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PREVENTING EXAM PAPER LEAKAGE THROUGH RTC-SYNCHRONIZED RFID AND OTP AUTHENTICATION

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Abstract— Exam paper leakage poses a significant threat to the integrity of academic examinations, undermining the fairness and credibility of evaluation systems. This paper proposes a novel security system designed to prevent exam paper leakage by integrating Real-Time Clock (RTC) synchronization with Radio Frequency Identification (RFID) and One-Time Password (OTP) authentication. The RTC module ensures strict timing control over exam paper access, while RFID technology provides secure identification of authorized personnel. The OTP mechanism adds an additional dynamic layer of authentication to prevent unauthorized access. Experimental implementation and testing demonstrate that the combined use of RTC, RFID, and OTP significantly reduces the risk of leakage and enhances control over exam paper distribution. This system offers an effective, real-time, and user-friendly solution for safeguarding exam materials in educational institutions.

I. INTRODUCTION

The leakage of examination papers remains a critical challenge in education systems worldwide, causing disruption to academic schedules and damaging institutional reputations. Traditional methods of exam paper handling often rely on manual controls, which are susceptible to human error and deliberate breaches. To maintain the credibility of assessments, it is imperative to develop automated and secure systems that tightly regulate access to exam materials.

This research introduces a preventive system that combines Real-Time Clock (RTC) synchronization, Radio Frequency Identification (RFID), and One-Time Password (OTP) technologies to secure exam paper distribution and access. The RTC module ensures that exam papers can only be accessed at predetermined times, eliminating premature exposure. RFID tags assigned to authorized

personnel enable secure identification, while OTP authentication provides a dynamic, time-sensitive password that restricts access further, reducing the possibility of unauthorized retrieval.

By integrating these technologies, the proposed system aims to offer a robust, scalable, and real-time solution to exam paper leakage, enhancing security protocols and maintaining examination integrity.

II. RELATED WORK

The practice surveyed from many years. This system contains "the sealed boxes" comprising the exam papers that will be dispersed to the examination centers. This framework includes a lot of restrictions that might lead to exam papers leakage at different instances same time the box is moved from "printing area to examination centers". This happens because of not difficult tampering of sealed boxes and more interference of people. Another technique that is in use today includes the mailing of the exam papers from the university to particular college's former to examination. The colleges take the Xerox of the exam paper and then the examination methodology follows. Significantly this specific strategy also includes lots of limitations. The sever interruption might occur, the website might have a chance to be hacked, and more than 100 colleges must take Xerox that includes the threats such as framework failure, energy failure, and the paper leakage. The knowledge for the suggested framework that includes the electronic security may be determined from current equipment such as "Electronic lockers, automated teller machine (ATM), and other security improved electronic frameworks". This framework includes the incorporation of specific electronic peripherals that operates on the methodologies depend on GSM, UART, RFID, and I2C [7], [8].

III. EXISTING SYSTEM

In the existing system Survey the question papers are dispersed in fixed boxes. This framework is being taken after since numerous years. The burdens of this framework are it might prompt spillage of question papers at different cases in the voyage of box from printing area to examination focuses. This occurs because of simple altering of fixed boxes and more human impedance. Other strategy includes the e-duplicate of the question papers sent from the college to the universities earlier to examination. The schools take the printouts of the question paper and afterward are disseminated to the examinees impediments.

The site might be hacked, server may likewise breakdown and number of schools needed to take printouts which includes the dangers like power disappointment, framework disappointment and may prompt spillage or issues in conduction of examination. The thought for the proposed framework which includes the electronic insurance is gotten from advanced applications like Electronic lockers in bank, Home security frameworks, office security frameworks and other security upgraded electronic framework.

IV. PROPOSED SYSTEM

The proposed system principle enclose contains the sub boxes which address papers are proposed to be kept. The RFID tag and GSM modem are associated with the container alongside the Arduino.

GSM modem interfaced to Arduino dependably sends the report of exercises to college by means of instant messages. Fundamental issues of students are "exam paper leakage", who endures from the cancellation or postponed of the exam. Every year we gather news something like postponed/ canceled exam because of paper leakages in the daily paper or on TV.

Sometimes the university itself does not recognize how there will be spillage of the data related to exam papers. Therefore, some candidates won't get the rank that put maximum efforts and hard work, and some candidates get the good rank in less time and minimum effort. This perspective will make a negative impact on students and discourage the

society's development. Thus we have come up with a convenient and portable result and decided to execute "an examination paper leakage security framework". Together with "the Arduino Mega, keypad, GSM modem, LCD, RFID module, and the electromagnetic lock" would be utilized in this framework. First, the university will send the exam paper to the college in "an electronic sealed box" that will be termed as "Electronic Control Box". This "electronic control box" is an embedded framework, which might have been proposed utilizing "the Arduino Mega" that has inherent RTC to observe "the electronic control box". Whether anybody attempts to unlock the box previous and afterwards the time duration of the RFID swipe the framework communicates to the university powers by sending "a SMS (Short Message Service)" through "Global system for mobile communication (GSM)", which several malfunctioning has taken place with "the Electronic Control Box".

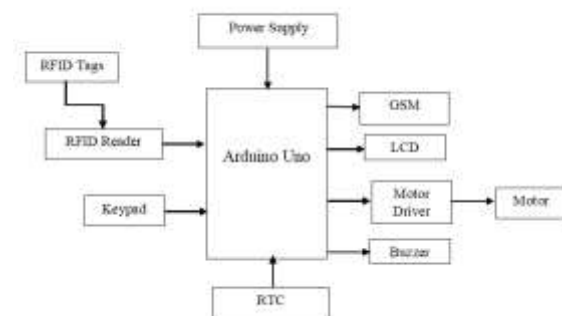


Figure: Proposed Block diagram

RFID(radio frequency identification) it works on the principle of wireless systems, It is made up of two components RFID tags and RFID readers. Where RFID tags are portable chips and RFID readers are mounted on Electronic Concealed Box. The RFID tags are given to the main examiner and the invigilator and there data is stored in Arduino memory. Whenever a tag is swiped on the reader it detects the tags is valid or not using electromagnetic fields of tags. There are two types of tags active tags and passive tags. Active tags use power from its power storage where as passive tags depend on RFID readers for power. RFID is a best protection layer for this layer

because we can manage who can assess the Electronic Concealed Box from RFID.

Arduino UNO module, a microcontroller that has 14 digital pins(D0-D13) and as 6 analog pins(A0-A6). We used Arduino microcontroller for this project because it consumes less power and it's cheaper. We choose Arduino because we don't need any communication from Electronic Concealed Box and Arduino does not have inbuilt communication module so it's cheaper compatible. We use Arduino to basically deals with the receiving the signal from RFID reader and give signal to servo motor and electronic lock to open.

LCD is Liquid Crystal Display. We use 16*2 display, which shows or guides the invigilator to do next step to open the box and print question paper through displaying messages on it.

Motor driver L293D is used in this project which has 16 pins it is used drive motors in this case it is used to drive dc servo motor which controls the locking and unlocking of solenoid lock. This motor driver receives input from Arduino which guides it to perform the function.

signal received from the GSM module is converted by using TTL logic circuit. The figure shows the experimental setup for GSM based motor control for irrigation system.

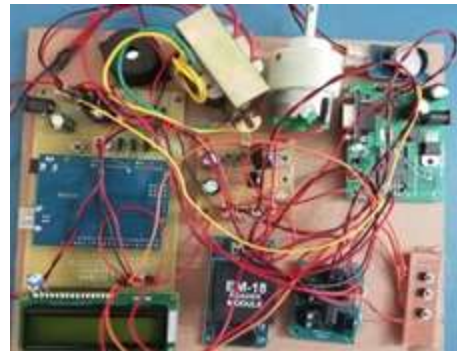
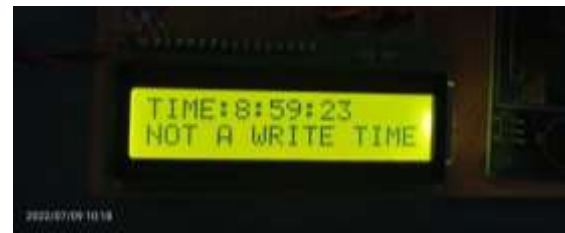


Figure: Hardware Kit

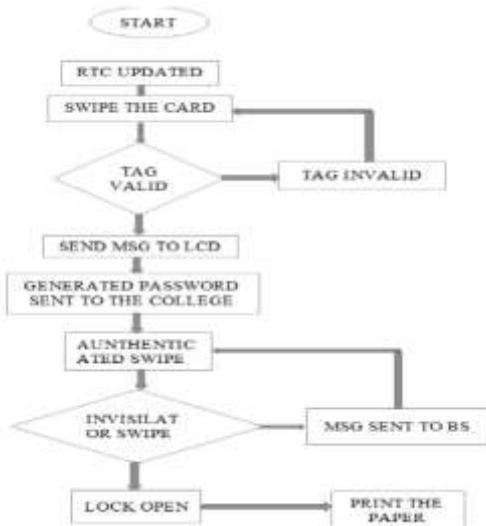


Figure: Flow Chart

V. RESULTS

In this paper microcontroller was used, to perform the various operations the several circuits are designed and interfaced to the microcontroller. The

VI. CONCLUSION

The proposed RTC-synchronized RFID and OTP-based system offers a comprehensive approach to preventing exam paper leakage. By leveraging synchronized timing controls, secure identity verification, and dynamic authentication, the system effectively restricts exam paper access to authorized individuals within designated time frames. Experimental validation confirms the system's reliability, usability, and efficiency in minimizing leakage risks.

Educational institutions can implement this integrated solution to strengthen examination security, reduce administrative burdens, and uphold academic integrity. Future work may explore integrating biometric authentication and remote monitoring features to further enhance system robustness and adaptability in diverse educational environments.

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