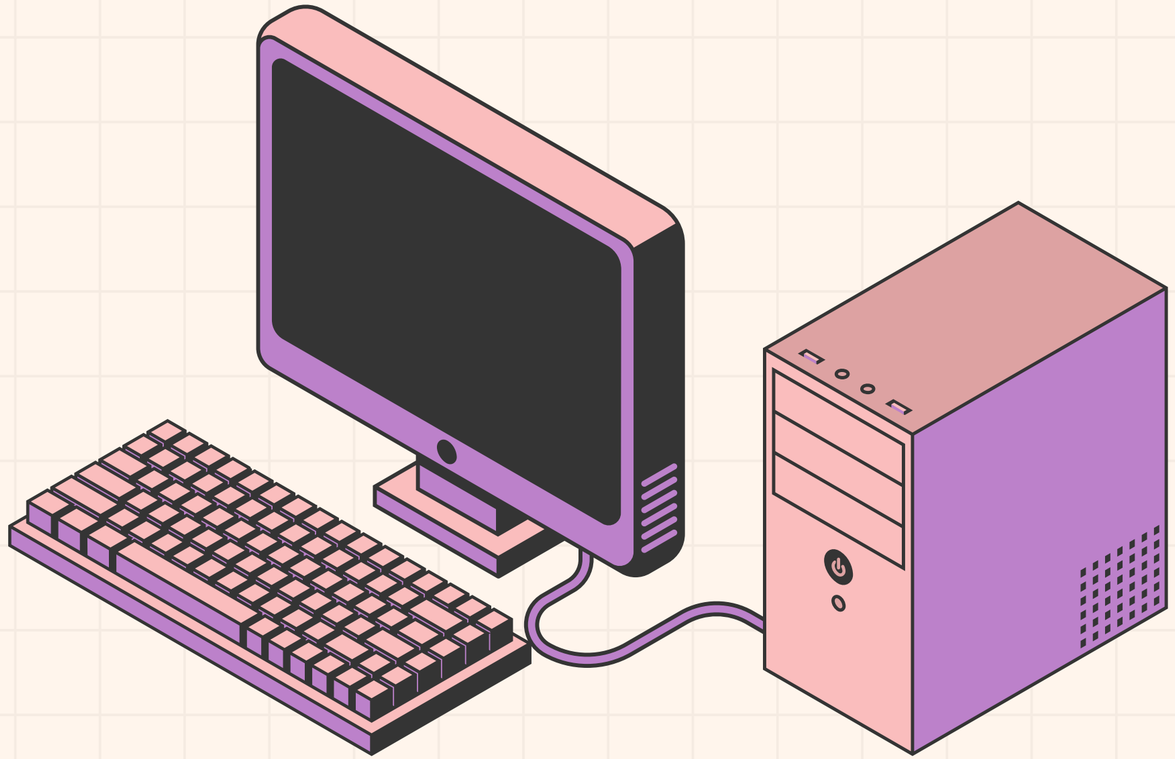
ONLINE

EXAMINATION MANAGEMENT SYSTEM



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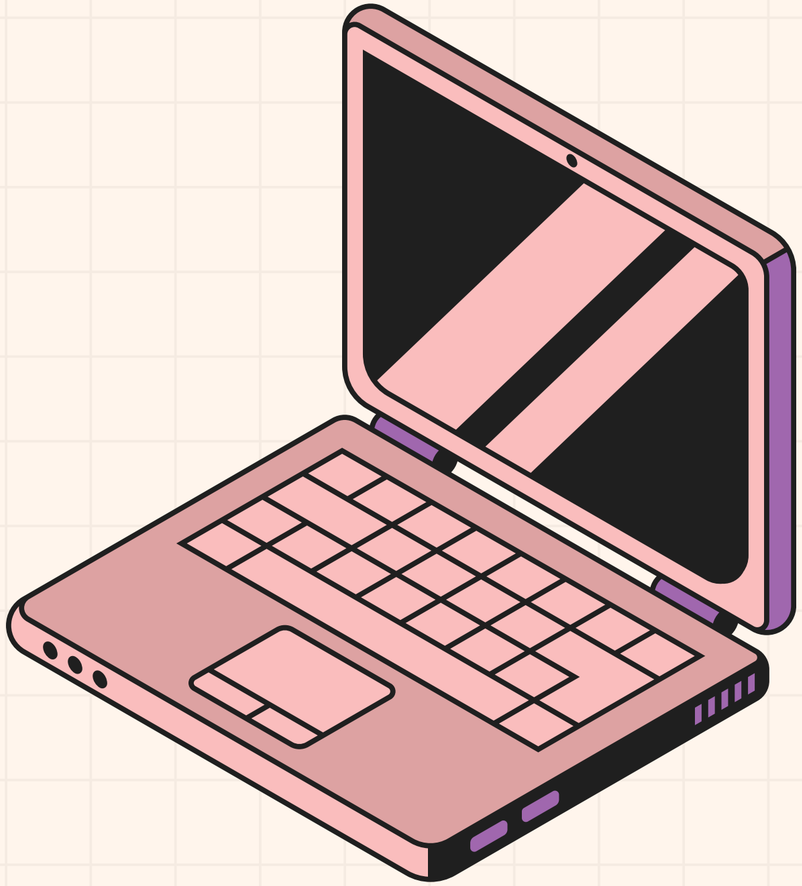


OBJECTIVES

- ✓ To organize Examination Data
- ✓ To manage System Tasks with SQL
- ✓ To simplify the Grading Process
- ✓ To provide Insightful Reports
- ✓ To secure Data

OVERVIEW

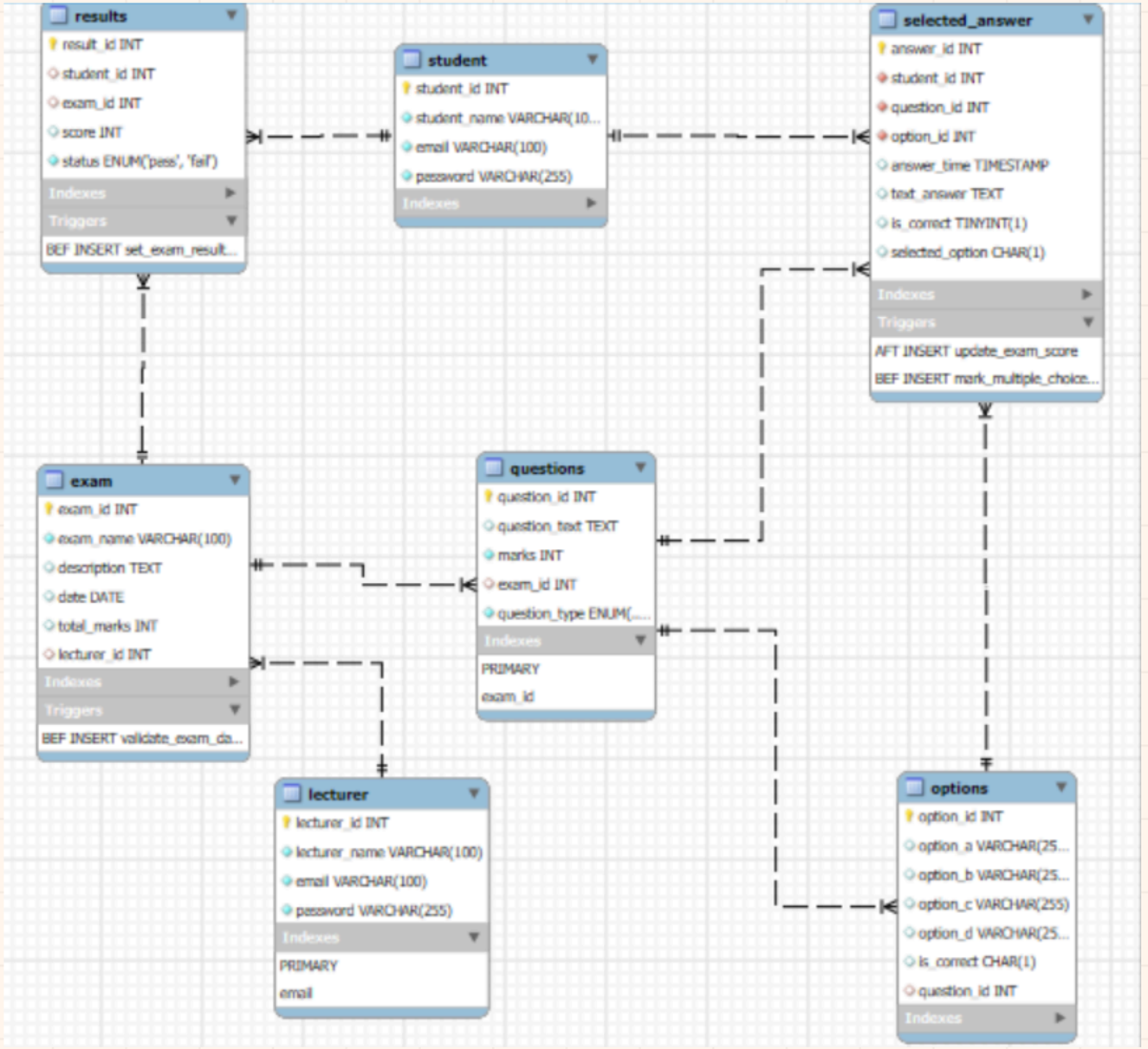
This project focuses on building a system that simplifies how online examinations are managed. It is designed to allow teachers to create and organize tests and provide students with a platform to take exams and view their results. The system will use SQL and its system design features such as queries, schemas and ER diagrams to structure and maintain the database for storing information, like user accounts, test questions, submissions, and grades.

SYSTEM DESIGN

TABLES WE HAVE

- Lecturer
- Student
- Exam
- Questions
- Options
- Selected Answer

ER DIAGRAM



TO ORGANIZE EXAMINATION DATA

✔ We built a database to store questions, student records, lecturer (examiner) records, test submissions, and results in a clear and structured way.

Example of the scripts for creating tables

```
-- Create student table
CREATE TABLE Student (
 student_id INT PRIMARY KEY AUTO_INCREMENT,

 student_name VARCHAR(100) NOT NULL,

 email VARCHAR(100)NOT NULL UNIQUE ,

 password VARCHAR(255) NOT NULL
);
```

```
-- Create lecturer table
CREATE TABLE Lecturer (
 lecturer_id INT PRIMARY KEY AUTO_INCREMENT,

 lecturer_name VARCHAR(100) NOT NULL,

 email VARCHAR(100) UNIQUE NOT NULL,

 password VARCHAR(255) NOT NULL
);
```

EXAM TABLE

```
--Create Exam table
CREATE TABLE Exam (

 exam_id INT PRIMARY KEY AUTO_INCREMENT,

 exam_name VARCHAR(100) NOT NULL,

 description TEXT,

 date DATE,

 total_marks INT,

 lecturer_id INT,

 FOREIGN KEY (lecturer_id) REFERENCES
Lecturer(lecturer_id)
);
```

RESULTS TABLE

```
-- Create Results table
CREATE TABLE Results (

 result_id INT PRIMARY KEY AUTO_INCREMENT,

 student_id INT,

 exam_id INT,

 score INT DEFAULT 0,

 status ENUM('pass', 'fail') NOT NULL,

 FOREIGN KEY (student_id) REFERENCES
student(student_id),

 FOREIGN KEY (exam_id) REFERENCES exam(exam_id)

);
```

TO MANAGE SYSTEM TASKS

✔We wrote SQL commands to handle adding, updating, retrieving, and deleting data related to exams, users, and results.

- INSERT to add data into the tables
- UPDATE to edit information in the database
- SELECT to retrieve data from the database
- DELETE to delete data in the database

✔In addition, we used stored procedures to add new data in the database.

TO SIMPLIFY THE GRADING PROCESS

✔Set up tools to calculate scores automatically and update records after students complete the tests

- Made use of a trigger that automatically updates a student's score when a new answer is added based on the correctness of the answer selected.
- We also created a trigger that automatically checks whether the option selected is the correct one.
- Lastly a trigger that assigns a pass or fail automatically based on the threshold set

TRIGGERS

EXAM SCORE TRIGGER

```
DELIMITER //
CREATE TRIGGER update_exam_score
AFTER INSERT ON Selected_Answer
FOR EACH ROW
BEGIN
    DECLARE question_marks INT;
    DECLARE exam_id_var INT;

    SELECT marks INTO question_marks
    FROM Questions
    WHERE question_id = NEW.question_id;

    SELECT exam_id INTO exam_id_var
    FROM Questions
    WHERE question_id = NEW.question_id;

    UPDATE Results r
        SET r.score = r.score + (CASE WHEN NEW.is_correct THEN
question_marks ELSE 0 END)
    WHERE r.student_id = NEW.student_id AND r.exam_id = exam_id_var;
END;//
DELIMITER ;
```

Explanation

The trigger automatically updates a student's score when a new answer is added based on the correctness of the answer selected

MULTIPLE MAX CHOICE TRIGGERS

```
DELIMITER //
CREATE TRIGGER mark_multiple_choice_answer
BEFORE INSERT ON Selected_Answer
FOR EACH ROW
BEGIN
    DECLARE correct_option CHAR(1);

    -- Check if the question is of type 'multiple_choice'
        IF (SELECT question_type FROM Questions WHERE question_id =
NEW.question_id) = 'multiple_choice' THEN
        -- Retrieve the correct option for the question
        SELECT is_correct INTO correct_option
        FROM Options
        WHERE question_id = NEW.question_id;

        -- Compare the selected option with the correct option
        IF NEW.selected_option = correct_option THEN
            SET NEW.is_correct = TRUE; -- Answer is correct
        ELSE
            SET NEW.is_correct = FALSE; -- Answer is incorrect
        END IF;
    ELSE
        -- If the question is not 'multiple_choice', leave is_correct as NULL
        SET NEW.is_correct = NULL;
    END IF;
END;
//
DELIMITER ;
```

Explanation

The trigger checks whether the selected option is correct

STATUS SCORE TRIGGER

```
DELIMITER //
CREATE TRIGGER set_exam_result_status
BEFORE INSERT ON Results
FOR EACH ROW
BEGIN
    DECLARE pass_threshold INT DEFAULT 50;
    IF NEW.score >= pass_threshold THEN
        SET NEW.status = 'pass';
    ELSE
        SET NEW.status = 'fail';
    END IF;
END;//
DELIMITER ;t
```

Explanation

The trigger automatically assigns a pass or fail status based on the results

TO PROVIDE INSIGHTFUL REPORTS

- ✔ We created database queries as well as views to display information, such as student performance and exam statistics, in a detailed format.

REPORT ON THE CORRECT ANSWERS OF A SPECIFIC EXAM

question_id	question_text	correct_answer_text	correct_option	exam_id
1	Which on is NOT a hardware component?	Operating System	B	100
9	What is the main function of the CPU in a computer?	Perform calculations	A	100
10	Which of the following is an example of an input device?	Keyboard	B	100
11	What does the term "RAM" stand for in computing?	Random Access Memory	B	100
12	What is the primary purpose of an operating system?	To manage hardware resources	A	100
13	Which programming language is commonly used for web development?	HTML	C	100

```
-- Report on the correct answers of a specific exam
CREATE VIEW MarkingScheme AS
SELECT
    q.question_id,
    q.question_text,
    CASE o.is_correct
        WHEN 'A' THEN o.option_a
        WHEN 'B' THEN o.option_b
        WHEN 'C' THEN o.option_c
        WHEN 'D' THEN o.option_d
    END AS correct_answer_text,
    o.is_correct AS correct_option,
    q.exam_id
FROM
    Questions q
JOIN
    Options o ON q.question_id = o.question_id
WHERE
    o.is_correct IN ('A', 'B', 'C', 'D');
```

```
-- Viewing the marking scheme
SELECT * FROM MarkingScheme WHERE exam_id = 100;
```

REPORT FORM FOR A STUDENT

-- Report on the results of a specific student

CALL GetStudentResults(1000);

result_id	exam_name	score	status	total_marks
1	Introduction To Computing	60	pass	70
4	Basic Mathematics	50	pass	100
19	Advanced Database	68	pass	100

Uses the GetStudentResults procedure

REPORT ON STUDENTS' PERFOMANCE IN A SPECIFIC EXAM

```
CREATE VIEW ExamResults AS
SELECT
 r.result_id,
    r.student_id,
    s.student_name,
    e.exam_id,
    e.exam_name,
    r.score,
    r.status
FROM
    Results r
JOIN
    Student s ON r.student_id =
s.student_id
JOIN
    Exam e ON r.exam_id = e.exam_id
ORDER BY
    e.exam_id DESC, r.score DESC;

SELECT *
FROM ExamResults
WHERE exam_id = 102;t
```

result_id	student_id	student_name	exam_id	exam_name	score	status
20	1001	Ashford Kipleting	102	Advanced Database	90	pass
23	1005	King James	102	Advanced Database	87	pass
25	1007	Christine Achola	102	Advanced Database	80	pass
28	1010	Chris Zawadi	102	Advanced Database	71	pass
27	1009	Danny Samuel	102	Advanced Database	69	pass
19	1000	Hamisi Juma	102	Advanced Database	68	pass
26	1008	Jeff Mulwa	102	Advanced Database	60	pass
30	1012	Elton Kawia	102	Advanced Database	54	pass
22	1004	Collins Ondeki	102	Advanced Database	53	pass
24	1006	Joy Kamau	102	Advanced Database	46	fail
21	1003	David Erick	102	Advanced Database	35	fail
29	1011	Fiona Waziri	102	Advanced Database	30	fail

VIEW ON THE EXAM QUESTIONS WITH THEIR RESPECTIVE OPTIONS

exam_id	exam_name	question_	question_text	question_type	option_id	option_a	option_b	option_c	option_d
100	Introduction To Computing	1	Which on is NOT a hardware component?	multiple_choice	2	Monitor	Operating System	Keyboard	Mouse
100	Introduction To Computing	9	What is the main function of the CPU in a computer?	multiple_choice	4	Perform calculations	Store data	Display images	Print documents
100	Introduction To Computing	10	Which of the following is an example of an input device?	multiple_choice	5	Monitor	Keyboard	Printer	Speaker
100	Introduction To Computing	11	What does the term RAM" stand for in computing?"	multiple_choice	6	Read Access Memory	Random Access Memory	Readable and Accessible Memory	Randomized Address Memory
100	Introduction To Computing	12	What is the primary purpose of an operating system?	multiple_choice	7	To manage hardware resources	To calculate mathematical equations	To create software applications	To store files
100	Introduction To Computing	13	Which programming language is commonly used for web development?	multiple_choice	8	C	Python	HTML	Java

```
CREATE VIEW ViewExamQuestions AS
SELECT
    q.exam_id, e.exam_name, q.question_id,
q.question_text, q.question_type,
    o.option_id, o.option_a, o.option_b, o.option_c,
o.option_d
FROM
    Questions q
LEFT JOIN
    Options o ON q.question_id = o.question_id
JOIN
    Exam e ON q.exam_id = e.exam_id;
```

```
SELECT *
FROM ViewExamQuestions
WHERE exam_id = 100;
```

This view displays the exam questions and choices for students

TO SECURE DATA

✔ We encrypted the passwords of lecturers and students using SHA2 ((Secure Hash Algorithm 2).

```
-- Adding new student
DELIMITER //

CREATE PROCEDURE AddStudent(
    IN p_student_name VARCHAR(100),
    IN p_email VARCHAR(100),
    IN p_password VARCHAR(255)
)
BEGIN
    INSERT INTO Student (student_name, email, password)
    VALUES (p_student_name, p_email, SHA2(p_password, 256));
END //

DELIMITER ;
```

CONCLUSION

From our implementation of an online management system we managed to perform various SQL operations such as creating tables , perform commands to manipulate the data in the tables as well as providing valuable reports from the data

RECOMMENDATIONS

- Improved security features and audits.
- Integrate with a learning management system for a better experience.
- Improve the feedback mechanism.