Project Report: Complete Architecture, Database, and Route Hierarchy of the App

1 Overall Application Architecture

- **Framework & Libraries:**
  - **Flask:** Primary web framework for handling HTTP requests, routing, sessions, and templating (via Jinja2).
  - **Flask-SQLAlchemy & SQLAlchemy:** Manage the Object Relational Mapping (ORM) to interact with a SQLite database.
  - **Flask-Migrate:** Supports database schema migrations.
  - **Additional Libraries:**
    - **datetime & pytz:** Manage dates, times, and timezone localization (set to Asia/Kolkata).
    - **random & copy:** Used for shuffling questions and options in the quiz.
- **Session Management & Role-based Access:** The application distinguishes between two types of users (admin and regular user) via session variables (e.g., `session['role']`). This determines route access and which templates are rendered.
- **Templates:** Multiple HTML templates (e.g., `index.html`, `login.html`, `admin_dashboard.html`, etc.) are used to render pages, with data passed from the database.
- **Database:** A SQLite database (`database.db`) is used with several interrelated models as described below.

2 Complete Database Schema

The application defines six primary models with the following fields and relationships:

1. User

- **Fields:**
  - `id`: Integer, primary key.
  - `username`: String (max 100), unique, required.
  - `password`: String (max 100), required.
  - `full_name`: String (max 100), optional.
  - `qualification`: String (max 100), optional.
  - `dob`: Date, optional.
  - `role`: String (max 20), required (e.g., `'admin'` or `'user'`).
  - `points`: Integer, default is 0.
- **Relationships:** One-to-many with **Score** (a user can have multiple quiz scores).

2. Subject

- **Fields:**
  - `id`: Integer, primary key.
  - `name`: String (max 100), required.
  - `description`: Text, optional.
- **Relationships:** One-to-many with **Chapter** (when a subject is deleted, its chapters are also removed).

3. Chapter

- **Fields:**
  - `id`: Integer, primary key.
  - `subject_id`: Integer, foreign key linking to a subject, required.
  - `name`: String (max 100), required.
  - `description`: Text, optional.
- **Relationships:** One-to-many with **Quiz** (deleting a chapter cascades and deletes its quizzes).

4. Quiz

- **Fields:**
  - `id`: Integer, primary key.
  - `chapter_id`: Integer, foreign key linking to a chapter, required.
  - `date_of_quiz`: Date, defaults to today.
  - `time_duration`: String (format "HH:MM"), denotes quiz duration.
  - `remarks`: Text, optional.
  - `question_limit`: Integer, required, default is 10.
  - `scheduled_at`: DateTime, required (indicates when the quiz is available).
- **Relationships:**
  - One-to-many with **Question** (all related questions are deleted if the quiz is removed).
  - One-to-many with **Score** (scores related to this quiz are also removed if the quiz is deleted).

5. Question

- **Fields:**
  - `id`: Integer, primary key.
  - `quiz_id`: Integer, foreign key linking to a quiz, required.
  - `question_statement`: Text, required.
  - `option1`, `option2`, `option3`, `option4`: Strings for possible answers.
  - `correct_option`: String (e.g., `'option1'`), indicates the correct answer.
  - `explanation`: Text, optional (provides additional context for the correct answer).

6. Score

- **Fields:**
  - `id`: Integer, primary key.
  - `quiz_id`: Integer, foreign key linking to a quiz, required.
  - `user_id`: Integer, foreign key linking to a user, required.
  - `time_stamp_of_attempt`: DateTime, defaults to current UTC time.
  - `total_scored`: Integer, represents the score achieved in the quiz.

These model definitions and relationships form the complete database structure used in the app [**?**].

3 Route Hierarchy and Template Connections

The routes are organized into three main groups: Public, Admin, and User routes. Each group connects to specific templates that render various pages.

3.1 A. Public Routes

- **Home Page:**
  - **Route:** `/`
  - **Template:** `index.html`
  - **Functionality:** Landing page of the app.
- **Authentication & Registration:**
  - **Admin Login:** `/admin/login` → Renders `login.html` with login type "Admin".
  - **User Login:** `/user/login` → Renders `login.html` with login type "User".
  - **User Registration:** `/register` → Renders `register.html`.
- **Logout:**
  - **Route:** `/logout`
  - **Functionality:** Clears the session and redirects to the home page.
- **Public Subject and Chapter Views:**
  - **Subject Details:** `/subject/{subject_id}` → Renders `view_subject.html`.
  - **Chapter Details:** `/chapter/{chapter_id}` → Renders `view_chapter.html`.

3.2 B. Admin Routes (prefixed with `/admin`)

- **Dashboard & Management:**
  - **Admin Dashboard:** `/admin/dashboard` → Renders `admin_dashboard.html` with a list of subjects.
  - **Admin Charts:** `/admin/charts` → Renders `admin_charts.html` showing summary statistics (subjects, chapters, quizzes, etc.).
- **Subject Management:**
  - **View Subject Details:** `/admin/subject/view/{subject_id}` → Renders `subject_details.html` with a list of chapters.
  - **Create Subject:** `/admin/subject/create` → Renders `create_subject.html`.

  - **Edit Subject:** `/admin/subject/edit/{subject_id}` → Renders `edit_subject.html`.
  - **Delete Subject:** `/admin/subject/delete/{subject_id}` → Deletes the subject and redirects.

- **Chapter Management:**
  - **View Chapter Details:** `/admin/chapter/view/{chapter_id}` → Renders `chapter_details.html` with its quizzes.
  - **Create Chapter:** `/admin/chapter/create/{subject_id}` → Renders `create_chapter.html`.
  - **Edit Chapter:** `/admin/chapter/edit/{chapter_id}` → Renders `edit_chapter.html`.
  - **Delete Chapter:** `/admin/chapter/delete/{chapter_id}` → Deletes and redirects to the subject view.

- **Quiz Management:**
  - **View Quiz Details:** `/admin/quiz/view/{quiz_id}` → Renders `quiz_details.html` with questions.
  - **Create Quiz:** `/admin/quiz/create/{chapter_id}` → Renders `create_quiz.html`.
  - **Edit Quiz:** `/admin/quiz/edit/{quiz_id}` → Renders `edit_quiz.html`.
  - **Delete Quiz:** `/admin/quiz/delete/{quiz_id}` → Deletes and redirects.

- **Question Management:**
  - **Create Question:** `/admin/question/create/{quiz_id}` → Renders `create_question.html`.
  - **Edit Question:** `/admin/question/edit/{question_id}` → Renders `edit_question.html`.
  - **Delete Question:** `/admin/question/delete/{question_id}` → Deletes and redirects.

- **User Management (Admin-specific):**
  - **View Users:** `/admin/users` → Renders `admin_users.html`.
  - **Edit User:** `/admin/user/edit/{user_id}` → Renders `admin_edit_user.html`.
  - **Delete User:** `/admin/user/delete/{user_id}` → Deletes a user.
  - **User Activities:** `/admin/user_activities` → Renders `admin_user_activities.html`.

- **Search & Performance:**
  - **Admin Search:** `/admin/search` → Renders `admin_search.html` with search results across users, subjects, and quizzes.
  - **Performance Dashboard:** `/admin/performance_dashboard` → Renders `performance_dashboard.html` with metrics and charts.

3.3 C. User Routes (prefixed with `/user` and other public endpoints)

- **Dashboard & Profile:**
  - **User Dashboard:** `/user/dashboard` → Renders `user_dashboard.html` with available subjects.
  - **Edit Profile:** `/user/profile/edit` → Renders `edit_user_profile.html`.
  - **Delete Profile:** `/user/profile/delete` → Deletes the user profile.

- **Quiz Interaction:**
  - **Attempt Quiz:** `/user/quiz/{quiz_id}` → Renders `attempt_quiz.html` with a randomized order of questions and options.
  - **Auto-Submit:** `/user/quiz/{quiz_id}/auto_submit` → Automatically submits the quiz if time expires.

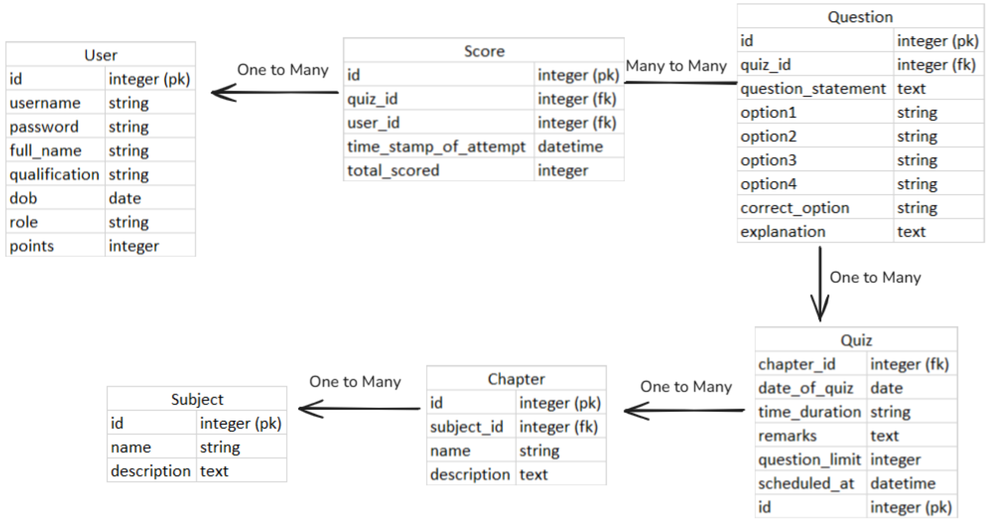
  - **Quiz Results:** `/user/quiz/results/{quiz_id}` → Renders `quiz_results.html`.

- **Performance & Scores:**
  - **User Scores:** `/user/scores` → Renders `user_scores.html` showing the list of quiz scores.
  - **Quiz Performance:** `/user/quiz/performance` → Renders `user_quiz_performance.html` with score trends.
  - **Overall Performance:** `/user/performance` → Renders `user_performance.html` with a performance chart.

- **Leaderboard:**
  - **Route:** `/leaderboard`
  - **Template:** `leaderboard.html`
  - **Functionality:** Displays the ranking of users based on accumulated points.

- **API Endpoints (JSON Responses):**
  - **Subjects API:** `/api/subjects`
  - **User Scores API:** `/api/user/{user_id}/scores`
  - **Quiz Stats API:** `/api/quiz_stats`

ER Diagram



User	
id	integer (pk)
username	string
password	string
full_name	string
qualification	string
dob	date
role	string
points	integer

Score	
id	integer (pk)
quiz_id	integer (fk)
user_id	integer (fk)
time_stamp_of_attempt	datetime
total_scored	integer

Question	
id	integer (pk)
quiz_id	integer (fk)
question_statement	text
option1	string
option2	string
option3	string
option4	string
correct_option	string
explanation	text

Quiz	
chapter_id	integer (fk)
date_of_quiz	date
time_duration	string
remarks	text
question_limit	integer
scheduled_at	datetime
id	integer (pk)

Chapter	
id	integer (pk)
subject_id	integer (fk)
name	string
description	text

Subject	
id	integer (pk)
name	string
description	text

ER Diagram of the Database (User, Subject, Chapter, Quiz, Question, Score)

Presentation Video

The presentation video is uploaded to Google Drive. Please access it using the following link:

Link to the video