

Examination System

Team Tigers

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Project Overview

The Examination System is a software solution for an e-learning organization that wants to generate, grade, and customize their exams for their students. The software enables the instructors to fill in the questions bank, then generate an exam based on the course type. The exam is generated fairly based on specific criteria given in the business logic. The students can then take exams in the desired courses. On submission, the exam is graded, and the student's grade is then stored so he can review it whenever. Both the instructor and the student can also view their details via the system UI.

Architecture

Data Layer:

Utilizes a Microsoft SQL Server database to store and manage organization data.

Firstly, the analysis phase, where the requirements were gathered.

Then came the ERD designing phase, where it was determined that there were three main entities (Exam, Instructor and Student).

Based on that ERD, the mapping process took place, after it, a clear schema of the database emerged.

Finally, the implementation phase began, using the MS SQL Server, scripts were formed from the schema, generating stored procedures and detailed tables that will build the software underlying structure.

Logic Layer:

At the start of the system, the system administrator creates an account for the user through the database using the email provided by them. The user is then prompted to enter their username and password, from which the system determines whether the logged in person is an instructor or a student. After being logged in, the system redirects each user to either an instructor layout or a student layout.

The instructors can view their details in their layout. They also have the ability to create questions in the questions bank and generate exams in only the courses they are assigned to. They can also view their department's details, and depending on whether they are the manager or not, they can update the department details. Lastly, they can view their students' grades.

The students can view and edit their details in their layout accordingly. They can take exams in the courses they are assigned to. Lastly, they can view their grades in the courses they are assigned to.

Presentation Layer:

After wrapping up the data and logic layers, comes the presentation layer. The system uses Windows Forms .NET as a user interface to provide accessibility of the system's functions through a friendly interface. The system also uses MetrosetUI as it provides a more elegant look to the forms.

It consists of 3 parts, Login Form, Instructor Form, and Student Form.

- Login Form is responsible for handling the authentication of the user, passing the type of the current user to the business logic.
- Instructor Form is responsible for the instructor's actions and details.
- Student Form is responsible for the student's actions and details.

Database Schema

Main Tables:

- Course: Stores the courses provided by the organization. Consists of **Cr_ID, Cr_Name**.
- Topic: Stores topics that go under each course. Consists of **Topic_ID, Topic_Name, Cr_ID ->** (Relation between Course and Topic)
- Department: Stores the departments. Consists of **Dept_ID, Dept_Name, Dept_Description, Location, Mgr_ID ->** (Relation between Instructor and Department), **MGR_HireDate**.
- Instructor: Stores the instructors' information. Consists of **Ins_ID, Ins_Name, Ins_Salary, Ins_Degree, Dept_ID ->** (Relation between Department and Instructor), **Username**.
- Student: Stores the students' information. Consists of **St_ID, St_Name, St_Phone, St_Age, Street, City, Zip_Code, St_Email, Username, Dept_ID ->** (Relation between Department and Student)
- Exam: Stores the exams generated and whether they are taken or not. Consists of **Ex_ID, Cr_ID, IsAssigned**.
- Question: Stores information about questions. Consists of **Q_ID, Q_Head, Q_Grade, Q_Difficulty, Type, Model_Answer, Cr_ID->** (Relation between Course and Question)
- Question_Choices: Stores the choices for the questions. Consists of **Choice_Desc, Choice_Selector, Q_ID ->** (Relation between Question and Question Choices)

Relation Tables:

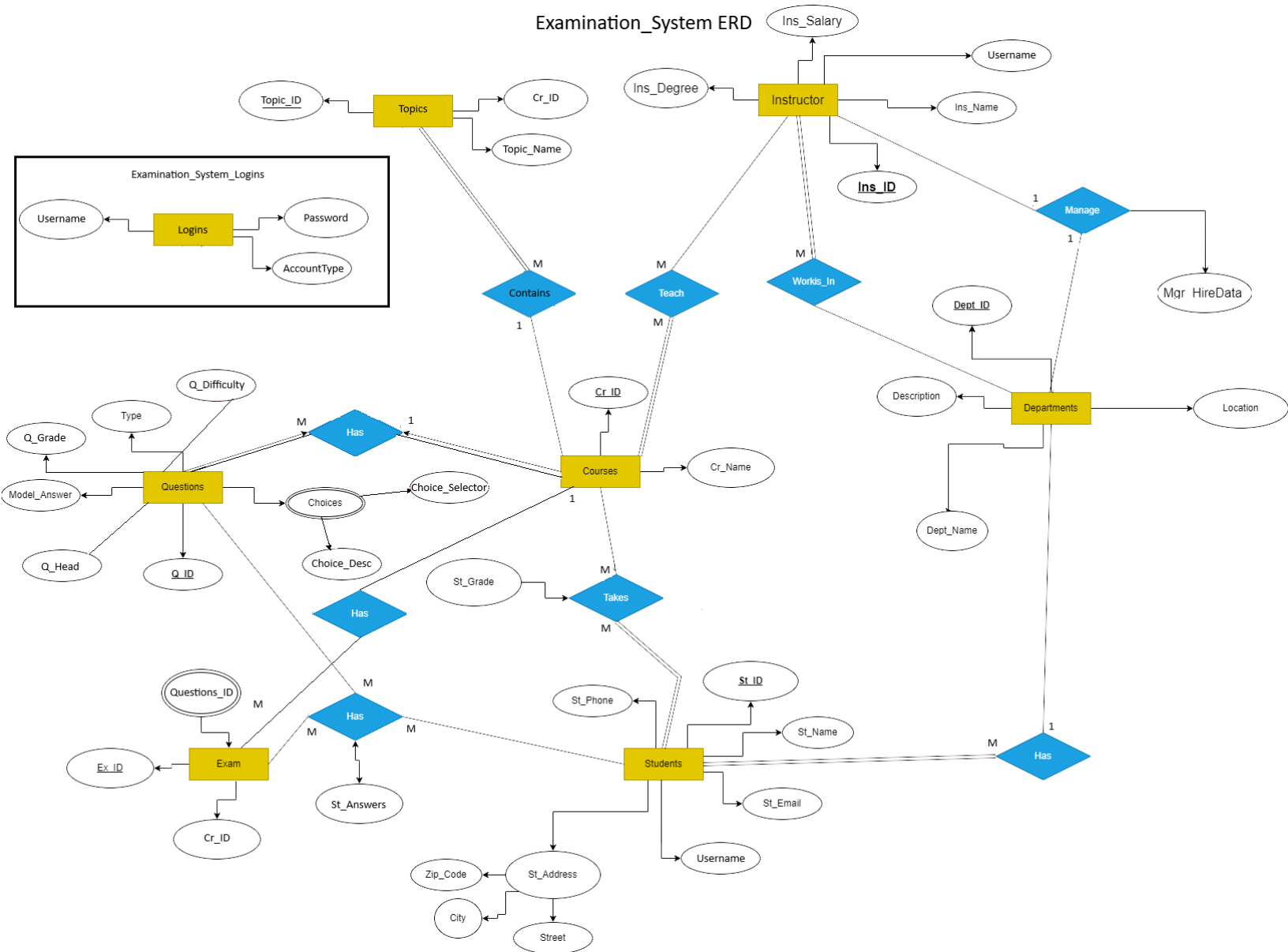
- Instructor_Course: Represents the M-M relationship between the two tables. Consists of
Ins ID, Cr ID
- Exam Questions: Represents the M-M Relationship between the two tables. Consists of
Q ID, Ex ID
- Student Exam Questions: Represents the relationship between the Exam, Student and Question tables. Consists of
St ID, Exam ID, Q ID, St Answer
- Student Course: Represents the M-M relationship between the two tables as well as their grade in said course. Consists of
St ID, Cr ID, St Grade

Login Tables:

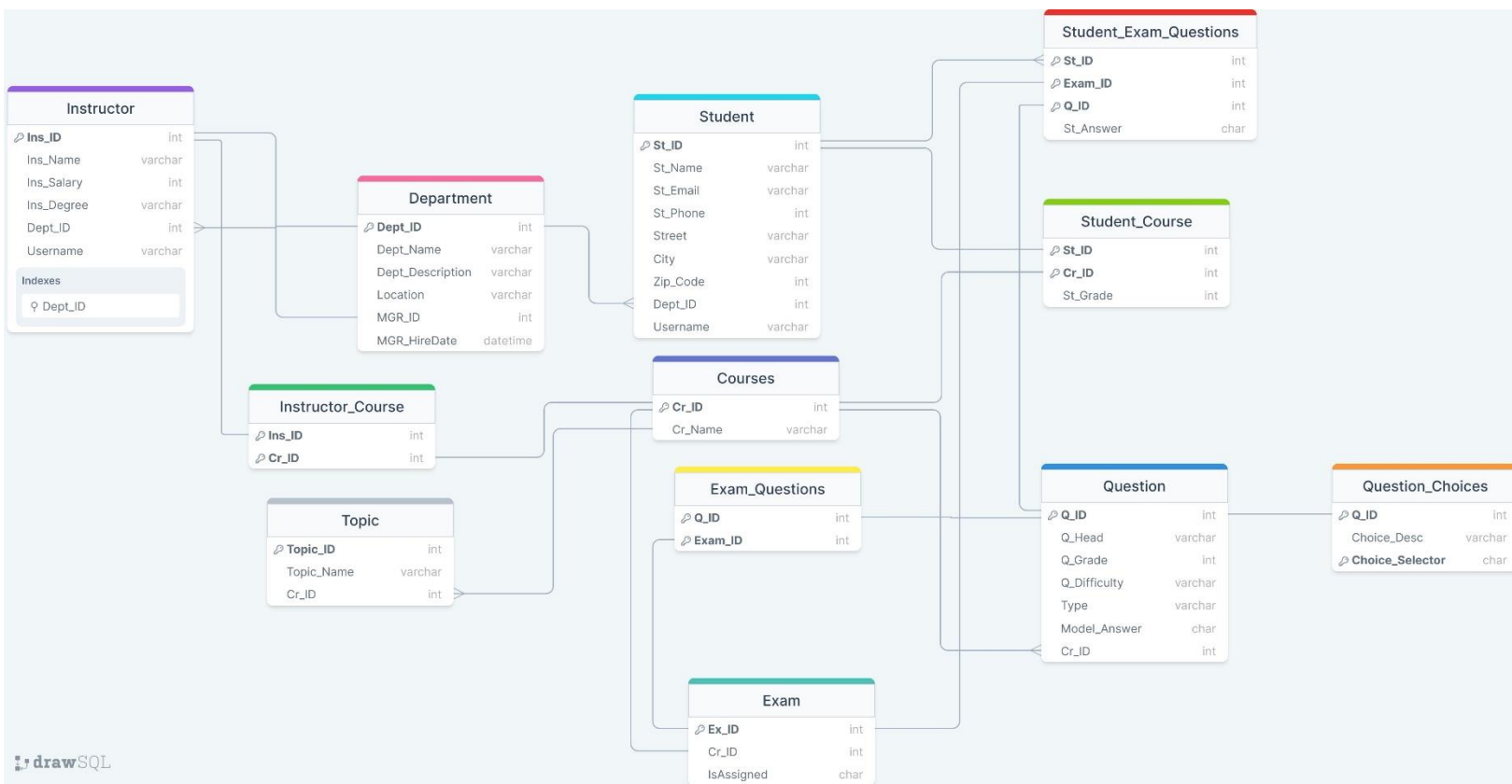
- Logins: Stores the Authentication information for the users.
Consists of
Username, Password, AccountType
- For the system's safety, it was decided that the Login tables would be in a different database to protect it from any possible data breaches or singular database crash with the information database.

ERD

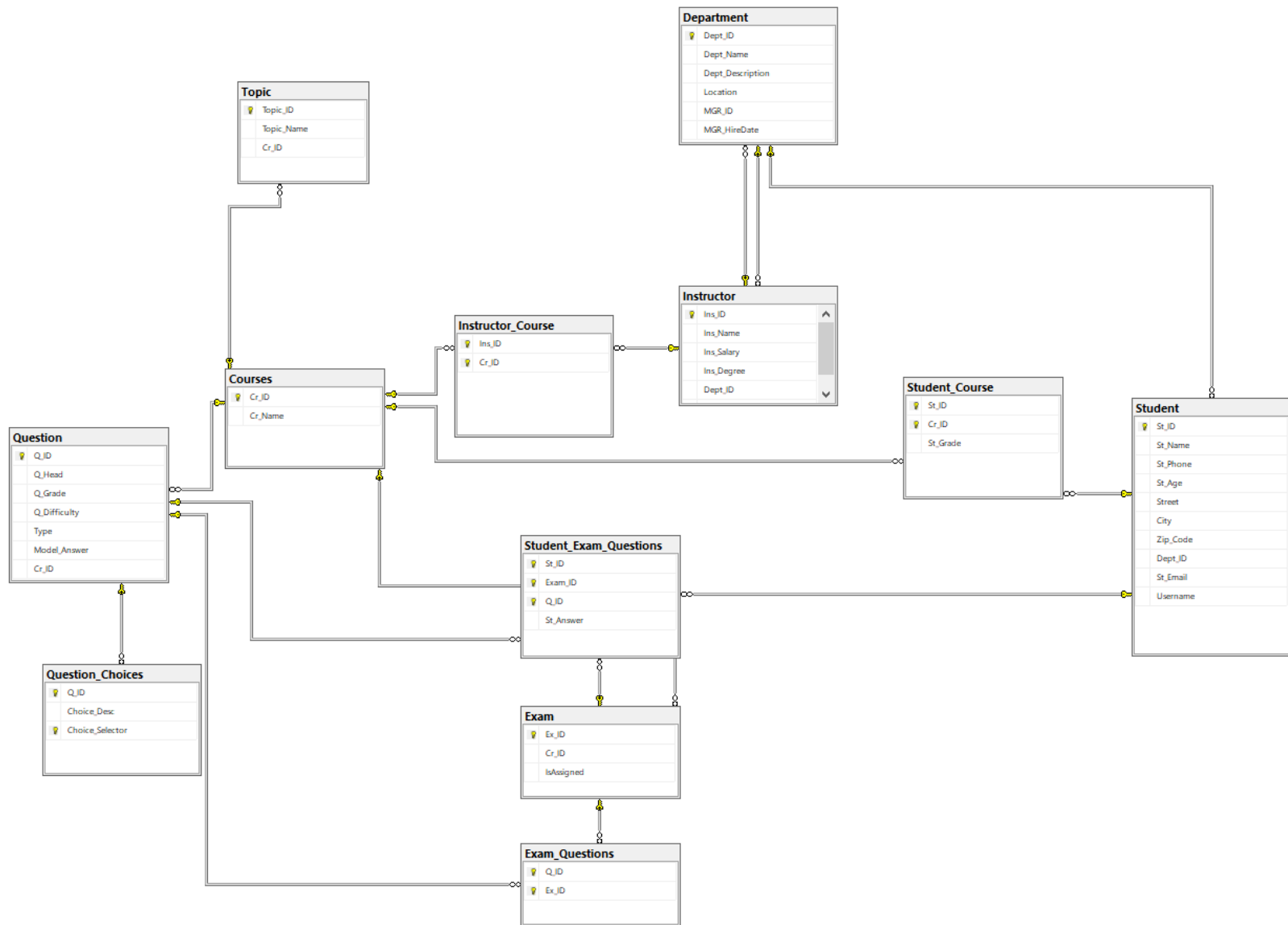
Examination_System ERD



Mapping



Diagram



User Interface

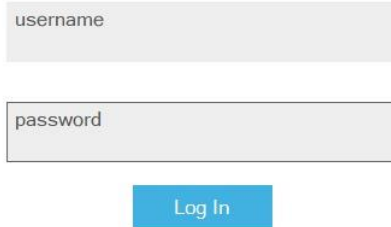
- The user interface is designed using C#'s Windows Forms .NET and enhanced by the [Metroset UI](#) to give it a fresher look aligning with the new versions of windows.

➤ It consists of 3 main forms:

1- Login Form:

Examination System

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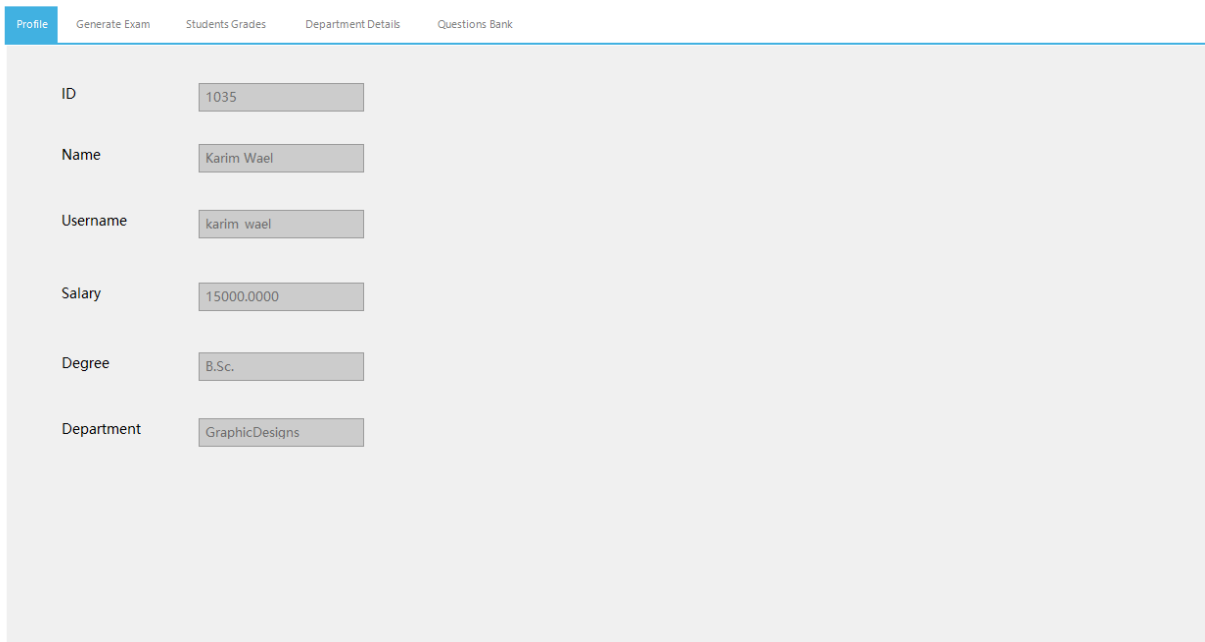
A screenshot of a login form. It features two input fields: the top one is labeled 'username' and the bottom one is labeled 'password'. Below these fields is a blue button with the text 'Log In'.

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2- Instructor Form:

Instructor's Control Panel

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A screenshot of the 'Instructor's Control Panel'. At the top, there is a navigation bar with five tabs: 'Profile' (which is highlighted in blue), 'Generate Exam', 'Students Grades', 'Department Details', and 'Questions Bank'. Below the navigation bar, there is a form with six rows, each containing a label and an input field. The data entered in the fields is as follows:

Label	Value
ID	1035
Name	Karim Wael
Username	karim wael
Salary	15000.0000
Degree	B.Sc.
Department	GraphicDesigns

3- Student Form:

Student Interface - □ ×

Profile

Take Exam

Grades

ID	1013	City	Giza	Username	ahmed_fawzi
Name	Ahmed Fawzi1	Street	5 Faisal St	Department	SD
Phone	<input type="text" value="01003337868"/>	Zip Code	<input type="text" value="46644"/>		
Email	<input type="text" value="ahmed.fawzi@mail.com"/>	Age	<input type="text" value="25"/>		<input type="button" value="Save"/>

Installation Guide

➤ To install the examination system you need the following items:

- Visual Studio and Sql Server Management Studio (SSMS)
- Project files ([GitHub](#))
- Databases .bak

➤ Steps:

1. Install Visual Studio and SSMS
2. Download the project files (clone if using GitHub)
3. Download the database restore files (ExaminationSystem.bak, ExaminationSystemLogin.bak)
4. Restore the databases through SSMS.
5. Configure the context connection string through the App.Config file.

```
<connectionStrings>
  <add name="ConnectionString" connectionString="Data Source=.;Initial
Catalog=Examination_System;TrustServerCertificate=True;Integrated Security=True"/>
  <add name="LoginConnectionString" connectionString="Data Source=.;Initial
Catalog=EXAMINATION_SYSTEM_LOGINS;TrustServerCertificate=True;Integrated
Security=True"/>
</connectionStrings>
```

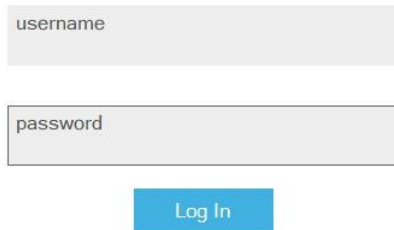
6. Build the application and run.

Usage Guide

1. Login through the login form using username and password provided by database administrator.

Examination System

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A login form with two input fields and a button. The first field is labeled 'username' and the second is labeled 'password'. Below the fields is a blue button labeled 'Log In'.

Log In

2. Navigate through the popup form

2.1. Instructor Form

2.1.1 Profile

The screenshot shows a web application window titled "Instructor's Control Panel". It has a navigation bar with five tabs: "Profile" (selected), "Generate Exam", "Students Grades", "Department Details", and "Questions Bank". The main content area displays a profile form with the following fields and values:

Field	Value
ID	1035
Name	Karim Wael
Username	karim wael
Salary	15000.0000
Degree	B.Sc.
Department	GraphicDesigns

2.1.2 Generate Exam

The screenshot shows the same "Instructor's Control Panel" window, but with the "Generate Exam" tab selected. The form contains the following fields and values:

Field	Value
Course	C#
Number of MCQ questions	0
Number of TF questions	0

A blue button labeled "Generate Exam" is located at the bottom right of the form.

2.1.3 Student Grades

Instructor's Control Panel - □ ×

Profile Generate Exam **Students Grades** Department Details Questions Bank

	CourseName	StudentName	StudentGrade

2.1.4 Department Details

Instructor's Control Panel - □ ×

Profile Generate Exam Students Grades **Department Details** Questions Bank

Department Details:

Department ID

Department Name

Department Description

Department Location

Manager ID

Manager Hire Date

2.1.5 Questions Bank: used for storing new questions

Instructor's Control Panel - □ ×

Profile Generate Exam Students Grades Department Details **Questions Bank**

Question	Question	Question	Question Head
<input type="radio"/> True/False <input type="radio"/> MCO	Question Grade		
Select	Question		
C#	<input type="radio"/> Easy <input type="radio"/> Medium <input type="radio"/> Hard		
Set Question			

2.2. Student Form

2.2.1 Profile

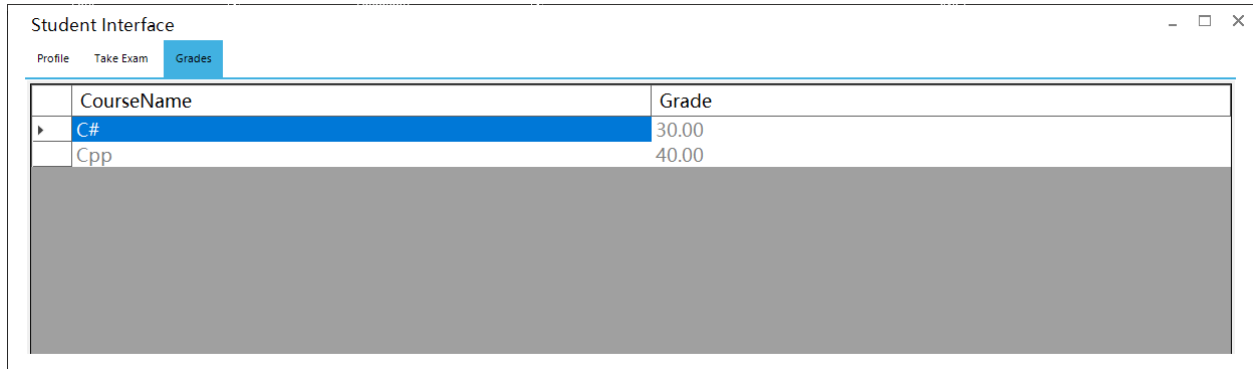
Student Interface - □ ×

Profile Take Exam Grades

ID	1013	City	Giza	Username	ahmed_fawzi
Name	Ahmed Fawzi1	Street	5 Faisal St	Department	SD
Phone	01003337868	Zip Code	46644		
Email	ahmed.fawzi@mail.com	Age	25		Save

2.2.2 Take Exam

2.2.3 Grades: only the current student's grade



The screenshot shows a web application window titled "Student Interface" with standard window controls (minimize, maximize, close) in the top right corner. Below the title bar is a navigation bar with three tabs: "Profile", "Take Exam", and "Grades". The "Grades" tab is currently selected and highlighted in blue. The main content area displays a table with two columns: "CourseName" and "Grade". The table contains two rows of data: "C#" with a grade of 30.00, and "Cpp" with a grade of 40.00. The "C#" row is highlighted in blue. Below the table, there is a large, solid gray rectangular area, likely a placeholder for additional content or a chart.

	CourseName	Grade
▶	C#	30.00
	Cpp	40.00

Conclusion

In conclusion, the Examination System represents a robust and comprehensive solution tailored for e-learning organizations seeking efficient exam generation, grading, and customization capabilities. Throughout the development process, **Team Tigers** accurately analyzed requirements, designed an appropriate database schema, and implemented a multi-layered architecture to ensure scalability, reliability, and security.

The software's architecture, building distinct layers for data management, business logic, and presentation, facilitates seamless interaction between users and the system. Leveraging Microsoft SQL Server for data storage ensures the integrity and accessibility of organization data, while Windows Forms .NET, augmented with Metroset UI, provides a user-friendly interface for instructors and students alike.

With features such as exam generation based on predefined criteria, question bank management, and grade tracking, the system empowers instructors to efficiently manage courses and assessments. Similarly, students benefit from streamlined exam-taking experiences and easy access to their grades and profile information.

The installation process, outlined in the documentation, ensures a smooth setup for administrators, while the usage guide offers clear instructions for users to navigate the system's functionalities effectively.

In essence, the Examination System exemplifies **Team Tigers'** commitment to delivering a tailored software solution that meets the evolving needs of e-learning organizations, enhancing productivity, and fostering an enriched learning experience for both instructors and students.