCIATE PROFESSOR   ASSISTANT PROFESSOR

Department of Artificial Intelligence   Department of Artificial Intelligence

K.Ramakrishnan College of Technology   K.Ramakrishnan College of Technology
(Autonomous)   (Autonomous)

Samayapuram–621112.   Samayapuram–621112.

Submitted for the viva-voce examination held on 04.06.2025

INTERNAL EXAMINER   **EXTERNAL EXAMINER**

DECLARATION

I declare that the project report on **"ONLINE EXAMINATION SYSTEM"** is the result of original work done by me and best of my knowledge, similar work has not been submitted to **"ANNA UNIVERSITY CHENNAI"** for the requirement of Degree of **BACHELOR OF TECHNOLOGY**. This project report is submitted on the partial fulfilment of the requirement of the completion of the course **CGB1221 – DATABASE MANAGEMENT SYSTEMS.**

Signature

VAISHALI A

Place: Samayapuram
Date: 04.06.2025

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It is with great pride that I express my gratitude and in-debt to my institution "**K.Ramakrishnan College of Technology (Autonomous)**", for providing me with the opportunity to do this project.

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INSTITUTE

Vision:

- To serve the society by offering top-notch technical education on par with global standards.

Mission:

- Be a center of excellence for technical education in emerging technologies by exceeding the needs of industry and society.
- Be an institute with world class research facilities.
- Be an institute nurturing talent and enhancing competency of students to transform them as all – round personalities respecting moral and ethical values.

DEPARTMENT

Vision:

- To excel in education, innovation, and research in Artificial Intelligence and Data Science to fulfil industrial demands and societal expectations.

Mission

- To educate future engineers with solid fundamentals, continually improving teaching methods using modern tools.
- To collaborate with industry and offer top-notch facilities in a conducive learning environment.
- To foster skilled engineers and ethical innovation in AI and Data Science for global recognition and impactful research.
- To tackle the societal challenge of producing capable professionals by instilling employability skills and human values.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

- **PEO1:** Compete on a global scale for a professional career in Artificial Intelligence and Data Science.
- **PEO2:** Provide industry-specific solutions for the society with effective communication and ethics.
- **PEO3** Enhance their professional skills through research and lifelong learning initiatives.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- **PSO1:** Capable of finding the important factors in large datasets, simplify the data, and improve predictive model accuracy.
- **PSO2:** Capable of analyzing and providing a solution to a given real-world problem by designing an effective program.

PROGRAM OUTCOMES (POs)

Engineering students will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

ABSTRACT

The Online Examination System is a database-driven application developed using SQL for data management and Python for backend processing. It is designed to digitize and automate the traditional examination process, providing a secure, scalable, and user-friendly environment for conducting tests online. The system allows administrators to manage exams efficiently, while students can take exams remotely with real-time monitoring. It supports the creation, scheduling, and execution of various types of tests, with automatic evaluation for objective questions and easy handling of subjective responses. Data integrity and security are maintained through structured database design, authentication mechanisms, and activity tracking features. By integrating Python with a MySQL database, the system ensures fast data retrieval, reliable performance, and a seamless user experience. This approach not only reduces administrative overhead but also enhances accessibility and transparency in the assessment process.

ABSTRACT WITH POs AND PSOs MAPPING

CO 5 : BUILD DATABASES FOR SOLVING REAL-TIME PROBLEMS.

ABSTRACT	POs MAPPED	PSOs MAPPED
The Online Examination System is a database-driven application developed using SQL for data management and Python for backend processing. It is designed to digitize and automate the traditional examination process, providing a secure, scalable, and user-friendly environment for conducting tests online. The system allows administrators to manage exams efficiently, while students can take exams remotely with real-time monitoring. It supports the creation, scheduling, and execution of various types of tests, with automatic evaluation for objective questions and easy handling of subjective responses. Data integrity and security are maintained through structured database design, authentication mechanisms, and activity tracking features. By integrating Python with a MySQL database, the system ensures fast data retrieval, reliable performance, and a seamless user experience. This approach not only reduces administrative overhead but also enhances accessibility and transparency in the assessment process.	PO1 -3 PO2 -3 PO3 -3 PO4 -2 PO5 -3 PO6 -2 PO7 -1 PO8 -3 PO9 -2 PO10 -2 PO11 -2 PO12 -2	PSO1 -3 PSO2 -3

Note: 1- Low, 2-Medium, 3- High

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CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE

The primary objective of this project is to develop a secure and efficient Online Examination System that facilitates the creation, management, and assessment of online exams. The system is designed to support student registration, test creation, secure test delivery, automated evaluation, and result reporting. By integrating modern web technologies with a robust SQL database backend, the application aims to reduce administrative workload, enhance academic integrity, and provide a user-friendly testing environment accessible from anywhere.

1.2 OVERVIEW

The Online Examination System is a web-based platform built using Python's Flask framework and powered by an SQL (MySQL or SQLite) backend. It supports multiple user roles, such as students, instructors, and administrators. Instructors can create and schedule exams, upload questions in various formats, and view student performance. Students can log in, take assigned exams, and receive instant results for objective questions. Admins have system-wide access to manage users, monitor exam activity, and maintain question banks. The system ensures secure login using hashed passwords and session handling via Flask-Login. SQLAlchemy is used as the ORM for interacting with the database, and Jinja2 is used for rendering dynamic HTML templates.

- Built with Flask, Jinja2, SQLAlchemy, and HTML/CSS.
- Role-based access: admin, instructor, and student.
- Question bank and exam schedule management.
- Real-time recording of student responses.
- Score calculation and result storage.

1.3 SQL AND DATABASE CONCEPTS

The system utilizes normalized relational database structures to manage entities like users, exams, questions, responses, and scores. Foreign keys enforce relationships among tables. SQLAlchemy ORM is used for CRUD operations and to avoid direct SQL queries, improving security and maintainability.

- Normalized tables for efficient data storage.

- Foreign key constraints to maintain relationships.

- Passwords stored using hashing for security.

- CRUD operations supported via SQLAlchemy.

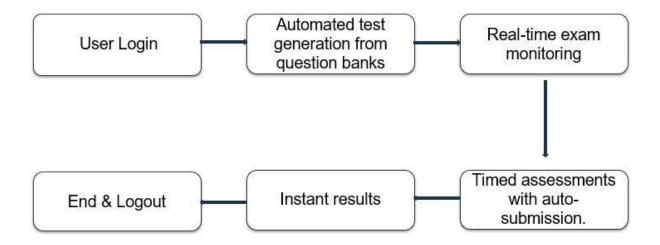- Many-to-many relationships using junction tables.

CHAPTER 2
PROJECT METHODOLOGY

2.1 PROPOSED WORK

An agile, sprint-based workflow guided development, emphasizing incremental releases and stakeholder feedback. Each sprint produced a working module, ensuring continuous validation against police-station requirements.

- **Requirement Gathering:** Interviewed officers to map real workflows.
- **Schema Design:** Drafted ER diagrams, normalized to 3NF.
- **Prototype Build:** Gradio screens for CRUD on cases and persons.
- **Iterative Enhancement:** Added evidence tracking, analytics, security.
- **Testing:** Unit tests with pytest; manual validation by officers.
- **Deployment Prep:** Dockerfile and batch script for one-click setup.

2.2 BLOCK DIAGRAM

CHAPTER 3
MODULE DESCRIPTION

3.1 AUTHENTICATION MODULE

This module handles user registration, login, logout, and role-based access control to ensure secure authentication for students, teachers, and admins. It manages password hashing, session management, and access restrictions to protect exam data and system integrity.

Key Methods:

- register_user(username, email, password, role) — Registers a new user with encrypted password.

- login(username, password) — Authenticates user credentials and initiates a session.

- logout(user_id) — Ends the user session securely.

3.2 TEST CREATION & MANAGEMENT MODULE

Allows teachers or admins to create, update, organize, and delete tests. Tests include metadata like title, description, duration, and question sets. Supports categorization and status control (draft, published).

Key Methods:

- create_test(test_data) — Inserts a new test into the database.

- update_test(test_id, updated_data) — Modifies existing test details.

- delete_test(test_id) — Deletes or archives a test.

- add_question(test_id, question_data) — Adds questions to a test.

- list_tests(filter_criteria) — Retrieves a list of tests based on filters.

3.3 TEST EXECUTION & MONITORING MODULE

Handles the student-facing test interface including timing, navigation between questions, answer submission, and real-time monitoring to prevent cheating (e.g., tab-switch detection).

Key Methods:

- start_test(user_id, test_id) — Initializes a test session for the user.

- submit_answer(session_id, question_id, answer) — Records the student's answer.

- get_next_question(session_id) — Retrieves the next question for the student.

3.4 EVALUATION & REPORTING MODULE

Automates scoring for objective questions, collects subjective answers for manual review, and generates comprehensive reports for students and instructors.

Key Methods:

- auto_score(session_id) — Automatically scores multiple-choice questions.

- submit_manual_evaluation(session_id, question_id, score) — Allows manual grading of subjective questions.

- generate_report(user_id, test_id) — Produces performance reports and analytics.

3.5 FEEDBACK MODULE

Collects student feedback on tests and the system itself to improve the quality of exams and user experience.

Key Methods:

- submit_feedback(user_id, test_id, feedback_text, rating) — Records feedback from users.

- view_feedback(test_id) — Allows instructors to view feedback for specific tests.

- analyze_feedback() — Aggregates feedback data to identify trends.

CHAPTER 4
CONCLUSION & FUTURE SCOPE

The Online Examination System provides a robust, user-friendly, and secure platform for managing the end-to-end process of conducting digital exams. With modular architecture covering authentication, test creation, execution, evaluation, and feedback collection, the system effectively reduces manual overhead and improves exam accuracy and efficiency. It facilitates real-time test monitoring and automatic scoring, ensuring timely results with minimal human intervention. The system also emphasizes data integrity and accessibility, backed by secure login mechanisms, proper role management, and a responsive interface. Overall, the project contributes to modernizing examination processes for educational institutions, promoting fairness, transparency, and operational scalability.

FUTURE SCOPE

- **AI-Based Proctoring:** Integration of webcam-based AI proctoring to detect cheating behaviors in real time (e.g., face recognition, gaze detection).
- **Plagiarism Detection:** Incorporating NLP techniques to automatically detect similarities in subjective answers and flag potential plagiarism.
- **Mobile Application Support:** Developing native Android/iOS apps for wider accessibility and ease of use on mobile devices.
- **Multilingual Support:** Adding support for multiple languages to serve diverse student populations.
- **Advanced Analytics Dashboard:** Implementation of visual dashboards for performance trends, question difficulty analysis, and student-wise comparisons.

APPENDIX A – SOURCE CODE

-- Database: online_exam_system

CREATE DATABASE IF NOT EXISTS online_exam_system;

USE online_exam_system;

-- User Authentication Table

CREATE TABLE users (

   user_id INT AUTO_INCREMENT PRIMARY KEY,

   username VARCHAR(50) NOT NULL UNIQUE,

   password_hash VARCHAR(255) NOT NULL,

   role ENUM('admin', 'teacher', 'student') NOT NULL,

   email VARCHAR(100),

   created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP

);

-- Subjects Table

CREATE TABLE subjects (

   subject_id INT AUTO_INCREMENT PRIMARY KEY,

   subject_name VARCHAR(100) NOT NULL UNIQUE

);

-- Questions Table

CREATE TABLE questions (

   question_id INT AUTO_INCREMENT PRIMARY KEY,

   subject_id INT NOT NULL,

   question_text TEXT NOT NULL,

   option_a VARCHAR(255),

```sql
    option_b VARCHAR(255),

    option_c VARCHAR(255),

    option_d VARCHAR(255),

    correct_option CHAR(1), -- A, B, C, D

    marks INT DEFAULT 1,

    FOREIGN KEY (subject_id) REFERENCES subjects(subject_id) ON DELETE
CASCADE
);


-- Exams Table
CREATE TABLE exams (
    exam_id INT AUTO_INCREMENT PRIMARY KEY,

    subject_id INT,

    exam_title VARCHAR(100),

    exam_date DATE,

    duration_minutes INT,

    status ENUM('scheduled', 'ongoing', 'completed') DEFAULT 'scheduled',

    FOREIGN KEY (subject_id) REFERENCES subjects(subject_id) ON DELETE
SET NULL
);


-- Exam-Question Mapping Table
CREATE TABLE exam_questions (
    exam_id INT,

    question_id INT,

    PRIMARY KEY (exam_id, question_id),

    FOREIGN KEY (exam_id) REFERENCES exams(exam_id) ON DELETE
CASCADE,

    FOREIGN KEY (question_id) REFERENCES questions(question_id) ON
```

```sql
    DELETE CASCADE
);


-- Student Exam Submissions Table
CREATE TABLE submissions (
    submission_id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT,
    exam_id INT,
    score INT DEFAULT 0,
    submitted_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    FOREIGN KEY (user_id) REFERENCES users(user_id) ON DELETE CASCADE,
    FOREIGN KEY (exam_id) REFERENCES exams(exam_id) ON DELETE CASCADE
);


-- Student Answers Table
CREATE TABLE answers (
    answer_id INT AUTO_INCREMENT PRIMARY KEY,
    submission_id INT,
    question_id INT,
    selected_option CHAR(1), -- A, B, C, D
    is_correct BOOLEAN,
    FOREIGN KEY (submission_id) REFERENCES submissions(submission_id) ON DELETE CASCADE,
    FOREIGN KEY (question_id) REFERENCES questions(question_id) ON DELETE CASCADE
);
```

```
-- Feedback Table
CREATE TABLE feedback (
    feedback_id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT,
    exam_id INT,
    rating INT CHECK (rating BETWEEN 1 AND 5),
    comments TEXT,
    submitted_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    FOREIGN KEY (user_id) REFERENCES users(user_id),
    FOREIGN KEY (exam_id) REFERENCES exams(exam_id)
);
```
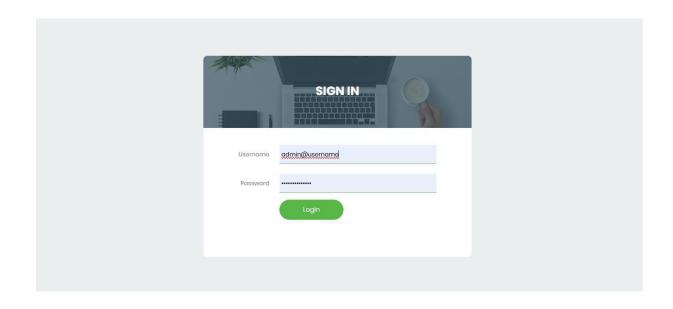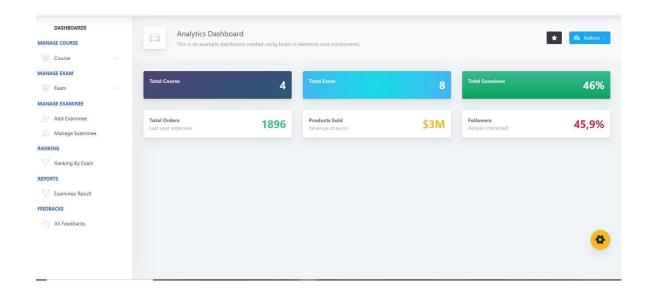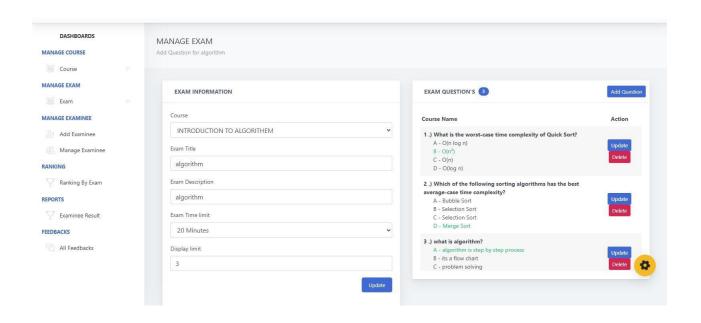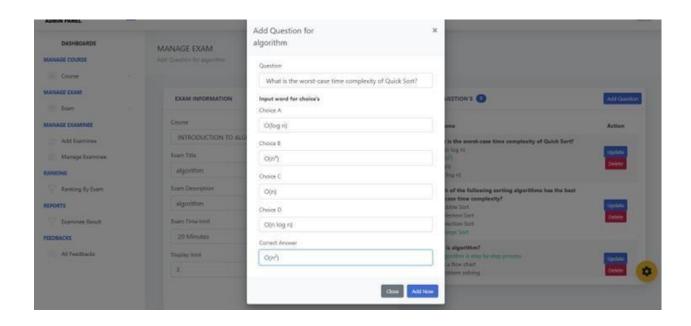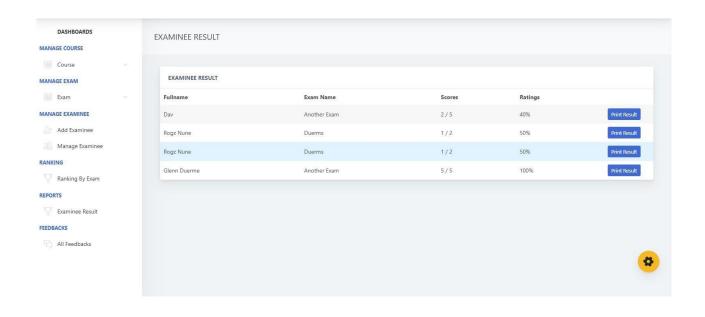
APPENDIX B – SCREENSHOTS

DASHBOARDS

MANAGE COURSE

🖥 Course   ⌄

MANAGE EXAM

🖥 Exam   ⌄

MANAGE EXAMINEE

👤 Add Examinee

👥 Manage Examinee

RANKING

🏆 Ranking By Exam

REPORTS

🏆 Examinee Result

FEEDBACKS

📋 All Feedbacks

EXAMINEE RESULT

EXAMINEE RESULT				
Fullname	Exam Name	Scores	Ratings	
Dav	Another Exam	2 / 5	40%	Print Result
Rogz Nune	Duerms	1 / 2	50%	Print Result
Rogz Nune	Duerms	1 / 2	50%	Print Result
Glenn Duerme	Another Exam	5 / 5	100%	Print Result

⚙

FEEDBACK'S LIST		
Examinee	Feedbacks	Date
warren dalaoyan	haah	January 12, 2020
Anonymous	dfsdf	January 05, 2020
		December 08, 2019
		December 08, 2019
Rogz Nunezsss	Yes	December 08, 2019
Anonymous	Lageh. idol na nako!	December 05, 2019
Glenn Duerme	Gwapa kay Miss Pam	December 05, 2019

⚙

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1. Gradio Documentation: An open-source Python library for creating customizable user interfaces.
   URL: https://www.gradio.app

2. SQLite Documentation: A lightweight, serverless SQL database engine used in local applications.
   URL: https://www.sqlite.org/docs.html

3. Pandas Documentation: Used for data manipulation and retrieval from the database.
   URL: https://pandas.pydata.org/docs/

4. Matplotlib Documentation: A visualization library for Python used to generate charts and graphs.
   URL: https://matplotlib.org/stable/contents.html