CS-3009 Software Engineering

E-Val: Online Exam and Quiz Management System

System Requirement Specifications

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Abstract*— This paper presents an Online Exam and Quiz Management System integrating JavaFX for a dynamic user interface and Spring Boot for backend management. Key features include secure authentication, automated quiz generation, real-time result computation, and data persistence using a relational database. The system ensures seamless exam administration, supporting both online and offline functionality. JavaFX provides an interactive frontend, while Spring Boot enables scalability and efficient data handling. This integration enhances accessibility, reliability, and efficiency for educators and students alike.

Keywords*— Online Exam System, Quiz Management, JavaFX, Spring Boot, Authentication, Database Management, Automated Quiz Generation, Real-time Results, Scalability, User Interface, Security, Offline Mode, Educational Technology, Software Integration, Web and Desktop Application.

I. Introduction

The Online Exam and Quiz Management System is designed to facilitate seamless creation, administration, and evaluation of exams and quizzes. It aims to streamline the examination process by providing an interactive platform for teachers, students, and administrators. The system ensures automated grading, real-time performance tracking, and secure access to examination materials, making the assessment process more efficient and accessible.

II. Project Vision

The vision of the Online Exam and Quiz Management System is to create a robust, user-friendly, and scalable assessment platform that enhances learning and evaluation experiences. The system aspires to eliminate manual exam inefficiencies by introducing automation in grading, result generation, and exam scheduling. It will provide a secure and accessible platform that caters to educational institutions, teachers, and students, enabling fair, transparent, and streamlined online assessment.

Identify applicable funding agency here. If none, delete this text box.

The system will be used by educational institutions, teachers, students, and administrators to manage and conduct online exams efficiently. The platform allows teachers to create quizzes, students to take assessments, and administrators to oversee the examination process. By automating grading and result tracking, the system minimizes human error and enhances accessibility for users.

III. Functional Requirements

Following are the functional Requirements for E-val.

A. User Authentication and Autherization:

- Users (students, teachers, admins) must be able to register and log in securely.
- The system should verify email addresses upon registration.
- Users must be able to reset their passwords.
- The system must enforce role-based access control (RBAC) to restrict actions based on user type.

B. User Authentication and Autherization:

- Teachers should be able to create, edit, and delete quizzes.
- Quizzes should support various question types (MCQs, short answers, true/false, etc.).
- Teachers should be able to set time limits and scheduling for quizzes.
- Teachers should be able to define grading criteria (points per question, passing marks, etc.).

C. Quiz Attempt & Submission:

- Students must be able to start a quiz within a scheduled timeframe.
- The system should track time and auto-submit when the time limit expires.
- Students should be able to navigate between questions before submitting.
- The system should save quiz progress in case of an interruption.

D. Automated & Manual Grading:

- The system should auto-grade objective questions (MCQs, true/false, etc.).
- Teachers should be able to manually grade subjective responses.
- The system should calculate final scores based on predefined criteria.

E. Results & Performance Tracking:

- Students should be able to view their quiz results after submission.
- Teachers should be able to review and adjust scores if needed.
- The system should generate reports on student performance over time.
- Teachers should be able to export results and analytics in CSV or PDF format.

F. Class & Student Management:

- Admins should be able to create and manage classes.
- Teachers should be able to assign quizzes to specific classes.
- Students should be able to enroll in classes via an invitation or request.

G. Teaching Habits: Using Visual Aids and Simulations:

- Teachers should be able to upload lecture materials and study resources.
- Students should be able to access uploaded resources.

H. System Administration & Configuration:

- Admins should be able to manage users (add, remove, or edit profiles).
- Admins should be able to configure grading policies, quiz settings, and system parameters.

IV. Non-Functional Requirements

A. Product Requirements:

- Performance Requirements: The system should work smoothly for at least 50 users at a time without lag. Quiz results should be generated within 10 seconds after submission.
- Usability Requirements: The interface should be simple and easy to use, even for non-technical users. The system should have a clean layout with clear navigation for students and teachers.
- Reliability Requirements: The system should not crash during normal use. If a quiz attempt is interrupted (e.g., due to a system crash), the progress should be saved automatically.
- Security Requirements: Users should have to log in with a username and password to access their dashboard. The system should restrict access based on roles (students, teachers, admins).

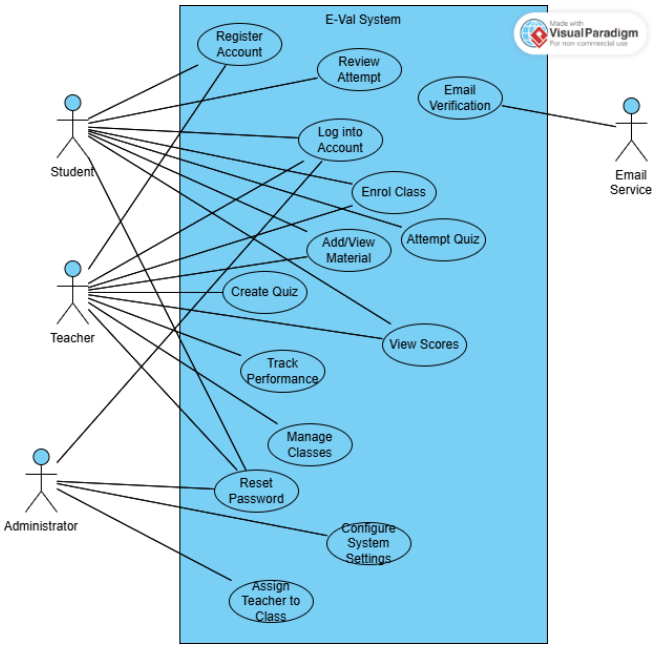
B. Organizational Requirements:

- Maintainability Requirements: The code should be modular, so adding new features later is easier. The system should log errors, so bugs can be fixed without much trouble.
- Compliance Requirements: The system should store quiz results securely, ensuring they are not lost or altered.

C. External Requirements:

- Scalability Requirements: The system should allow adding more users over time without needing a major redesign.
- Compatibility Requirements: The system should run on Windows, as it is commonly used by students and teachers.

V. Use Case Diagram



VI. User Stories

A. Authentication

- As a User, I want to create an account and log in so that I can access my dashboard.
  - Pre-condition: The user must provide valid credentials (email and password) or register a new account.
  - Post-condition: The user is authenticated and redirected to their dashboard.

- As a Student, I want to register an account so that I can access quizzes.

    - Pre-condition: The student must provide a unique email, password, and required details.
    - Post-condition: The student account is created, and they are redirected to the dashboard.
- As a Teacher, I want to register an account so that I can create and manage quizzes.
    - Pre-condition: The teacher must provide a unique email, password, and required details.
    - Post-condition: The teacher account is created, and they are redirected to the dashboard.
- As a User, I want to reset my password so that I can regain access if I forget it.
    - Pre-condition: The user must enter their registered email.
    - Post-condition: The password is updated in the database after verification.
- As a User, I want the system to verify my email upon registration to ensure security.
    - Pre-condition: The user must enter a valid email during registration.
    - Post-condition: The email is verified and linked to the registered account.

B. Quiz Management

- As a Teacher, I want to create quizzes so that my students can attempt them.
    - Pre-condition: The teacher must be logged in and have access to the quiz management feature.
    - Post-condition: The quiz is saved and available for students to attempt.
- As a Student, I want to attempt quizzes so that I can test my knowledge.
    - Pre-condition: The student must be enrolled in the class and the quiz must be published.
    - Post-condition: The student's answers are recorded, and grading is initiated.
- As a Teacher, I want to set a marking criteria for quizzes so that the system can grade them accordingly.
    - Pre-condition: The teacher must define the grading criteria while creating the quiz.
    - Post-condition: The system applies the grading criteria automatically during quiz evaluation.
- As a System, I want to automatically grade quizzes based on predefined criteria so that students get instant results.
    - Pre-condition: The system must have a predefined marking scheme.
    - Post-condition: The quiz is graded automatically, and results are stored.
- As a Student, I want to review my past quiz attempts so that I can identify mistakes and improve.
    - Pre-condition: The student must have attempted at least one quiz.
    - Post-condition: The student can access and review their past quiz submissions.

C. Class Management

- As a School Admin, I want to assign teachers to classes so that they can manage exams and quizzes.
    - Pre-condition: The school admin must be logged in.
    - Post-condition: Teachers are assigned to classes and can manage quizzes.
- As a Teacher, I want to view classes assigned to me so I can manage examinations, announcements, and student grades.
    - Pre-condition: The teacher must have an assigned class.
    - Post-condition: The teacher can access the class dashboard and perform management tasks.
- As a Teacher, I want to track the progress of my entire class so that I can identify students who need help.
    - Pre-condition: The teacher must have access to class performance data.
    - Post-condition: The system provides reports on student progress and performance.
- As a Student, I want to enroll in an available class to take exams by either opting for it or getting an invitation from a teacher.
    - Pre-condition: The student must be registered in the system.
    - Pot-condition: The student is added to the class and gains access to quizzes.
- As a Teacher, I want to add and view class materials so that students can access study resources.
    - Pre-condition: The teacher must be logged in and have class management permissions.
    - Post-condition: The materials are uploaded and accessible to students.
- As a Student, I want to view class materials so that I can access resources provided by my teacher.
    - Pre-condition: The student must be enrolled in the class.
    - Post-condition: The student can browse and download available study materials.

D. Performance Tracking

- As a Teacher, I want to view students' quiz scores so that I can assess their performance.

- Pre-condition: The teacher must have relevant permissions to access student scores.
- Post-condition: The scores are displayed based on student quiz attempts.

- As a Student, I want to view my quiz scores so that I can see my performance on individual quizzes.
  - Pre-condition: The student must have attempted at least one quiz.
  - Post-condition: The student can view their quiz results and feedback.
- As a Student, I want to track my performance over time so that I can see my improvement.
  - Pre-condition: The system must store quiz attempt history.
  - Post-condition: The student can view trends in performance over time.

E. System Administration

- As an Admin, I want to configure system settings so that I can manage platform behavior and security.
  - Pre-condition: The admin must have access to system settings.
  - Post-condition: Changes are applied, and system configurations are updated.
- As an Admin, I want to reset passwords for users so that I can assist them in regaining access.
  - Pre-condition: The admin must verify the user's identity before resetting the password.
  - Post-condition: The user receives a new password or reset link.

VII. CLASS DIAGRAM