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Computer Based Tests using PHP and MYSQL

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Abstract: In the current digital age, numerous recruitment bodies and educational institutions are transitioning from conventional paper examinations to Computer Based Tests (CBT).A Computer Based Test system is an online assessment platform where candidates take exams using computers rather than traditional pen and paper. The system autonomously assesses the responses and delivers immediate outcomes, guaranteeing precision, clarity, and efficacy. The goal of this project is to create a CBT (Computer Based Test) System that enables students to take exams online in a safe and easy-to-use setting. The platform offers features for both administrators and students — the administrator can generate exams, organize questions, and access results, whereas students can sign in, take the exam within a specified time frame, and immediately obtain their scores. Competitive exams are a type of examination conducted to test and rank candidate according to their grades, percentage, or percentile. These exams are mostly conducted at the central or state level. Competitive exams in India are conducted by UPSC and various State Public Service Commissions for various fields like engineering, medicine, law etc. These exams are mostly conducted whenever needed and millions of individuals appear for these exams. The idea of such exams is to select deserving and worthy candidates by making them appear for the exam in a fair and unbiased setting. A multiple-choice question (MCQ) are composed of stem that identifies the question or problem, and a set of alternatives or possible answers that contain a key that is the best answer to the question, and a number of distracters that are plausible but incorrect answers to the question. Students respond to MCQs by indicating the alternative that they believe best answers or completes the stem. There are many advantages to using MCQs for assessment. One key advantage is that the questions are easy to mark and can even be scored by a computer, which makes the man attractive assessment approach for large classes. Well designed MCQs allow testing for a wide breadth of content and objectives and provide an objective measurement of aspirant ability.

Keywords: Computer Based Test (CBT), PHP, MYSQL, Admin Panel, Student Panel, SQL

I. Introduction

Background of the Study

Traditional examinations using paper and pen were time-consuming, required manual checking, and often led to errors and delays in result processing. With the growth of technology, Computer Based Testing (CBT) emerged as an efficient alternative, offering automated evaluation, instant results, and better management of large-scale exams. This project is designed to develop a CBT System that provides a faster, more accurate, and user-friendly platform for conducting online examinations.

II . Problem Statement

The traditional paper-based examination system is time-consuming, costly, and prone to human errors during evaluation and result processing. Managing large numbers of students, maintaining exam security, and ensuring timely result declaration are major challenges in manual systems. Due to these limitations, there is a need for a

Computer Based Test (CBT) System that can automate the examination process — from question paper generation to result evaluation — providing accuracy, transparency, and efficiency in conducting exams.

Objectives of the System

- To conduct exams online in an efficient and user-friendly manner.
- To automate the evaluation and result generation process.
- To provide instant results to students after submission.
- To maintain a secure record of questions, answers, and results.
- To reduce manual errors and improve transparency in examinations.

Purpose of the Project

The main purpose of this project is to develop an efficient and automated examination system that replaces the traditional paper-based testing method. This Computer Based Test (CBT) System aims to make the examination process faster, more accurate, and convenient for both students and administrators.

It provides:

- Instant result generation after the test
- Reduced human error in checking and scoring
- Secure and organized management of exams and results
- Time-saving and eco-friendly examination process

Overall, the project's purpose is to digitize the testing system and ensure fairness, accuracy, and efficiency in assessments.

III.Scope Of The Project

The scope of the **Computer Based Test (CBT) System** includes the design and implementation of an **online examination platform** that automates the entire testing process.

Key points include:

1. **Online Examination** – Students can take exams on a computer anytime and anywhere.
2. **Instant Evaluation** – Automatic scoring and result generation immediately after submission.
3. **Question Management** – Admin can add, update, or delete questions and manage multiple exams.
4. **Time Management** – Exams are conducted with a timer and auto-submit on timeout.
5. **Secure and Organized System** – User authentication ensures secure access for students and admins, with proper storage of results.
6. **Versatility** – Can be used in schools, colleges, universities, recruitment boards, and certification exams.

Features Overview

The **CBT (Computer Based Test) System** provides a secure and user-friendly platform for online examinations. It includes features like **student and admin login, exam and question management, timer-based tests, and automatic evaluation**. Students can attempt exams with randomized questions, and results are generated instantly after submission. The system ensures **efficient data storage, result tracking, and**

improved exam management, making it suitable for schools, colleges, recruitment boards, and certification exams.

IV.System Analysis:

1. Existing System

In many educational institutions, examinations are still conducted manually using pen and paper. This conventional approach involves several time-consuming steps, including printing question papers, physically distributing them to students, collecting answer sheets, manual evaluation by instructors, and finally compiling and publishing results.

This system suffers from numerous limitations:

- **Time-Consuming Process**: The preparation, distribution, and evaluation of exams require significant time and resources.
- **Prone to Human Error**: Manual checking increases the chances of mistakes in marking and result calculation.
- **Lack of Security**: Paper-based exams can be leaked or tampered with, compromising exam integrity.
- **Resource Intensive**: A large amount of paper, printing, and human effort is required, making the system inefficient and costly.
- **Limited Accessibility**: Students must be physically present at the exam venue, which is not feasible in emergencies or for remote learners.
- **Delayed Results**: Due to manual evaluation, students must wait days or even weeks for their results.

As the demand for scalability, speed, and flexibility grows in the education sector, this outdated method no longer meets modern academic requirements. Hence, a more robust, secure, and automated solution is necessary.

2. Proposed System

The proposed Online Examination System aims to overcome the limitations of the traditional manual examination process by offering a fully digital, secure, and user-friendly platform for conducting and managing exams.This system provides a web-based solution where administrators can manage subjects, questions, exams, and student records, while students can register, take exams, and view results — all from the convenience of their devices.

V. Project Development Approach

Software Development Methodology

For the CBT System, the Waterfall Model is chosen because it is simple, structured, and suitable for academic projects. The model follows a step-by-step approach, where each phase is completed before moving to the next.

Phases of Development

1. Requirement Analysis

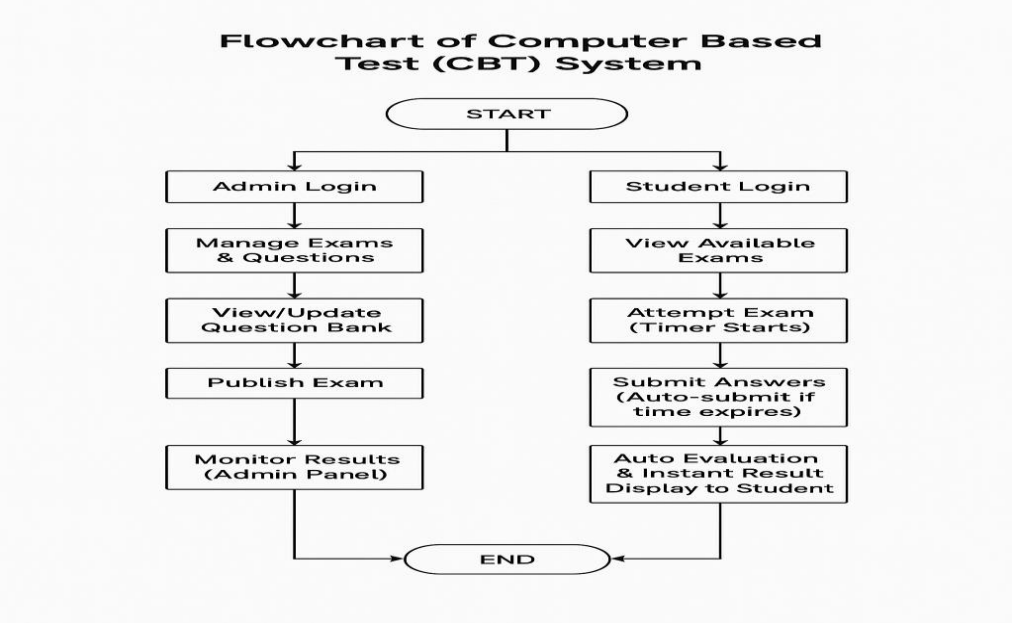
- The requirements of the system were gathered and analyzed carefully.
- Two main users were identified:

1. Admin – Can create exams and manage questions.
2. Student – Can attempt exams and view instant results.

- The primary requirement was to automate exam evaluation and result generation.
- Additional needs included secure login, timer-based exams, and proper database management.

2. System Design

- System Architecture and Database Schema were designed based on the requirements.
- ER Diagram was created for tables: Users, Exams, Questions, Answers, Results.
- UI layouts were planned for: login page, exam interface, and result display.
- Database designed for secure storage of exam data.



Level 0 DFD (Context Diagram)

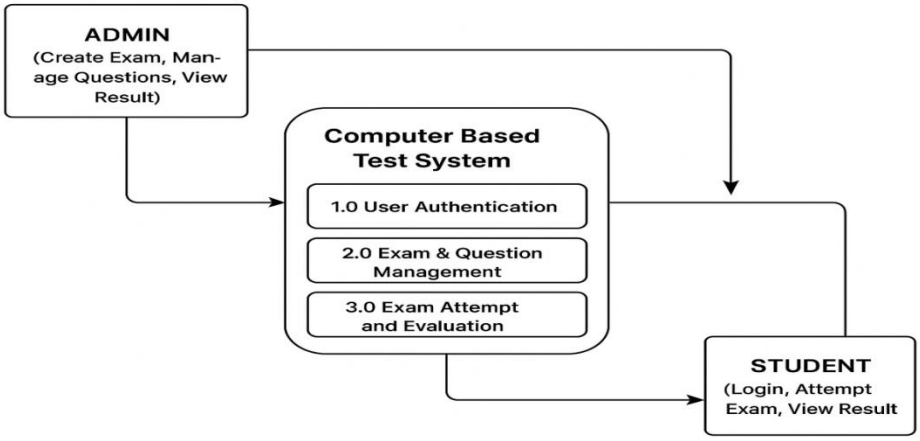
Purpose:

To show the overall system as a single process and how it interacts with external entities.

Level 1 DFD (Detailed View)

Purpose:

To show the internal processes within the CBT system (like login, exam, result, etc.)



ER Diagram Explanation

This Entity Relationship (ER) Diagram represents the database structure of the Computer Based Test (CBT) System.
It defines the main entities (tables), their attributes (fields), and the relationships between them.

Admin Entity

Role: The Admin is the controller of the system.

Functions: Creates exams, adds questions, and views results.

Attributes:

- Admin_ID – Unique ID for each admin.
- Name – Admin's name.
- Email – For login and communication.
- Password – For secure authentication.

Relationship:

Creates → Exam (One-to-Many)→ One Admin can create multiple Exams, but each Exam is created by one Admin.

Exam Entity

Role: Represents each exam conducted through the system.

Attributes:

- Exam_ID – Unique identifier for each exam.
- Exam_Name – Name of the exam (e.g., Java Test).
- Subject – The subject or topic of the exam.
- Date – Exam date.
- Duration – Total time allowed.

Relationship:
Contains → Question (One-to-Many)→ One Exam can contain many Questions.
Linked to Result through Exam_ID (FK)
→ Many results are generated for one Exam (each student's result).

Question Entity

Role: Stores all the questions for each exam.

Attributes:

- Question_ID – Unique ID for each question.
- Exam_ID (FK) – Links the question to its exam.
- Question_Text – The question content.
- OptionA, OptionB, OptionC, OptionD – Multiple-choice options.
- Correct_Answer – Stores the right option.

Relationship:

Belongs to → Exam (Many-to-One)→ Many Questions belong to one Exam.

Student Entity

Role: Represents users who take the online exams.

Attributes:

- Student_ID – Unique ID for each student.
- Name – Student's full name.
- Email – For login and notifications.
- Password – For secure login.

Relationship:

Takes → Exam / Generates → Result→ One Student can take multiple Exams and therefore have multiple Results.

Result Entity

Role: Stores results after a student completes an exam.

Attributes:

- Result_ID – Unique result number.
- Student_ID (FK) – Foreign key linking to Student.
- Exam_ID (FK) – Foreign key linking to Exam.
- Marks – Score obtained.
- Status – Pass or Fail.

Relationship:

Linked to both:

- One Student → Many Results
- One Exam → Many Results

Summary of Relationships

Relationship	Type	Description
Admin → Exam	1 : N	One admin can create many exams
Exam →Question	1 : N	One exam contains many questions
Student → Result	1 : N	One student can have multiple results
Exam →Result	1 : N	One exam generates many results

VI.OVERVIEW OF TECHNOLOGIES USED

1. Front End Technology

PHP

PHP is a server-side scripting language designed specifically for the web. Within an HTML page, you can embed PHP code that will be executed each time the page is visited. Your PHP code is interpreted at the web server and generates HTML or other output that the visitor will see.
PHP was introduced in 1994. As of November 2007, it was installed on more than 21 million domains worldwide, and this number is growing rapidly. You can see the current number at http://www.php.net/usage.php
PHP is an Open Source project. PHP originally stood for Personal Home Page and now stands for PHP Hypertext Preprocessor.

Unique Features

If you are familiar with other server side language like ASP.NET or JSP you might be wondering what makes PHP so special, or so different from these competing alternatives well, here are some reasons:

1. Performance
2. Portability(Platform Independent)
3. Ease Of Use
4. Open Source
5. Third-Party Application Support
6. Community Support

PHP Server

The PHP Community Provides Some types of Software Server solution under The GNU (General Public License).

These are the following:

1. WAMP Server
2. LAMP Server
3. MAMP Server
4. XAMPP Server

All these types of software automatic configure inside operating system after installation it having PHP, MySQL, Apache and operating system base configuration file, it doesn't need to configure manually.

WAMP----- Microsoft window o/s,Apache Mysql PHP
LAMP---- Linux Operating System Apache Mysql PHP
MAMP---- Mac os Apache Mysql PHP
XAMPP---- x-os(cross operating system) Apache Mysql PHP Perl

Introduction to HTML

The hypertext markup language (HTML) is a simple markup language. Used to create a hypertext documents that are portable from one platform to another HTML documents are SGML (Standard generalized mark up language) documents with generic semantics that are appropriate for representing information from a wide range of applications. This specification defines HTML version 3.2. HTML 3.2 aims to capture recommended practice as of early '96 and as such a replacement for HTML2.0 (RFC 1866).

A set of instructions embedded in a document is called mark up language. These instructions describe what the document text means and how it should look like in a display. Hyper Text Mark Up language (HTML) is the language used to encode World Wide Web documents.

2.Back End Technology:

MYSQL

MySQL Introduction

There are a large number of database management systems currently available, some commercial and some free. Some of them : Oracle, Microsoft Access, Mysql and PostgreSQL.
These database systems are powerful, feature-rich software, capable of organizing and searching millions of records at very high speeds**.**

Understanding Databases, Records, and Primary Keys

Every Database is composed of one or more tables.
These Tables, which structure data into rows and columns, Impose organization on the data.
The records in a table(below) are not arranged in any particular order.

SQL, statements fall into one of three categories.(Types of SQL)

Data Definition Language(DDL) : DDL Consists of statements that define the structure and relationships of a database and its table.

These Statements are used to Create, drop and modify databases and tables.

Data Manipulation Language(DML) : DML statements are related to altering and extracting data from a database.

These statements are used to add records to, update records in, and delete records from, a database; perform queries; retrieve table records matching one or more user specified criteria; and join tables together using their common fields.

Data Control Language(DCL) : DCL statements are sued to define access levels and security privileges for a database.

You would use these statements to grant or deny user privileges; assign roles; change passwords; view permissions; and create rulesets to protect access to data.

PHP MySQL connectivity

Use the mysqli_connect( ) function to established connection to the MySQL server.
To access the database functionality we have to make a connection to database using Php. mysqli_connect() function is used to establish the connection to MySQL server. four arguments need to be passed to mysqli_connect() function.

hostname : if you are working on local system , you can use localhost or you can also provide ip address or server name.
username : if there is a existing user , you can provide username. default username is 'root'.
password : by default password is blank or null.
dbname : it is a optional field . it is basically a name of the database that need to be connected.
mysqli_connect(host,username,password,dbname);

host(Server name)---- Either a host name(server name) or an IP address
username---- The MySQL user name
password----The password to log in with
dbname----Optional. The database to be used when performing queries

VII.Coding

This system aims to replace traditional paper-based exams with a digital solution that automates the process of:

Key features include:

- Database Schema
- Database Connection
- User Authentication and Session Management
- Login Page
- MCQ Link
- Retrieving Random Questions
- Calculating Score

- Exam Management and Timer Module
- Handling Exam Submissions
- Result Processing and Ranking

By achieving these objectives, the system enhances examination efficiency, maintains result accuracy, and provides a transparent and reliable method of conducting assessments in educational institutions.

Database Schema

Sql

```
CREATE DATABASE exam_system ;

USE exam_system;

--Table for users( Admins and Students)
CREATE TABLE users()
id INT Auto_Increment Primary Key,
name VARCHAR(100),
email VARCHAR(100) UNIQUE,
password VARCHAR(255),
role ENUM('admin', 'student') DEFAULT 'student'
);

--Table for  available exams
CREATE TABLE exams (
id INT AUTO_INCREMENT PRIMARY KEY,
title VARCHAR (200),
duration_mins  INT
);

--Table for multiple-choice questions
CREATE TABLE questions(
id INT AUTO_INCREMENT PRIMARY KEY,
exam_id INT,
question_text TEXT,
option_a VARCHAR(255)
option_b VARCHAR(255)
option_c VARCHAR(255)
option_d VARCHAR(255)
correct_option CHAR(1),
FOREIGN KEY(exam_id) REFERENCES exam(id) ON DELETE CASCADE
);

--Table to store final results

CREATE TABLE results(
id INT AUTO_INCREMENT PRIMARY KEY,
user_id  INT,
```

```
exam_id  INT,
score  INT,
total_marks INT,
FOREIGN KEY(user_id) REFERENCES users(id),
FOREIGN KEY(exam_id) REFERENCES exams(id)
);
```

Database Connection (Security First)

php

```
<php>
<? php
$ host= “localhost”;
$ user=”root”;
$ pass=” “;
$ dbname=”exam_system”;
try{
$pdo=new PDO(“mysql: host=$ host; $ user; $ pass; dbname=$db”);
$pdo=setAttribute( PDO::Attr_ERRMODE, PDO:: ERRMODE_EXCEPTION);
}
catch(PDOException  $e)
{
die(“Connection failed:”$ conn - > connect_error);
}
?>
```

User Authentication and Session Management

php

```
session_start();
$ Stmt= $ pdo->prepare(“SELECT id, password FROM users WHERE email=?”);
$ Stmt->execute([$ email]);
$ user= $ Stmt-> fetch();
if ($ user $$ password_verify ($ password, $ user[‘password’])){
$_Session[‘user_id’];
header (“Location:dashboard.php”);
}
```

Login Page

```
session_start();
$ Stmt= $ pdo->prepare(“SELECT id, password FROM users WHERE email=?”);
$ Stmt->execute([$ email]);
$ user= $ Stmt-> fetch();
if ($ user $$ password_verify ($ password, $ user[‘password’])){
$_Session[‘user_id’]=$ user[‘id’];
header (“Location:dashboard.php”);
```

}

MCQ Link

```
CREATE TABLE choices (
id INT(11) AUTO_INCREMENT PRIMARY KEY,
question_id INT(11),
choice_text TEXT,
is_correct TINYINT (1) DEFAULT 0;
FOREIGN KEY(question_id) REFERENCES questions(id)
);
```

Retrieving Random Questions

sql

```
SELECT * FROM questions
WHERE subject_id=5
ORDER BY RAND()
LIMIT 10;
```

Calculating Score

php

```
$ score=0;
foreach ($_Post[‘answers’] as $ question_id=> $ selected_option){
$ stmt = $ pdo->prepare (“ SELECT correct_options FROM questions where id=?”);
$ stmt-> execute ([$ question_id]);
$ correct=$ stmt-> fetchColumn();
if($ Selected_option== $ correct){
$ score++;
}
echo” Your total score is:”$ score;
```

Exam Management and Timer Module

```
Let time Remaining=3600;
Function countdown() {
If ( time Remaining<=0){
document.getElement By Id(“examForm”).Submit();
}
else
{
Time Remaining--;
setTimeout (countdown, 1000);
}
}
```

Handling Exam Submissions

php

```
$ score=0;
foreach ($_Post[‘answers’] as $ question_id=> $ selelcted_option){
$ stmt = $ pdo->prepare (“ SELECT correct_options FROM questions where id=?”);
$ stmt-> execute ([$ question_id]);
$ correct=$ stmt-> fetchColumn();
if($ Selected_option== $ correct){
$ score++;
}
}
```

Result Processing and Ranking

```
SELECT  student_id, score,
RANK() OVER (ORDER BY score DESC)as student_rank
FROM exam_results WHERE exam_id=?;
```

VIII.Expected Outcome/Benefits

The CBT System provides an efficient and user-friendly platform for online exams. Students can receive instant results, reducing manual evaluation errors and waiting time. It ensures secure login and transparent evaluation, while saving time and administrative effort. Admins can easily manage exams, questions, and student records. The system is scalable, allowing future enhancements like analytics, AI-based evaluation, and mobile access. Overall, it offers convenient, reliable, and modern examination management for both students and administrators.

IX.Conclusion:

The **CBT System** provides a modern and efficient alternative to traditional exams, offering **instant results, accuracy, and transparency**. It reduces manual effort and errors while providing a **user-friendly platform** for students and administrators. Computer adaptive testing is yet another milestone of the assessment technology, providing an effective means to assess aspirants' abilities more precisely. CBT Saves time and energy but paper pencil tests need more time for assessment.One of the serious downsides of paper pencil test is that you have to figure out the easy questions and the difficult questions on your own. As a result, you are likely to spend more time in figuring out the easy questions due to which, you may end up running out of time.Option scanning machine which marks the answers does not take the stray pencil marks and circles into account. Due to this, you may not get the marks for the questions that you answered correctly.Today we have maximum competitive MCQ based examinations like recruitment exams, class room performance tests, teacher eligibility tests, admission entrance tests like many more assessment tests are conducted on CBT mode.The Computer Based Test (CBT) System is a modern, efficient, and reliable solution for examinations. It automates the entire process, provides instant result generation, and ensures accuracy, security, and transparency. The system reduces administrative workload, saves time and resources, and offers a convenient platform for students and administrators.

X.Future Enhancements:

- Maintenance: Fixing bugs or issues discovered after deployment.
- Future Enhancements:
  - Integration of webcam monitoring for anti-cheating
  - AI-based question difficulty analysis and analytics
  - Email notification of results to students
  - Support for multiple exams and subjects
  - Mobile-friendly or responsive design for any device access

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