**CS3425 Final Project**

**Fall 2020**

**100 points, 20% of the overall grade**

**Report Due date: 11:59pm, Tuesday, Dec 15 (subject to change due to TA’s exam schedule).**

**Besides the report, you also need to schedule a 10-minute meeting with our TA before the report due. A signup sheet will be provided to you in week 14. During the Zoom meeting, the TA will ask you to run selected functions, which will be 20% of your project grade.**

**Project description:**

In this project, you will design and implement an extremely simplified online exam system. The system will be used by a single course for one semester. It will be used by the course’s instructor and students in the course. **If there is any ambiguous requirement to you, write down your assumptions in your project report.**

1. The instructor can create many exams. Each exam is uniquely identified by an exam name, such “Midterm”, “quiz1”, “quiz2” etc. We will also record when the exam is created and the total points of the exam.
2. Each exam will contain many questions. In each exam the question is uniquely identified by the questions’ number, such as 1,2,3. Different exams may have same question numbers.
3. All the questions are multiple choices.
   1. Each choice is uniquely identified by a choice identifier, such as “A”,”B”,”C” or “1”,”2”,”3”, and some text.
   2. The number of choices can vary for different questions. For example, the first question may have 3 choices (A,B,C) and the second question may have 5 choices(A,B,C,D,E).
   3. The instructor can assign points for each question.
   4. Instructor provides the correct choice for each question.

The points and correct choice for each question will be used for automatic grading.

1. Each student has an account with password. Instructor will create students for the class. The system records their student id, name, major. Each student is uniquely identified by student id.
2. Students will take the online exams. They will choose the exam by name after instructor creates them. After one student submit their answers, the system grades automatically and records the point the student get for each question and also record the total score for the whole exam.

**Your Tasks:**

1. E-R Model and Relational Schema

1) Construct an E-R diagram representing the conceptual design of the database.

2) Be sure to identify primary keys, relationship, cardinalities, etc.

3) Create relational schema from your E-R design, and refine it based on the principles of relational design.

2. SQL Schema

Create the tables in Mysql with PK, FK, unique, not null, etc. constraints as appropriate.

3. You shall design and implement the following functions for the instructor and the students.

The interfaces for teacher’s tasks can be implemented inside database as Stored Procedure or function. The interface for students must be accessible through Web Browser.

1) **Teachers**

1. Predefined teacher login name and password
2. Create students with initial password
3. Create exams
4. Create problems for exams
5. Create multiple choices for each problem
6. Set the correct answer for each problem
7. Check student grades for each exam

2) **Students**

1. Login to the system
2. Change password
3. Take exams and the system grade the exam automatically.
4. Check exam result. Including the total score, for each problem student’s answer, solution, the point that student get for each problem.

Let me repeat: the interfaces for teacher’s tasks can be implemented inside database as Stored Procedure or function. The interface for students must be accessible through Web Browser.

**What to turn in to canvas:**

To speed up the grading, please submit two files.

1. **FinalReport.pdf.** Put all the following contents into a pdf file **FinalReport.pdf**

1) E-R diagram and relational schema, plus any explanatory notes if you will.

2) SQL schema script. That is the create table statement.

3) Do the following three things for each task(total 5) below as user cs3425gr, not your account, which means you need to grant permission to cs3425gr appropriately.

A. The detailed instruction of how to perform the following task

B. The output of each task (if GUI, please attach screen shot),

C. Show the related data inside the database before and after the operation to proof that it works correctly

Please make sure you give clear instruction and include the exact input and output for each step because TA will do the test following your example here.

1. Create an new user **Alice**
2. Create a new exam **QuizF18**
3. Create 3 SQL related questions for the exam, each one worth 3, 4, 3 points, each question has 4 choices, make C, D, C to be the correct answers.
4. Have **Alice** login to the system with password
5. take the exam, answering A, D, C for the problems.

You have to show the user’s answer, and the grading result for each problem in the database by querying the data directly in Mysql Command Line or WorkBench.

1. Have Alice check her exam result.

She should get 7 points with the first one wrong and last two correct)

**2. Source Code files (source.zip or source.tar) Grading:**

1. ER design and relation schema: 10 points
2. SQL schema, including constraints and indices: 10 points
3. User interfaces in the report: 50 points

Teacher’s functions: 20 points

About 3 points for each function

Student’s functions: 30 points

Login in and log out: 5 points

Change password: 5 points

Take exam: 10 points

Automatic grading: 5 points  
 Check result of exams: 5

(Important note! You need to show that the above functions actually work correctly. You could display the related database data before and after the operation, then explain what had happened. You will only get 20% for each problem if there is no proof that the function works as expected)

1. Other requirements (10 points)
   1. Use transaction correctly: 2 points
   2. Encrypted password: 2 points
   3. SQL injection: 2 points
   4. Comments: 2 points
   5. Programming style: 2 points
2. Selected user interfaces checking by TA (20 points)

Extra points (up 15 points)

1. You may get to up 5 points for your user interface design. A nice interface includes the following
   1. Self explained – user does not need to be trained for long time to use it
   2. Efficient - user does not need to enter much information in different places
   3. User friendly - nice look, it is enjoyable for user to use it
2. You may earn up to 10 points for using OAuth 2.0 to authenticate the users of your web application.

In the specification, above, we have two functions:

* Teacher creates students and set the initial password for user.
* Students login with their password.

To do so, you will create a student account table to record their account name and password. Then you will need to ask student’s account and password to allow them login.

But with Google OAuth2.0 API, we will delegate the user authentication to Google’s OAuth Server. The OAuth 2.0 server will authenticate the user with their email address and ISO password. We can also specify the redirected URL once user has been authenticated.

What this means: we may still list valid students account (gmail address) in our table, but we don’t need to save passwords in the students table, and we don’t handle student login. Instead we let the OAuth 2.0 server do it, and tell the OAuth server where to go (redirect url) after user is authenticated.

See the instructions here: https://developers.google.com/api-client-library/php/auth/web-app