A SYNOPSIS ON

Intranet Based Examination System

Submitted in partial fulfilment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY

In

Computer Science & Engineering

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CANDIDATE'S DECLARATION

We hereby certify that the work which is being presented in the Synopsis entitled **"Intranet Based Examination System"** in partial fulfilment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science & Engineering of the Graphic Era Hill University, Bhimtal campus and shall be carried out by the undersigned under the supervision of **Mr. Anubhav Bewerwal,** Department of Computer Science & Engineering, Graphic Era Hill University, Bhimtal.

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The above-mentioned students shall be working under the supervision of the undersigned on the **"Intranet Based Examination System"**

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Internal Evaluation (By DPRC Committee)

Status of the Synopsis: Accepted / Rejected

Any Comments:

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1.

2.

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Chapter 1

Introduction

The Intranet-Based Online Examination System is a web-based platform designed to conduct secure and efficient exams within a local network (LAN), eliminating the need for an internet connection. The system ensures fair assessment, reduced manual effort, automatic grading, and a seamless user experience for students and administrators.

Unlike traditional online examination systems, which rely on cloud-based infrastructure, this system operates entirely within an institution's intranet, ensuring enhanced security, reduced dependency on external internet services, and faster response times.

The project integrates key Operating System (OS) concepts, such as:

- Process Scheduling – Managing concurrent student exam sessions efficiently.
- Multithreading – Enabling multiple students to take exams simultaneously.
- Inter-Process Communication (IPC) – Allowing secure data exchange between local servers.
- Fault Tolerance & Redundancy – Ensuring system stability in case of a server failure.
- Load Balancing – Distributing students across multiple servers for optimal performance.

This system will consist of multiple local web servers deployed within a LAN. Students can access the exam portal through their browsers by connecting to a centralized gateway server. The load balancer will distribute students evenly among different servers to avoid overloading any single machine. If a server fails, the system will automatically redirect students to an available backup server using redundancy and fault-tolerance mechanisms.

The exam content, student responses, and results will be stored securely on a local database hosted within the intranet, ensuring data integrity and privacy. Real-time monitoring tools will allow administrators to track exam progress and system health, ensuring smooth operation throughout the examination period.

Problem Statement

The traditional examination process faces several challenges, such as:

- Manual evaluation delays
- Paper wastage and security risks
- Human errors in checking and result calculation

On the other hand, cloud-based examination systems also have limitations:

- Dependence on stable internet connectivity
- Potential data security risks due to cloud storage
- Performance issues when handling large student numbers

To address these challenges, this project proposes an Intranet-Based Online Examination System, which operates in a controlled, high-performance local environment, ensuring better efficiency, security, and reliability.

Chapter-2

Background/Literature survey

2.1 Background

Examinations play a crucial role in assessing students' knowledge, performance, and skills in academic institutions. Traditional paper-based exams have been widely used for years, but they come with several challenges such as manual evaluation delays, paper wastage, risk of human errors, and logistical constraints. With the advent of digital education, many institutions have moved towards computer-based online examination systems to enhance efficiency and reduce administrative burdens.

Most existing online examination systems rely on the internet to function, storing exam content and student responses on cloud servers. However, this dependency introduces various risks, including network failures, security vulnerabilities, slow response times, and high operational costs. Furthermore, during large-scale exams with thousands of students, server overload can cause system crashes, disrupting the examination process.
To overcome these limitations, an Intranet-Based Online Examination System offers a self-contained solution where all servers, databases, and student interfaces operate within a local network (LAN). This setup eliminates the need for external internet connectivity, making the system more secure, faster, and cost-effective while ensuring uninterrupted operation.

2.2 Literature Survey

Several research papers and case studies highlight the advantages and limitations of various examination systems. Below is a comparison of different methods and their challenges.

2.2.1 Traditional Paper-Based Examination Systems

Studies show that conventional pen-and-paper exams remain widely used due to their simplicity and accessibility. However, they have several limitations, including:

- Slow manual checking process, leading to delays in result generation.
- High logistical costs due to printing, transportation, and storage of exam papers.
- Security concerns, such as question paper leaks or loss of answer sheets.
- Prone to human errors in marking and result calculation.

2.2.2 Cloud-Based Online Examination Systems

Modern universities and organizations have shifted to cloud-based examination platforms, such as Google Forms, Moodle, and proprietary solutions like TCS iON, Mettl, and ExamSoft**.** These systems offer:

- Automated evolution of multiple-choice and subjective questions.
- Remote evaluation of multiple choice and subjective questions.
- Remote accessibility for students from different locations.
- Instant result generation, reducing waiting time.

However, research highlights the following issues**:**

- Internet Dependency: Any network failure can disrupt the entire examination process.
- Security Risks: Online exams are susceptible to hacking, cheating, and unauthorized access.
- High Server Load: A sudden surge in concurrent users may cause server crashes and system lag.
- Expensive Infrastructure: Cloud storage and third-party exam management platforms incur high recurring costs.

- Failed sync operations are automatically retried in a priority queue.
- The system resumes from the last successful state, avoiding redundant uploads.
- Checksums and integrity verification ensure data consistency between local and cloud storage.

From the above research, we conclude that cloud-based online exams, while automated, suffer from network failures, security risks, and high costs. Meanwhile, traditional exams are outdated, time-consuming, and inefficient.

An Interanet Based Online Examination System is the optimal solution , offering:-

- Zero internet dependency , ensuring uninterrupted exams.
- Better security, as data remains within a controlled local environment.
- Load balancing capabilities , ensuring smooth handling of multiple students.
- Cost effective infrastructure , with no reliance on external cloud storage.

Based on these findings, our project aims to develop a scalable, fault-tolerant, and secure intranet-based examination system, integrating key OS concepts such as multithreading, process scheduling, inter-process communication (IPC), and redundancy mechanisms to enhance performance and reliability.

Chapter 3

Objectives

The Intranet Based Online Examination System aims to provide an efficient , secure , and self-contained Examination platform that functions within a local network, eliminating the dependency on internet connectivity. This project will integrate key operating system concepts such as multithreading, process scheduling,load balancing, inter-process communication(IPC), and fault tolerance to enhance system reliability and performance.

The objectives of this project are as follow:

- To develop an intranet-based examination system that ensures a secure and efficient exam process without the need for an internet connection.
- To implement multithreading for handling multiple students-concurrently, ensuring smooth and responsive system performance.
- To incorporate process scheduling for efficient CPU utilization, preventing system slowdowns during high student activity.
- To integrate load balancing mechanisms for distributing student exam requests across multiple servers, preventing system overload.
- To establish fault tolerance and redundancy measures to ensure continuous availability of exam services in case of server failures.
- To provide a secure authentication system that restricts access based on user roles (students,faculty and administrators).
- To enable real-time monitoring for administrators to track student progress and system performance.
- To securely store student responses in a centralized or distributed local database for result processing.
- To develop a user-friendly web interface that allows to easily navigate the exam process and faculty to manage exam efficiently.
- To ensure scalability and adaptability so that the system can support an increasing number of users and integrate with existing academic infrastructures.

This project aims to deliver a cost-effective, reliable, and secure solution for educational institutions, ensuring an uninterrupted and efficient examination experience within a local network environment.

Chapter 4

Hardware and Software Requirements

4.1 Hardware Requirements

Sl. No	Name of the Hardware	Specification
1.	Processor	Intel i5/i7 or equivalent
2.	RAM	4GB or higher
3.	Storage	100GB (HDD/SSD)
4.	Network	LAN(Local Area Network)

4.2 Software Requirements

Sl. No	Name of the Software	Specification
1.	Operating System	Windows
2.	Web Server	Apache/NGINX
3.	Programming language	Python/JavaScript/PHP
4.	Database	PostgreSQL/Mysql

Chapter 5

Possible Approach/Algorithms

Approach

The Intranet-Based Online Examination System is designed to function within a Local Area Network (LAN), ensuring secure and offline examination management. The system architecture includes multiple interconnected local web servers to handle student requests efficiently. The approach focuses on system reliability, load distribution, fault tolerance, and concurrency management to create a seamless exam-taking experience.

The development approach follows these key steps:

1. System Design & Planning:
    - Define the architecture using a multi-server approach to balance the load.
    - Set up an intranet-based network where multiple web servers handle exam requests.
    - Plan a centralized or distributed database for storing exam questions, responses, and student records.
2. Server Setup & Load Balancing:
    - Deploy multiple local web servers (e.g., Apache, IIS, or Nginx).
    - Implement load balancing to distribute students evenly across servers.
    - Assign a primary server for exam control and backup servers for failover.
3. Multithreading & Process Scheduling:
    - Use multithreading to manage multiple student sessions concurrently.
    - Implement process scheduling to optimize CPU utilization.
4. Exam Flow Implementation:
    - Student authentication using local credentials to prevent unauthorized access.
    - Dynamic question retrieval from the database based on exam configurations.
    - Real-time submission & auto-save to prevent data loss in case of failure.
5. Fault Tolerance & Redundancy:
    - Implement server health checks to detect failures.
    - Auto-redirect students to another server if their assigned server crashes.
    - Maintain replicated databases to ensure data availability in case of a failure.

6. Security & Data Protection:
    - Use encryption techniques to secure stored student responses.
    - Implement session timeouts and automatic logout to prevent misuse.
    - Restrict exam access to verified users only.
7. User Roles & Access Control:
    - Students: Can log in, take exams, and submit responses.
    - Faculty/Admins: Can upload exams, monitor students, and access results.
    - Servers: Handle request processing, load balancing, and data storage.

To prevent unnecessary storage usage, OSCloudSync automatically removes unmodified files from system memory after 15 days.

Optimization Techniques:

- incremental backups ensure that only modified files remain in memory for future syncs.
- Redundant/unchanged files are deleted after the set retention period.
- Users can customize cleanup policies to retain files for longer durations if needed.

Pseudocode for Load Balancing and Fault Tolerance

1. Load Balancing Algorithm (Round-Robin with Least Load Assignment)

```
Initialize server_list = [Server1, Server2, ..., ServerN]
Set max_students_per_server = 10

Function assign_student_to_server(student_id):
    min_load_server = NULL
    min_load = max_students_per_server

    For each server in server_list:
        If server.current_load < min_load:
            min_load_server = server
            min_load = server.current_load

    If min_load_server is not NULL:
        Assign student_id to min_load_server
        min_load_server.current_load += 1
        Return min_load_server
    Else:
        Add student_id to waiting_queue
        Return "All servers full, student added to waiting queue"

End Function
```

2. Server Failure Detection and Student Redirection Algorithm

```
Initialize server_list = [Server1, Server2, ..., ServerN]


Function check_server_health():
    For each server in server_list:
        If server does not respond for threshold_time:
            Mark server as "Failed"
            Redirect_students(server)

    Sleep for health_check_interval
    Repeat process

End Function


Function Redirect_students(failed_server):
    active_students = failed_server.get_active_students()

    For each student in active_students:
        new_server = assign_student_to_server(student)
        If new_server is not NULL:
            Notify student of redirection to new_server
            Restore last saved responses from database
        Else:
            Add student to waiting_queue
            Notify student of delay

End Function
```

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