CS348 - Introduction to Database Management

University of Waterloo

Cheriton School of Computer Science

Project: My Test Bank

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1 Project Description

This project named **My Test Bank** is designed to be a cross-platform application that provides featured test bank look-up services to registered users. Upon registration, users will be able to look up past tests and practice problem sets for all kinds of courses provided at the University of Waterloo through our application. We also provide features such as shuffling the order of the problems and the options within a questions.

2 Project details

2.1 Target Users

The users of the application could be students who may want to access some practice questions or testing resources for their academic courses as well as administrators of the application to manage(upload/update/delete) the resources.

2.2 Interaction With Users

The application interacts with users in different ways during each process.

2.2.1 New User Registration

During the process of registration, the user enters their desired username, password, email address then clicks on the ”Create” button to finish registration.

2.2.2 User Login

User enters the username and the corresponding password, then click the ”login” button.

2.2.3 Add Practice Problems to the Database

User enters the course name, course number, name of the practice problem set, and the problem content, including both the question and the answer, then click ”create”.

2.2.4 Work on Practice Problem Sets

By clicking ”Start Quiz”, user could work on randomly shuffled practice questions with randomly shuffled choices. User can click on a certain choice and ”Next” to move to the next question, or instead, they could also click ”Show Solution” to see the solution for that question.

2.3 Key Features

- Unique username and email pair.
- Unique practice problem set name.
- Allow users to contribute to the database and benefit all users by creating new practice problem sets.
- Questions and the order of the choices in each question are shuffled.
- Provide an overview of all the available practice problem sets to the users.
- Allow users to work on the problem and see the solution online.
- Notify users if a problem set is empty/invalid.

2.4 Dataset

Initially, We will create our own dataset by sorting out the public test bank resources and upload to GCP. After having the basic functionality and being able to provide this application to the users, we could also populate our dataset by accepting the practice problem sets entered by registered users.

2.5 Application Platform and User Interface

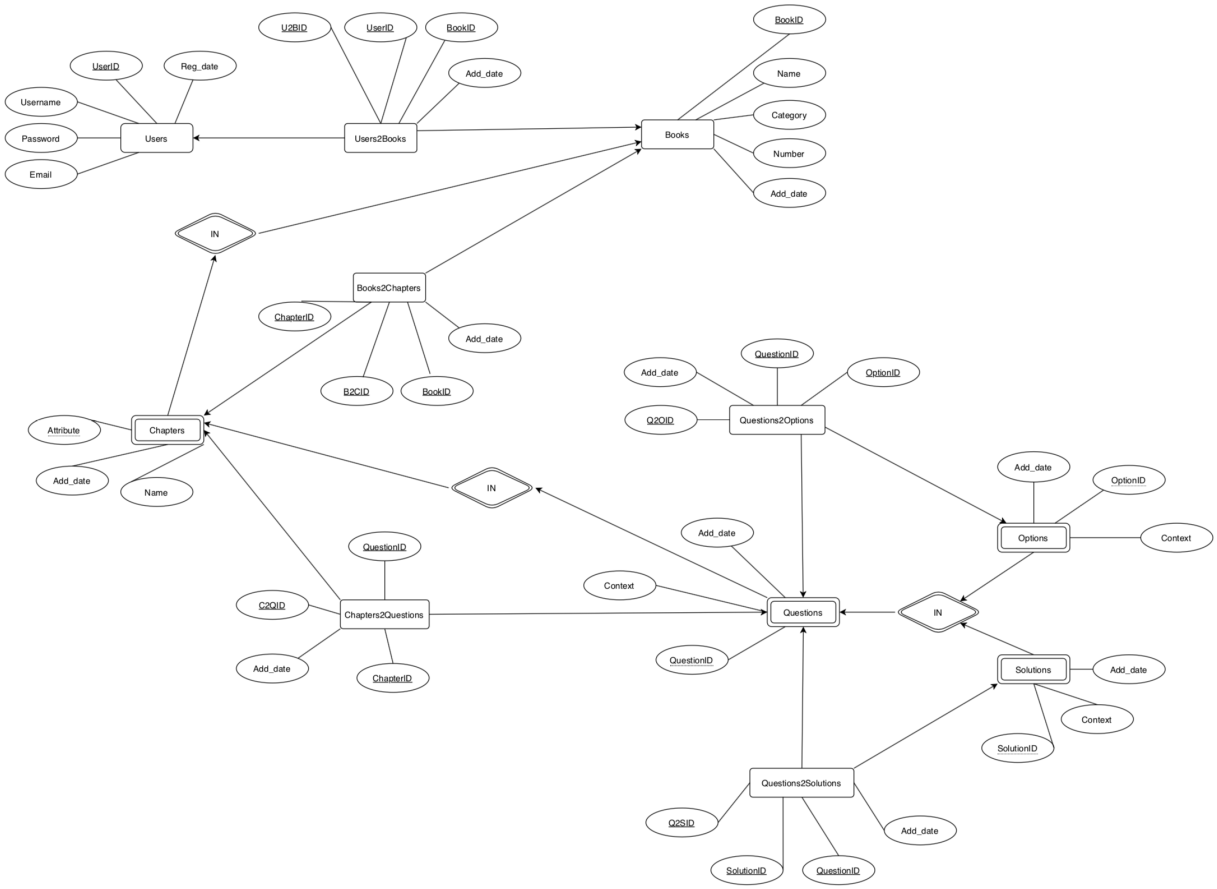
We will use MySQL as the platform via with Flask(Python). Users can interact with the application through web interface.

2.6 Design Database Schema

2.6.1 Data Assumptions

- Username and email are unique for each user.
- Password has to be longer than 6 characters including at least a letter and a number.
- Category and number pair are unique for each book, i.e., if book A's category is "CS" and number is "348", then "CS"+"350" and "SE"+"348" are valid while another "CS"+"348" is not allowed.
- A quiz can be started only when the selected chapter contains at least one question.

2.6.2 ER-Diagram



2.6.3 Relational Data Model

- Users(id, username, pw, email, reg_date)
  - username is a unique key
  - email is a unique key
- Books(id, category, number, name, add_date)
  - (category, number, name) is a unique key tuple
- Chapters(id, name, add_date)
- Questions(id, context, add_date)
- Options(id, context, add_date)
- Users_2_Books(id, user_id, book_id, add_date)

  - user_id is a foreign key pointing to id in Users
  - book_id is a foreign key pointing to id in Books
- Books_2_Chapters(id, book_id, chapter_id, add_date)
  - book_id is a foreign key pointing to id in Books
  - chapter_id is a foreign key pointing to id in Chapters
- Chapters_2_Questions(id, chapter_id, question_id, add_date)
  - chapter_id is a foreign key pointing to id in Chapters
  - question_id is a foreign key pointing to id in Questions
- Questions_2_Options(id, question_id, option_id, add_date)
  - question_id is a foreign key pointing to id in Questions
  - option_id is a foreign key pointing to id in Options
- Questions_2_Options(id, question_id, solution_id, add_date)
  - question_id is a foreign key pointing to id in Questions
  - solution_id is a foreign key pointing to id in Options