THE USE OF INVERTER POWERD CCTV IN MONITORING EXAMINATION

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CERTIFICATION

This is to certify that this project, was carried out by DIKE, PRECIOUS CHNDINMA with the Matric Number: ND/23/COM/PT/0081, has been read and approved by the Department of Computer Science, Kwara State Polytechnic, Ilorin. In partial fulfillment of the requirements for the award of National Diploma (ND) in Computer Science.

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DEDICATION

This Project is dedicated to the Almighty God whose Supremacy in the knowledge of everything is absolute.

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First and foremost, I express my deepest gratitude to the Almighty God, the Creator and Sustainer of all things, whose boundless love, mercy, and grace guided me throughout this project. His divine wisdom and strength were my anchor, illuminating my path and granting me the perseverance to complete this work. To Him alone be all glory, honor, and praise for His unending faithfulness.

I am profoundly thankful to my beloved parents, Mr. & Mrs. Dike, whose unwavering support, prayers, and sacrifices have been the bedrock of my academic journey. Their encouragement, love, and belief in my potential have inspired me to strive for excellence, and I am eternally grateful for their nurturing presence in my life.

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ABSTRACT

Examination malpractice continues to undermine the credibility of academic assessments in educational institutions, posing a threat to the integrity of qualifications and the quality of graduates produced. Traditional monitoring methods, which rely heavily on human invigilators, have proven insufficient due to limitations such as fatigue, corruption, and the

inability to effectively monitor large examination halls simultaneously. The introduction of Closed-Circuit Television (CCTV) surveillance has enhanced examination supervision; however, its effectiveness is often compromised in regions with unstable electricity supply. This research examines the use of inverter-powered CCTV systems as a reliable solution for continuous examination monitoring, even during power outages. The study highlights how inverter-backed surveillance ensures uninterrupted recording, prevents loopholes during electricity failures, and strengthens the enforcement of examination rules. It also addresses potential ethical concerns regarding privacy and explores the role of institutional policies in ensuring responsible deployment of the technology. Using a qualitative and analytical approach, the research evaluates existing literature, case studies, and institutional reports on the effectiveness of inverter-powered CCTV systems in reducing malpractice and improving examination security. The findings reveal that inverter-powered CCTV not only minimizes malpractice but also serves as a deterrent, thereby enhancing transparency and accountability in academic evaluations. The study recommends wider adoption of the technology, supported by clear operational guidelines to balance security with ethical considerations.

Keywords: Inverter-powered CCTV, Examination malpractice, Academic integrity,

Surveillance, Power outage, Monitoring system, Educational institutions.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

As the word continuously evolves and develops new technologies for the improvement of communities and individuals from all works of life, it is necessary to keep pace and adapt these innovations for the common good, creating a more comfortable and secure way of life.

Examination malpractice has become a significant issue in educational institutions, threatening the reliability and validity of academic evaluations. The increasing sophistication of cheating methods has rendered traditional invigilation techniques inadequate (Okafor, 2021). Consequently, schools and examination bodies have turned to technological solutions to reinforce the integrity of their examinations.

One of the most effective innovations adopted in recent years is the use of ClosedCircuit Television (CCTV) systems during examinations. CCTV cameras offer continuous, real-time surveillance and act as a deterrent to dishonest practices (Chris Norman, 2023). Furthermore, the availability of video recordings enables post-examination investigations and accountability for both students and staff

(Adewale & Musa, 2022).

The significant contribution of the internet to improving lives has been well documented with the integration of various technologies, new innovations has been increasingly relevant in today's generation.

One of such innovations has emerged prominently over the years and this is the use of closed-circuit television (CCTV) cameras in communities, owing to their substantial contribution to community development.(Chris Norman 2023) However, the deployment of CCTV systems is not without challenges—chief among them is the issue of unreliable power supply, particularly in developing countries. Power outages during examinations can disrupt surveillance and create opportunities for malpractice (Nwachukwu, 2024). To overcome this, many institutions have begun integrating inverter systems that store electricity and provide backup power during outages. Inverter-powered CCTV systems ensure uninterrupted monitoring, thereby enhancing the efficiency and reliability of examination supervision (Eze & Johnson, 2023).

Several techniques such as use of invigilators to monitor examination accrediting candidates for examination with photo albums from examination regulatory bodies, use of candidates identity cards or biometric machines have been made to salvage the situation in the past.

Through video surveillance system,the behavior and activities of people can be monitored using electronic equipment such as close circuit television (CCTV)system. (Wiley 2020)

Installing video surveillance systems will help student focus on their studies and lectures more dedicated to their work and to checkmate insecurity in classes. These installation represent a huge amount of video to transit ,view and archive, making itimpossible for a human monitor to analyze all of those videos recording in order to detect suspicious behavior or events.

Over the past decade, activities of examination malpractice, lack of dedication of personnel to services they are to render, security of individuals and properties has been a global issues. Among the solutions proposed, video surveillance is one of the oldest and most widespread security technologies.(Asimobi (2020).

Moreover, the shortage of invigilators and human limitations make it difficult to monitor every activity within examination halls effectively.

To address these challenges, institutions have started adopting Closed-Circuit Television (CCTV) surveillance systems to enhance transparency and accountability during exams. However, one major challenge in implementing these systems—especially in regions with unstable electricity supply—is the lack of uninterrupted power. This has necessitated the integration of inverter-powered CCTV systems, which can operate independently of the national power grid.

Inverter-powered CCTV systems ensure continuous monitoring even during power outages, thereby providing a reliable solution for examination supervision. They help in detecting, deterring, and recording malpractice incidents, while also promoting discipline among students and staff. The integration of such technology

not only boosts the integrity of the examination process but also reduces the workload on human invigilators.

The relevance of this research also lies in its potential for scalability and adaptability. The model of inverter-powered CCTV systems can be implemented in primary, secondary, and tertiary institutions, as well as in professional examination centers. With the increasing emphasis on remote and digital learning environments, the need for credible assessment processes continues to grow. This research thus provides a practical solution to an ongoing challenge and sets the stage for future innovations in educational monitoring systems.

The present study, therefore, aims to explore the design, development, and implementation of a CCTV system powered by an inverter, tailored specifically for use in monitoring examination environments. It investigates the technical components required, evaluates the system's performance under simulated and real conditions, and highlights the advantages and limitations of the proposed solution. By documenting and analyzing the process, this research seeks to contribute to the body of knowledge on examination integrity, power solutions in technology-driven systems, and the role of surveillance in academic settings.

1.2 STATEMENT OF THE PROBLEM

Examination malpractice remains a persistent issue in educational institutions, undermining the integrity of academic assessments. Despite efforts to curb this problem through human invigilation, the lack of sufficient personnel, human error,

and lapses in attention often allow dishonest practices to go unnoticed. In regions with unstable electricity supply, the use of electronic surveillance systems like CCTV is further limited due to frequent power outages. This has made it difficult to maintain continuous monitoring during examinations, thereby creating loopholes in the system. There is a need for a reliable, uninterrupted, and efficient method of monitoring examinations to ensure fairness, discipline, and security.

1.3 AIM AND OBJECTIVES

The aim of the study is to implement inverter-powered CCTV systems as a reliable method for monitoring examinations in order to curb malpractice and ensure academic integrity. The Objectives of the study are to

i. Install the camera; and
ii. connect the inverter to the battery

1.4. SCOPE OF THE STUDY

The study was implemented in department of computer science at Kwara state polytechnic in one of the classrooms at LR 28.

1.5. LIMITATION OF THE STUDY

This study faced several limitations that may have affected the depth and scope of its findings. One of the primary challenges was the limited availability of technical resources such as high-capacity inverters, durable batteries, and highdefinition

CCTV cameras. These limitations influenced the quality and extent of the surveillance setup used during the study.

Another challenge was the dependence on technical expertise for the proper installation and maintenance of the system. The limited number of trained personnel available made it difficult to ensure a perfectly optimized and professional setup. Moreover, the inverter system's performance was influenced by battery storage capacity, which in some cases did not support extended periods of power outage.

Lastly the cost of the installation and maintenance of the system might be high.

1.6 SIGNIFICANCE OF THE STUDY

This study is significant as it addresses one of the pressing challenges in the educational sector—ensuring the credibility and integrity of examinations in environments with unreliable power supply. By examining the use of inverterpowered CCTV systems, the study aims to contribute to the development of sustainable and effective examination monitoring strategies.

1.7. ORGANISATION OF THE REPORT

This researched work is divided into five chapter as follows: -

Chapter one discusses the Background to the study, Statement of the problem, aim and Objectives of the study, Methodology, Scope of the Study, Limitation of the

Study,significance of the study,organization of the report,and Definition of terms.Chapter two focus on past researches (Review of related literature),

Overview of the use of Inverter power CCTV in Monitoring

Examination. Chapter three focus on methodology . Chapter four emphasize on overall design of the research work. While the last chapter discuss the summary, conclusion of the research work and reference.

1.8. DEFINITION OF TERMS

CCTV(closed-circuit television) : refers to a system of video cameras that transmit signals to a specific, limited set of monitors . CCTV is used for surveillance and security purposes, allowing for real -time monitoring or recording of activities in a designated area.

INVERTER: refers to a device that converts direct current (DC) into alternating current (AC). This is particularly useful in applications where AC power is needed but only DC power is available. Such as batteries or solar panel.

Surveillance: the monitoring of behavior, activities or information for the purpose of ensuring security and preventing misconduct, typically using technological tools like CCTV cameras.

Power Outage: A temporary or prolonged loss of electrical power supply, often affecting the functionality of electronic devices like CCTV systems.

Backup Power Supply: An alternative energy source, such as an inverter or generator, that provides electricity during a power failure to ensure uninterrupted operation of systems.

Educational Institution: An establishment dedicated to education, such as a school, college, or university, where examinations and learning take place.

Monitoring System: A structured setup comprising hardware and/or software used to observe, record, and manage activities within a specific environment.

CHAPTER TWO

LITERATURE REVIEW

2.1 REVIEW OF RELATED WORKS

The integration of technology into educational systems has prompted numerous studies focusing on surveillance systems and power solutions in examination environments. The use of Closed-Circuit Television (CCTV) as a tool to monitor examinations has been explored in various contexts, highlighting its role in mitigating examination malpractice and enhancing supervision. Oladipo (2021) examined the effect of CCTV surveillance on examination integrity in selected Nigerian universities. His findings indicated a significant reduction in cheating incidents where CCTV cameras were installed. However, he noted that frequent power outages disrupted surveillance continuity, suggesting a need for an alternative power supply to ensure effective monitoring.

Similarly, Adebayo and Olumide (2020) studied the use of CCTV systems in West African secondary schools and revealed that students were more conscious of their conduct during examinations when aware of constant monitoring. Their research confirmed the deterrent effect of CCTV, though they identified poor infrastructure and power instability as major barriers to successful implementation. They

recommended the integration of sustainable power sources like solar and inverter systems to enhance performance.

Uzochukwu et al. (2019) explored digital surveillance tools in Nigerian polytechnics and reported that while technological monitoring has improved administrative oversight, its reliability was heavily dependent on stable electricity. Their study emphasized that most polytechnics, especially in rural areas, suffer from irregular power supply, which undermines the functionality of CCTV systems during critical academic periods. They proposed hybrid energy systems combining inverters and solar panels as practical solutions for consistent surveillance.

In a broader technological perspective, Yusuf (2019) reviewed the role of inverter systems in powering ICT infrastructure in Nigerian educational institutions. His work highlighted the inverter's ability to bridge energy gaps without the noise, pollution, or maintenance burden associated with generators. He demonstrated that inverter-backed systems were more cost-efficient and sustainable in the long term, especially for low-to-medium power-consuming devices like surveillance cameras. This finding aligns with the objectives of integrating inverter-powered CCTV systems for examination monitoring.

Ogunleye and Akinola (2020) conducted a comparative analysis of generator-powered versus inverter-powered security systems in Lagos private schools. Their results showed that inverter systems had lower operating costs and higher uptime during school hours compared to fuel-based generators. The study found that

inverters could support surveillance equipment for extended periods when properly configured, making them ideal for monitoring environments like examination halls. However, they stressed the importance of proper battery sizing and maintenance.

From a policy perspective, Nwachukwu (2021) investigated government regulations and the promotion of technological monitoring systems in tertiary institutions. He observed that the absence of clear policies on examination surveillance allowed institutions to adopt inconsistent methods. Nwachukwu recommended a standardized policy framework mandating the use of CCTV and backup power solutions during examinations to ensure uniform academic standards across institutions.

Internationally, studies also support the implementation of technological monitoring systems. Chen and Lee (2018) investigated smart classroom security systems in South Korea and concluded that the integration of CCTV with renewable energy systems improved reliability and reduced operational costs. Their findings support the scalability of inverter-supported surveillance in educational environments, even in energy-challenged locations.

In terms of the psychological impact, Onuoha (2020) examined student perceptions of CCTV surveillance during examinations in Nigerian universities. The study found that while many students felt their privacy was compromised, a larger proportion acknowledged that the presence of surveillance equipment

discouraged misconduct and promoted fairness. The study emphasized the importance of educating students on the purpose of surveillance to reduce resistance and enhance compliance.

Moreover, Adetunji and Musa (2022) assessed how inverter-powered CCTV systems influenced the integrity of remote learning assessments during the COVID-19 lockdown. Their study showed that institutions which adopted inverter-backed surveillance technologies recorded fewer cases of academic dishonesty compared to those that relied on unsupervised online platforms. This finding illustrates the relevance of such systems beyond physical examination halls and underscores the importance of uninterrupted power for digital monitoring tools.

A recent study by Bello et al. (2023) developed and tested an automated CCTV surveillance system powered by a solar-inverter hybrid for a university's examination center. Their system maintained 24/7 monitoring capability and recorded consistent footage across multiple examination sessions without any power-related disruptions. The study highlighted significant improvements in examination supervision and student behavior, supporting the case for scalable deployment in other academic institutions.

Finally, Adeyemi and Kolawole (2021) performed a feasibility study on the deployment of CCTV systems in public secondary schools with inverter support. Their research concluded that initial installation costs were justified by the long-

term benefits in reducing examination fraud, improving invigilator performance, and preserving evidence of misconduct. They recommended institutional partnerships with technology vendors and NGOs to support widespread adoption.

In summary, existing literature strongly supports the use of CCTV systems to enhance examination monitoring. However, their effectiveness is often compromised by unstable electricity supply. Integrating inverter power systems with CCTV infrastructure presents a sustainable and efficient solution for continuous surveillance. The reviewed studies reinforce the feasibility, cost-effectiveness, and impact of such integration, which this research seeks to build upon by proposing a practical implementation model tailored to institutions in power-challenged regions.

2.2 REVIEW OF RELATED CONCEPTS

2.2.1 Overview on Closed- Circuit Television

Closed-Circuit Television (CCTV) has emerged as a crucial tool in the field of surveillance, offering real-time monitoring and video recording capabilities in various environments, including educational institutions. CCTV systems consist of cameras, digital video recorders (DVRs), and monitors, all connected in a closed network, allowing security personnel or administrators to observe specific areas without public broadcast (Ogunleye & Akinola, 2020). In academic settings, particularly during examinations, CCTV serves as a deterrent to malpractice, ensuring that students adhere to established rules and reducing the workload on human invigilators.

The deployment of CCTV in examination halls enhances transparency and accountability by capturing visual evidence of any misconduct. Oladipo (2021) asserts that students are less likely to cheat when they are aware of continuous surveillance, thereby fostering a culture of honesty. Moreover, CCTV recordings can be reviewed post-examination to investigate reported cases of malpractice, offering undeniable evidence that can aid disciplinary actions.

Despite these advantages, the effectiveness of CCTV in educational institutions is often hindered by power supply issues. In regions with erratic electricity, such as many parts of Nigeria, the surveillance system may shut down during examinations, creating opportunities for malpractice to occur unmonitored (Uzochukwu et al., 2019). This limitation necessitates the integration of reliable power backup systems, such as inverters, to ensure uninterrupted surveillance.

Furthermore, CCTV contributes to broader institutional security, helping to monitor the movement of people within examination premises and prevent unauthorized access (Yusuf, 2019). As technology advances, newer CCTV systems incorporate artificial intelligence features like motion detection and facial recognition, further enhancing their efficiency. Overall, CCTV remains an indispensable asset in the educational sector's quest for academic integrity, especially when paired with consistent power solutions like inverter systems.

2.2.2 Inverter Technology

Inverter technology plays a vital role in ensuring uninterrupted power supply, particularly in environments where electricity is unstable or unavailable. An inverter is an electronic device that converts direct current (DC) from a battery or solar panel into alternating current

(AC), which is compatible with most household and institutional electrical appliances (Yusuf, 2019). In educational institutions, inverters serve as reliable backup systems that can power essential devices, including CCTV cameras, during power outages.

Ogunleye and Akinola (2020) highlight that inverter technology is not only silent and environmentally friendly compared to fuel generators but also more cost-effective in the long term. Modern inverters are often paired with battery banks that store energy during periods of stable power supply or from renewable sources like solar panels. This stored energy can then be used to power surveillance systems during examinations, thereby preventing disruptions in monitoring.

Moreover, Bello et al. (2023) observed that inverter-powered CCTV systems demonstrated consistent functionality during multiple examination sessions without failures, emphasizing their reliability. This integration ensures that surveillance systems remain active throughout examination periods, significantly reducing opportunities for malpractice. As such, inverter technology enhances institutional efficiency by maintaining the operational continuity of critical systems, especially in educational contexts where power reliability is crucial.

2.2.3 Examination Monitoring System

Examination monitoring systems are essential tools used by educational institutions to uphold academic integrity and ensure a fair testing environment. These systems involve a combination of human supervision and technological tools such as CCTV surveillance, biometric verification, and digital timestamping to monitor candidates during assessments (Oladipo, 2021). Their primary function is to deter and detect examination malpractice, which continues to pose a significant threat to the credibility of academic qualifications.

Technological monitoring systems, particularly those enhanced by automation, have proven more effective than manual supervision alone. Uzochukwu et al. (2019) emphasize that the integration of real-time surveillance, audio-visual recording, and remote monitoring capabilities in examination settings significantly reduces incidents of cheating. These systems allow for the observation of multiple examination halls simultaneously, thereby minimizing the need for numerous invigilators and reducing human error or bias.

Furthermore, Adetunji and Musa (2022) note that when paired with reliable power sources such as inverters, these monitoring systems become even more dependable, ensuring continuous operation even during electricity outages. This continuous surveillance is critical, as any downtime during examinations can be exploited by students to engage in malpractice. Thus, the use of robust examination monitoring systems plays a crucial role in promoting transparency, accountability, and fairness in educational assessments.

2.2.4 Benefits of CCTV in Examinations

The adoption of Closed-Circuit Television (CCTV) in examination settings offers numerous advantages that significantly enhance the monitoring process and safeguard academic integrity. These benefits span deterrence, evidence preservation, operational efficiency, and psychological impact.

1. Deterrence of Examination Malpractice

One of the primary benefits of CCTV is its ability to discourage students from engaging in cheating or other dishonest behaviors. The mere presence of cameras in examination halls creates an atmosphere of accountability. Oladipo (2021)

observed that students are more cautious and less likely to engage in malpractice when they are aware that their actions are being recorded.

2. Provision of Verifiable Evidence

CCTV provides audio-visual records that can be reviewed after examinations to investigate complaints or suspicions. In cases where misconduct is reported, the footage serves as undeniable evidence to support disciplinary actions (Uzochukwu et al., 2019). This reduces disputes and ensures justice is based on factual proof.

3. Enhanced Invigilation Efficiency

Instead of relying solely on human invigilators who may be limited in number or attention span, CCTV allows for the simultaneous monitoring of multiple examination rooms. This reduces the burden on staff and helps institutions manage large-scale examinations more effectively (Adebayo & Olumide, 2020).

4. Continuous Monitoring During Power Failures

When combined with inverter technology, CCTV systems can maintain uninterrupted monitoring even during power outages. Bello et al. (2023) demonstrated that institutions using inverter-powered CCTV systems experienced minimal disruptions, which ensured complete examination coverage without gaps.

5. Improved Student Behavior and Exam Environment

Students tend to behave more professionally and respectfully in an environment where surveillance is active. Onuoha (2020) noted that CCTV also reduces noise and distractions, fostering a more disciplined and conducive atmosphere for examinations.

6. Long-Term Institutional Accountability

Maintaining CCTV footage archives can help educational authorities analyze trends, plan future exam logistics, and implement security improvements. It also helps institutions respond to external audits or accreditation requirements with transparency (Nwachukwu, 2021).

2.2.5 Challenges of Traditional Monitoring

Traditional examination monitoring, primarily dependent on human invigilators, faces several critical challenges that limit its effectiveness in contemporary academic environments. These challenges are categorized as follows:

1. Human Limitations and Fatigue

Human invigilators, no matter how diligent, are prone to fatigue, distraction, and lapses in concentration. In long examination sessions or crowded halls, invigilators may struggle to maintain consistent vigilance, leading to undetected malpractice. Oladipo (2021) notes that subtle cheating techniques such as hand signals or concealed materials often escape human notice.

2. Insufficient Manpower

Many institutions lack enough trained personnel to monitor large groups of students effectively. The invigilator-to-student ratio is often too low to guarantee thorough supervision. This insufficiency creates blind spots where students can exploit the absence of watchful eyes to cheat (Ogunleye & Akinola, 2020).

3. Subjectivity and Ethical Compromise

Human supervision is not always free from bias or compromise. Invigilators may show favoritism, succumb to intimidation, or turn a blind eye to malpractice due to personal affiliations. Uzochukwu et al. (2019) highlight that this ethical compromise undermines the objectivity and fairness of the examination process.

4. Limited Detection of Technological Cheating

With the rise of smart devices and other digital tools, students now employ sophisticated methods to cheat. Unfortunately, traditional invigilators may not be adequately trained or equipped to detect such methods, especially those involving miniature earpieces, smartwatches, or hidden cameras (Adetunji & Musa, 2022).

5. Lack of Verifiable Evidence

In the absence of recorded footage or digital logs, it becomes difficult to substantiate allegations of examination malpractice. Disciplinary decisions based

solely on verbal reports may lead to unfair outcomes, legal challenges, or unresolved cases due to insufficient proof.

6. Logistical and Operational Issues

Issues such as late arrival of invigilators, poor coordination, or lack of standardized procedures can weaken the effectiveness of manual monitoring. Additionally, unexpected disruptions such as emergencies or noise can distract invigilators and compromise their supervision efforts.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 METHODOLOGY

Analogue design was use in installations of the device Installing an inverterpowered analogue CCTV system involves integrating a CCTV surveillance setup with a power backup system (inverter + batteries), ensuring continuous operation even during power outages. This are the step-by-step guide tailored to analogue CCTV systems (e.g., using coaxial cables and DVRs):

3.2 COMPONENTS REQUIRED

A. CCTV System (Analogue)

- CCTV cameras (BNC-type, typically 12V DC powered)
- DVR (Digital Video Recorder)
- BNC cables or RG59 coaxial + power cable
- Power supply adapter (12V DC)

Inverter Power Setup

- Inverter (sine wave, 600VA–1.5kVA depending on load)

- Battery (12V deep cycle battery – 100Ah recommended)

3.3 ESTIMATE THE POWER LOAD

Calculate total power consumption:

Device	Power (W)	Quantity	Total (W)
2 analogue cameras	5	2	20
DVR 20–30	1		30
Monitor (LED)	30	1	30
Total			80W

Inverter Rating: Choose at least 300–600VA pure sine wave inverter.

Battery Sizing Example:

To run 80W for 6 hours:

→ 80W × 6h = 480Wh

→ 480Wh / 12V = 40Ah

→ Choose at least 100Ah battery for safety and longevity.

3.4 STEP-BY-STEP INSTALLATION

1. Mount Batteries & Inverter o In a ventilated, dry enclosure near your DVR rack.

o Install a DC-rated fuse/breaker as close to the battery's positive terminal as possible.

2. Connect Batteries to Inverter o Run short, thick cables (e.g. 25 mm²) from battery +/− to inverter +/−. o Observe correct polarity, secure connections.

3. Powering the DVR o Plug DVR's 230 VAC input into one of the inverter's AC outlets or hardwire via a distribution board.

4. Powering Cameras o Connect the 12 VDC CCTV power supply's AC input to the inverter as well.

o Run 12 VDC output to each camera (use appropriate gauge; 2.5 mm² for runs under 30 m).

5. Video Cabling o Run RG-59 coax from each camera's BNC video out to the DVR's BNC inputs. o Secure and label cables.

6. Grounding & Surge Protection o Ground the battery negative, chassis of inverter, CCTV PSU, and DVR to a common earth rod. o Consider surge protectors on AC mains and coax lines.

7. Initial Power-Up & Testing o With no load, switch on inverter—verify 230 VAC output. o Power DVR and CCTV PSU—confirm they boot correctly. o Turn on each camera—check video feed on DVR.

o Simulate a grid failure (switch off solar/grid) and confirm continuous operation on battery/inverter.

3.5 TESTING THE SYSTEM

- Turn off the main grid power to test backup.
- The inverter should seamlessly power the cameras, DVR, and monitor.
- Check camera feed and recording functionality.

3.6 Safety & Best Practices

- Use a fuse or circuit breaker between battery and inverter.
- Install in a ventilated, dry area.
- Use surge protectors to protect DVR and cameras.
- Periodically check battery voltage and inverter health.
- Use deep cycle batteries for longer backup life.

CHAPTER FOUR

SYSTEM IMPLEMENTATION AND TESTING

4.1 SYSTEM IMPLEMENTATION TOOLS

System implementation tools are the hardware, software, and utilities used to install, configure, test, and deploy a system such as a CCTV system, a computer network, or a software application.

To implement an analog CCTV surveillance system, you'll need a set of essential tools and components.

4.2 INSTALLATION TOOLS

These tools are used during the physical mounting and positioning of CCTV cameras and other hardware components

◦ Drilling machine: For creating wall or ceiling holes to install cameras and mounting brackets.

◦ Screwdrivers and Screws: For assembling and securing cameras and casing unit

◦ Cable cutters: are hand tools used to cut wires and cables cleaning and safely

FIG 4.1. BNC (bayonet Neil concelman).

BNC(bayonet Neil-concelman)connectors , commonly use for coaxial cable connectors.

It is widely used to connect analog security cameras to DVRs

FIG 4.2 BATTERY

Battery is commonly used for backup power systems, inverters, and vehicles like cars or solar energy storage systems.

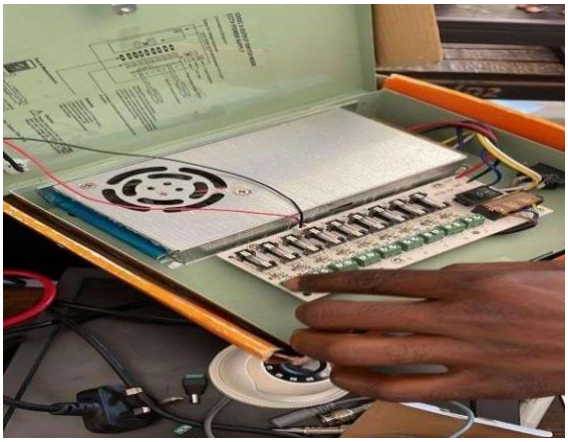

FIG 4.3. CCTV power supply box CCTV

POWER SUPPLY BOX.

A CCTV power supply box is a centralized device used to distribute electrical power to multiple CCTV cameras from a single location. It's essential for installations where multiple cameras need consistent and organized power management.

FIG 4.4 DVR(digital video recorder)
DVR(digital video recorder)

A DVR (Digital Video Recorder) is the central component in an analog CCTV surveillance system. It records and stores video footage captured by analog security cameras, typically using BNC connectors for video in

FIG 4.5 INVERTER

INVERTER

An inverter is a critical component in a CCTV system where uninterrupted power supply is needed, especially during power outages. It converts DC (Direct Current) power from a battery into AC (Alternating Current) power used by most CCTV components, including the DVR, monitor, and sometimes the camera.outdoor CCT withstand external temperatures,

FIG 4.6

Installation of camera 1

FIG 4.7 output installation of camera

FIG 4.8 installation of camera 2

FIG 4.9 output of camera 2 CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. SUMMARY

Examination malpractice continues to pose a serious threat to the credibility of academic institutions, especially in regions with limited access to reliable power

supply. Traditional invigilation methods are no longer sufficient to deter or detect dishonest practices during examinations. The integration of technology, particularly Closed-Circuit Television (CCTV), has proven to be an effective solution for enhancing examination monitoring.

However, the efficiency of CCTV systems is often hindered by frequent power outages. This proposal explores the use of inverter-powered CCTV systems as a sustainable and effective approach to maintaining uninterrupted surveillance during examinations. The study aims to assess the impact, feasibility, and benefits of this technology in educational settings.

By focusing on inverter-powered CCTV systems, the study provides valuable insights for school administrators, policymakers, and technology providers. The findings will help improve examination integrity and inform the development of smarter, more secure examination environments.

5.2. CONCLUSIONS

The use of inverter-powered CCTV systems in examination monitoring emerges as a practical and innovative solution to the persistent challenges of ensuring security and academic honesty in educational institutions. Given the background of unreliable electricity in many developing regions, the need for an uninterrupted surveillance system becomes not only relevant but essential. Traditional CCTV systems, though effective in monitoring, become vulnerable during power outages

potentially leaving critical moments unmonitored and opening opportunities for examination malpractice.

By integrating an inverter as a backup power source, educational institutions can guarantee that surveillance continues seamlessly, regardless of power disruptions. This not only enhances the reliability of the system but also reinforces the institution's commitment to transparent and fair examination practices. The technology ensures that invigilators and administrators have real-time access to events in the examination environment and can review footage retrospectively when needed.

Furthermore, the presence of a consistent and dependable surveillance system acts as a deterrent to students who may otherwise attempt to engage in dishonest practices. The recorded evidence can also serve as an impartial tool for resolving disputes or allegations of misconduct.

While the initial installation costs and technical requirements may pose some limitations, the long-term benefits such as reduced malpractice, improved institutional reputation, and enhanced examination integrity—make inverterpowered CCTV systems a valuable investment. In conclusion, the integration of this technology reflects a forward-thinking approach to academic supervision, especially in contexts where power supply is not guaranteed.

5.3. RECOMMENDATIONS

Based on the anticipated findings and the significance of inverter-powered CCTV systems in securing examination environments, the following recommendations are proposed:

1. Adoption of Inverter-Powered CCTV Systems: Educational institutions, especially those in regions with unreliable electricity, should adopt invertersupported CCTV systems to ensure continuous surveillance during examinations.

2. Government and Stakeholder Support: Ministries of Education and relevant stakeholders should provide financial and technical support to schools for the installation and maintenance of inverter-CCTV systems.

3. Training and Capacity Building: Staff and ICT personnel should be trained on the operation, maintenance, and troubleshooting of inverter and CCTV systems to maximize their effectiveness.

4. Development of Monitoring Policies: Institutions should establish clear policies and guidelines for the ethical and secure use of surveillance systems during examinations to protect privacy while ensuring transparency.

5. Pilot Programs in Rural Areas: A pilot implementation of inverter-powered CCTV systems should be carried out in rural and underserved areas to assess performance and scalability before broader adoption.

6. Regular Evaluation and Maintenance: Schools should conduct regular assessments of their surveillance infrastructure and ensure timely maintenance of

both inverter and CCTV components to prevent system failures during examinations.

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