**MCQ Test Web Application - Project Documentation**

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**Introduction**

The **MCQ Test Web Application (MYQUIZ)** is a full-stack educational platform designed to facilitate the creation, management, and participation in multiple-choice question (MCQ) based assessments. Developed using Angular 19 for the frontend and Express.js with MongoDB for the backend, this system provides separate roles and dashboards for administrators and users, ensuring both functionality and security.

Administrators have complete control over test and question management, report analysis, and user monitoring. Users can securely log in, attempt unattempted tests, and view performance-based reports and rankings. A special feature includes generating shareable test links, allowing users to directly access specific tests post-authentication.

The project is tailored for educational institutions, coaching centers, or corporate training departments aiming to conduct objective assessments efficiently and securely. This document outlines all functionalities, technical components, and smart features of the application.

**Technology Stack**

**Frontend**

* **Framework:** Angular 19 (Standalone Components)
* **Routing:** Angular Router with Route Guards
* **State Management:** LocalStorage for tokens, user sessions, and redirect paths
* **UI Design:** Angular Material for user-friendly and responsive interfaces
* **HTTP Communication:** Angular HTTPClient for secure REST API interactions

**Backend**

* **Framework:** Express.js (Node.js)
* **Database:** MongoDB with Mongoose ORM
* **Authentication:** JWT-based authentication with role-based access control
* **Security:** Password hashing using bcrypt, HTTP-only cookies/tokens, and route protection via middleware

**Modules and Functionalities**

**Admin Module**

The Admin module serves as the central control system for managing the application. All test content, user responses, and evaluation logic are handled from this interface.

**1. Authentication**

* Secure login for admin using credentials
* Backend verifies user and issues JWT token on success
* Admin routes are protected using route guards and role checks

**2. Test Management**

* Admin can create multiple tests with details like title, description, duration, and rules
* Editing functionality allows admins to revise tests and correct information
* Delete operation allows the removal of obsolete or incorrect tests

**3. Question Management**

* Admins can add multiple-choice questions to a specific test
* Each question supports multiple answer options and one correct answer
* Admin can edit or delete individual questions from any test

**4. Report Management**

* Admin can view all reports submitted by users for each test
* Reports show test taker name, email, score, and time of submission
* User ranks are calculated based on scores; equal scores yield the same rank
* Admins can delete individual user reports if needed (e.g. invalid attempts or duplicate submissions)

**5. Shareable Test Links**

* After creating a test, a unique and direct test URL is generated
* This link can be shared with users through email or other communication tools
* When a user clicks the link:
  + If logged in, they are taken directly to the test
  + If not logged in, they are redirected to login, and then to the test after authentication

**User Module**

The User module ensures a streamlined experience for users to register, log in, take tests, and view their results.

**1. Authentication**

* Users register with a valid email and password
* Login process validates credentials and returns a JWT token
* Tokens are stored locally and used for secure API communication

**2. Dashboard**

* Displays all available tests that the user has not yet attempted
* Previously attempted tests are filtered out dynamically
* Each test card includes details and a start button

**3. Test Participation**

* Clicking a test starts a timer and opens the question interface
* Users select answers and submit the test before time expires
* Backend evaluates and stores the result immediately upon submission

**4. Reports**

* Users can view their past test attempts
* Each report includes score, rank, and test details
* Data is fetched dynamically and presented in a readable format

**Backend Features**

**API Endpoints**

* **/auth/** - Register, Login, Logout
* **/tests/** - CRUD operations on tests
* **/questions/** - Add/Edit/Delete questions for tests
* **/reports/** - Submit report, fetch user reports, get rank, delete report

**Ranking Logic**

* All user reports for a test are sorted in descending order of score
* Ranks are assigned with equality in mind; users with the same score share the same rank
* Efficiently computed using array mapping and score grouping

**Middleware**

* **Auth Middleware:** Validates JWT token for each protected route
* **Role Check Middleware:** Ensures only authorized users access specific endpoints
* **Error Handling Middleware:** Manages consistent and clean error responses

**Smart Functionalities**

* **Route Guards:** Protects routes from unauthorized access using Angular AuthGuard
* **Redirect After Login:** Preserves the original URL if user needs to login first (especially useful with shareable links)
* **Back Navigation Control:** Prevents re-accessing the test page after submission using browser back button
* **Token Expiry Handling:** Users are logged out when the token expires or on browser close
* **LocalStorage Usage:** For storing authentication data, redirect URLs, and session control

**Outcome**

The MCQ Test Web Application delivers a full-featured platform for conducting online tests. It provides secure and structured controls for both administrators and end users. With Angular 19's powerful UI components and a robust Express backend, it handles test management, real-time evaluation, and user reporting efficiently.

The system supports practical needs such as:

* Organized test creation and deployment
* User-specific test access and participation
* Accurate performance evaluation and ranking
* Easy integration and sharing of test links
* Scalable and maintainable architecture for future growth

This platform is ideal for institutions, coaching centers, or corporate environments that require a customizable and user-friendly solution for multiple-choice assessments.

**End of Documentation**