Quiz Master (MAD-1 Project)

Author

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I'm a IITM BS student currently in the diploma level.
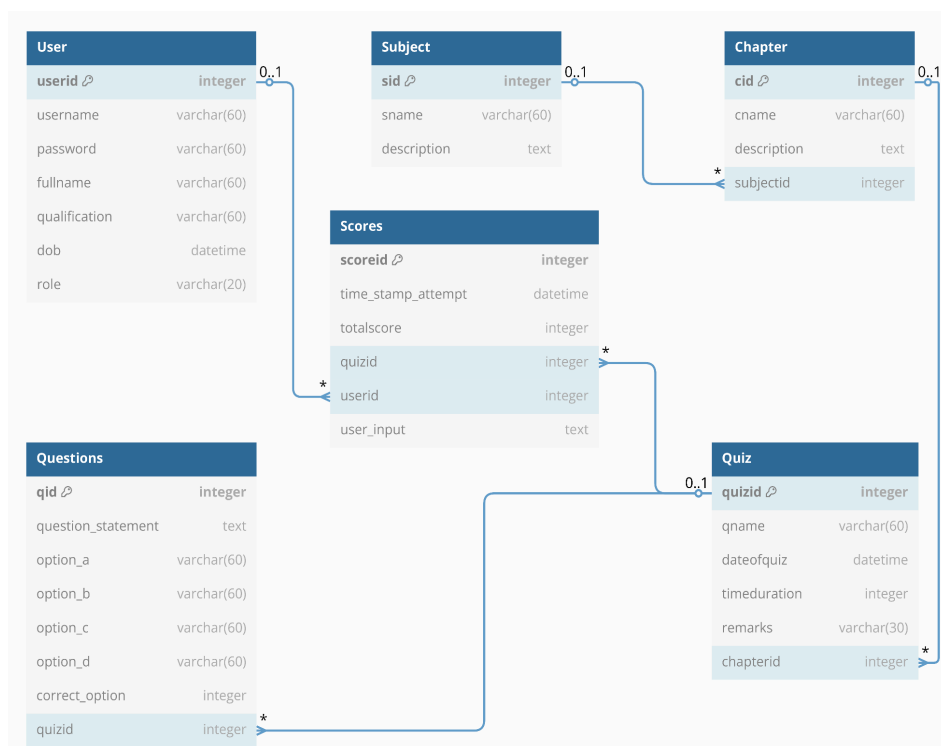
Description

A Flask-based quiz management system with admin/user roles, which enables multi-subject quizzes with timed attempts. Users can attempt quizzes as many times; the app provides performance tracking and analytics for both user and admin.

Technologies Used

- Backend
  - Flask : The entire web application is built on flask framework
  - Flask-SQLAlchemy : For creating and querying the relational database.
- Frontend
  - HTML : Used for structuring the contents of web pages.
  - Jinja2 : Used to enable dynamic content generation for HTML templates.
  - JavaScript : Used to have dynamic behavior in web pages.
  - CSS : Used to apply basic styling to enhance the web pages.
  - Bootstrap v5.3 : Used to create responsive and stylish web pages.
- Database
  - SQLite : Used as a relational database for the application.
- Libraries
  - Plotly : Used for creating interactive web-based visualization.

DB Schema Design

The database follows the relational model with multiple tables linked via foreign keys. Below is the ER Diagram:

- User : userid integer [primary key], username varchar(60) [not null, unique], password varchar(60) [not null], fullname varchar(60) [not null], qualification varchar(60) [not null], dob datetime [not null], role varchar(20) [not null, default: 'User']

- Subject : sid integer [primary key], description text [not null], sname varchar(60) [not null, unique]

- Chapter : cid integer [primary key], cname varchar(60) [not null], description text [not null], subjectid integer [not null, ref: > Subject.sid]

- Quiz : quizid integer [primary key], qname varchar(60) [not null], dateofquiz datetime [not null], timeduration integer [not null], remarks varchar(30), chapterid integer [not null, ref: > Chapter.cid]

- Questions : qid integer [primary key], question_statement text [not null], option_a varchar(60) [not null], option_b varchar(60) [not null], option_c varchar(60) [not null], option_d varchar(60) [not null], correct_option integer [not null], quizid integer [not null, ref: > Quiz.quizid]

- Scores : scoreid integer [primary key], time_stamp_attempt datetime, totalscore integer [not null], quizid integer [not null, ref: > Quiz.quizid], userid integer [not null, ref: > User.userid], user_input text [not null]

Flask-SQLAlchemy enables easy table relationships and direct access across models. Example, user.scores fetches all quiz attempts by user via User ↔ Scores relationship defined using db.relationship() and foreign keys.

Architecture and Features

Architecture :

The quiz application follows the Model-View-Controller architecture pattern using Flask.

- Models : The database schema is defined in models.py using Flask-SQLAlchemy, covering Users, Subject, Chapter, Quiz, Questions and Scores.

- Views : The HTML templates are stored in templates/ directory and inherited templates using Jinja2 rendering.

- Controllers : The application logic resides in routes.py and utils.py, which both handles user authentication, quiz management, quiz result calculations and admin functionalities.

- Database : The application uses SQLite relational database which is stored in an instance/ directory.

Features :

- User Roles
  - Admin : Create/Edit/Delete subjects, chapters, quizzes, and questions.
  - Users : Attempt any number of quizzes, view scores and view attempt history.
- Quiz Management
  - Time-limited quizzes with multiple questions (with only one correct option)
  - Automatic scoring system (takes place only after the quiz deadline ends)
  - Quiz attempt history tracking (records users each attempt option markings)
- Subject Hierarchy
  - Subjects → Chapters → Quizzes → Questions
- Search Functionality
  - Admin : Unified search across users, subjects, chapters, quizzes and questions
  - Users : Unified search across subjects, chapters, quizzes
- Analytics & Charts
  - Admin : Quiz performance and User engagement analytics.
  - User : Quiz Performance over time and Quiz participation metrics.

Project Presentation Video :

📹 quiz_master_21f1006877.mp4
https://drive.google.com/file/d/15k-NLlIwJxluLV9uYiyqPq09EbTTU-M3/view?usp=sharing