THE USE OF INVERTER POWEREDCCTV IN MONITORING EXAMINATION

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ND/23/COM/PT/0193

Submitted to the

DEPARTMENT OF COMPUTER SCIENCE,
INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGY (IICT), KWARA STATE POLYTECHNIC, ILORIN

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF NATIONAL DIPLOMA (ND) IN COMPUTER SCIENCE

JUNE, 2025

APPROVAL PAGE

This is to certify that this project was carried out by **FABIYI, PRECIOUS AYOMIDE** with Matric Number: **ND/23/COM/PT/0193** has been read and approved as meeting part of the requirements for the the Department of Computer Science, Kwara State Polytechnic Ilorin.. for the award of National Diploma (ND) in Computer Science.

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DEDICATION

This research project is dedicated to the Almighty God, the giver of life and taker of life that guided me throughout my program.

ABSTRACT

This project explores the design, implementation, and evaluation of an inverter-powered analogue CCTV surveillance system to monitor examination environments in regions with unstable electricity supply. Focusing on Lecture Room 28 at the Institute of Basic and Applied Sciences (IBASS), Kwara State Polytechnic, the study begins with a needs assessment identifying power-related vulnerabilities in traditional CCTV setups and determining optimal camera placement. It then details the selection of components (analogue cameras, DVR, 600 VA1.5 kVA inverter, 12 V 100 Ah battery, power supply box, RG59 cabling, BNC/DC connectors) and outlines the installation workflow: mounting cameras, routing power and video lines, integrating the inverter-battery backup, and configuring the DVR for real-time monitoring. System testing under simulated blackout conditions confirmed uninterrupted video capture, rapid switchover to backup power, and sustained recording quality. Feedback from invigilators and security personnel highlighted improved coverage and deterrence of malpractice. The findings demonstrate that inverter-backed CCTV enhances examination integrity by eliminating surveillance downtime during outages. The project concludes by recommending routine maintenance, strategic camera placement reviews, secure remote-access integration, and institutional investment in high-capacity power components to scale the solution across other venues

ACKNOWLEDGEMENTS

All Glory and adoration belong to him alone (God), Omniscience, and Omnipresent for his mercy over me throughout my undergraduate journey, which of your favour I will deny absolutely none.

First and foremost, I would like to express my deepest gratitude to my project supervisor, in person of Dr. Agboola, O.M**.,** for his unwavering support, insightful advice, and constructive feedback throughout the development of this project.

Also, to my lovely parents, indeed I am speechless to thank you today, I pray to the Almighty Allah to grant you both all your heart desires. May you both live long to eat the fruit of your labour.

Also, to the school management (Kwara State Polytechnic, Ilorin) and entire Staff of Computer Science Department, starting from the Head of Department in person of **Mr. Oyedepo, F.S,** I appreciate you all.

To all my friend and family, I can't be mention all of you, we shall all meet in the field of success.

Thank you all.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The increasing demand for secure and uninterrupted examination environments has prompted educational institutions to explore various technological solutions to enhance the security and monitoring of exams. One such solution is the integration of Closed-Circuit Television (CCTV) systems, which have become widely adopted in academic settings to ensure that examination procedures are carried out fairly and transparently (Mehdizadeh & Hasani, 2018). However, the reliance on electricity to power CCTV systems presents a significant challenge, particularly during power outages. This is especially critical in locations where the occurrence of power disruptions is frequent. To address this concern, the use of inverter-powered CCTV systems has emerged as a viable alternative. By providing a consistent power supply during power failures, inverter systems ensure that CCTV cameras continue to operate, thus maintaining constant surveillance during examinations (Alhassan et al., 2019). This research investigates the use of inverter-powered CCTV systems in monitoring examinations, exploring their advantages, challenges, and overall effectiveness in ensuring continuous surveillance during exam periods.

CCTV systems have been a central part of security measures in public and private spaces for decades. Their ability to capture live footage of an area and transmit it to a monitoring station makes them an invaluable tool in preventing cheating, unauthorized access, and other forms of misconduct during examinations. As educational institutions recognize the importance of maintaining integrity during exams, many have adopted CCTV surveillance as a means of

safeguarding against such incidents (Beyrampour et al., 2020). However, these systems depend heavily on the continuous supply of electricity, which can be interrupted by power outages, particularly in regions where power supply reliability is a concern. A sudden loss of power during an examination can leave the monitoring process vulnerable, potentially allowing cheating or other unethical behaviors to go undetected (Jafari et al., 2017).

Inverter-powered CCTV systems address this issue by providing an alternative power source. Inverters are devices that convert direct current (DC) from batteries or solar panels into alternating current (AC), allowing electronic systems to operate without relying directly on the power grid. By integrating inverters into CCTV systems, educational institutions can ensure that their surveillance cameras remain operational, even during power interruptions. This uninterrupted surveillance helps maintain the integrity of the examination process, reduces the likelihood of cheating, and enhances overall security during high-stakes exams. Furthermore, inverter systems are often more cost-effective and environmentally friendly compared to traditional backup generators, making them an attractive solution for schools and universities (Shamsuddin & Mustapha, 2021).

The application of inverter-powered CCTV systems in examination monitoring is relatively new, and while there are studies that discuss the use of CCTV for security purposes, limited research has specifically addressed the integration of inverters in this context. Previous studies have highlighted the importance of surveillance systems in preventing academic dishonesty, noting that the presence of CCTV cameras in examination halls has a deterrent effect on students (Beyrampour et al., 2020). Moreover, research by Alhassan et al. (2019) discusses how technological solutions, such as automated surveillance, have been increasingly adopted in educational settings to curb malpractice. However, few studies have focused on the practical challenges and benefits of using

inverter systems to power CCTV cameras during exams. This research aims to fill that gap by exploring how inverter technology can be utilized in educational institutions to ensure continuous surveillance during examinations (Alhassan et al., 2019).

The growing reliance on technology in education has led to the development of smart campuses, where various systems work together to enhance the learning environment. In this context, the integration of inverter-powered CCTV systems contributes to the broader goal of creating a technologically advanced and secure academic environment. Smart classrooms, automated attendance tracking, and intelligent security systems are all part of this technological revolution, which is aimed at improving the overall efficiency and integrity of academic processes. Inverter powered CCTV systems, as part of this broader technological framework, offer a promising solution to the challenge of maintaining consistent surveillance in examination halls (Ngi & Ekpo, 2022).

1.2 STATEMENT OF THE PROBLEM

The growing reliance on CCTV systems for maintaining security during examinations in educational institutions has highlighted a critical challenge: the dependence on a stable power supply. In many regions, power outages are frequent, posing a significant risk to the effectiveness of CCTV systems during exams. The sudden loss of electricity can disrupt surveillance, leaving examination environments vulnerable to cheating and other forms of malpractice. This issue is particularly problematic in schools and universities where ensuring the integrity of the examination process is of utmost importance. Traditional backup power solutions, such as generators, are often costly and require regular maintenance.

1.3 AIM AND OBJECTIVES OF THE STUDY

The use of CCTV cameras in Examination monitoring

(I) Installation of cameras

(ii) Connecting the inverter to the battery

1.4 SCOPE OF THE STUDY

The implementation took place at Kwarapoly in one of the classes at Lr 28.

1.5 LIMITATION OF THE STUDY

This study is subject to several limitations. First, the research is constrained by the geographical scope, focusing on selected educational institutions that have implemented or are planning to implement inverter-powered CCTV systems. This may limit the generalizability of the findings to other regions or institutions that have not adopted similar systems.

Second, the study may encounter challenges in obtaining reliable and complete data on the installation and operational costs of inverter-powered CCTV systems, as some institutions may not fully disclose this information.

Third, the study is also limited by the duration of the research, which may not be sufficient to assess the long-term performance and sustainability of inverter-powered CCTV systems in examination monitoring.

Lastly, the research primarily focuses on technical and financial aspects, and may not fully address the human factors involved, such as the training required for staff to operate and maintain the system effectively. These limitations may affect the comprehensiveness of the findings.

1.6 SIGNIFICANCE OF STUDY

The use of inverter-powered CCTV systems in examination monitoring holds significant relevance in modern educational settings. With increasing concerns about examination malpractice, ensuring uninterrupted surveillance has become essential. Traditional CCTV systems rely heavily on a stable electricity supply, which is often unreliable in many regions. An inverter-powered CCTV system addresses this challenge by providing a continuous power source during outages, ensuring that surveillance is not compromised.

This study is significant for several key stakeholders:

- For Educational Institutions: It offers a practical solution to maintain academic integrity, especially in areas prone to power outages.
- For Administrators and Policymakers: The study provides data-driven insights to support investment in sustainable examination monitoring technologies.
- For Technology Developers: It highlights areas for innovation in creating cost-effective, energy-efficient, and reliable surveillance solutions.
- For Future Researchers: It serves as a foundation for further research in the integration of renewable energy and surveillance technologies in educational contexts.

1.7 ORGANISATIONS OF THE REPORT

This research 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, significance of study,, Operational Definition of terms and Organization of the report. Chapter review past researches (Review of related literature), Overview of the use of Inverter power CCTV in Monitoring Examination. Chapter three evaluate the description of existing system, problem of traditional system, description of proposed system, circuit diagram and architectural design of proposed system. Chapter four emphasize on overall design of the research work. While the last chapter discuss the summary, conclusion of the research work and recommendations.

1.8 DEFINITION OF TERMS

CCTV (Closed-Circuit Television): A system of video cameras used to monitor and record activities in a specific area. The footage is transmitted to a limited number of monitors for security and surveillance purposes.

Inverter: An electronic device that converts direct current (DC) from batteries or solar panels into alternating current (AC), which is used to power electrical devices such as CCTV cameras. Inverters ensure a continuous power supply during power interruptions.

Power Outage: A temporary or prolonged disruption in the electrical supply, which can occur due to various factors, such as weather conditions, electrical faults, or maintenance work.

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

Academic Dishonesty: Any form of cheating, plagiarism, or violation of ethical academic standards during examinations, including unauthorized assistance, falsification of results, or copying.

Backup Power System: A power solution designed to provide energy during a power outage, such as generators, uninterruptible power supplies (UPS), or inverters, to keep essential systems operational.

Examination Integrity: The assurance that examinations are conducted fairly and securely, free from cheating, fraud, or misconduct. It involves maintaining confidentiality, security, and impartiality during the examination process.

Smart Campus: A campus that utilizes advanced technology and automation to enhance the overall functioning of educational institutions, including monitoring systems, energy management, and security measures.

CHAPTER TWO

LITERATURE REVIEW

Martin Ekata (2020) Video Surveillance in Examination Monitoring - According to Marths the issues of tackling malpratice both within the formal settings and other examination has become a growing concern to the stake holders Including the government , school administrations and Society.Several techniques such as the use of invigilators to monitor examination and candidates for examination with photo albums from examination regulatory bodies, use of candidates Identity cards or biometric machines have been made to salvage the situations in the past.

These technigues however, seem Not to have yielded the desired results as the cases of examination Malpractice Keeps Increasng. In event of a breach, there techniques may provide enough evidence needed for protection of the culprit and their conspiration that may have destroyed the evidence. This led to the Introduction of a video surveillance System Intended to complement the effort of the human intelligence through video surveillance systems the behavior and activities of people can be monitored using electronic equipment such as close monitors using electronic equipment such as surveillance infrastructure Such as Close circus telelsion (CCTV) system .The CCTV ensure optimal coverage which collect scene (images) that are transferred to a monitoring system or are stored for subsequent analysis and review , to prevent crime by deferny potential offenders because of their awareness of the cameras that maybe watching their activity .The objective of using a CCTV system is to detect suspicious behavior in real time so that protective measures will be taken.

Asrul Andi(2024) designed a solar-powered system to supply electricity to CCTV installations, addressing the issue of unreliable grid power. Developing a sustainable power source for CCTV systems using solar energy to ensure continuous operation of surveillance systems during power outages. Utilization of an Arduino Nano microcontroller to monitor battery voltage and

Integration of a solar charge controller (SCC) to regulate current from solar panels to batteries and the load.This result shows the The system provided consistent power delivery to CCTV units, ensuring uninterrupted surveillance.The recommendation is the Adoption of solar-powered CCTV systems in areas with unreliable grid power to enhance security and monitoring capabilities and.

Uchenna Izuka(2023) Solar-Powered CCTV and Surveillance Technologies.their aim was to To explore various solar-powered surveillance technologies and their applicability in different contexts. To Evaluate the strengths and weaknesses of solar-powered CCTV cameras, drones, and sensor networks and also to assess the suitability of these technologies for various surveillance applications. The method used to carry this out they review of existing solar-powered surveillance technologies. This results show that Solar-powered CCTV cameras offer adaptability, energy independence, and rapid deployment , and Solar drones provide aerial perspectives and extended endurance. The recommendations was that the Organizations should consider hybrid solutions integrating multiple technologies for comprehensive coverage.

Taiwo Monsuru Agboluaje (2021) Appraising the Roles of Closed-Circuit Television as a Security Tool on Examination Malpractice . was to investigate the effectiveness of
CCTV systems in curbing examination malpractice, using the Unified Tertiary Matriculation Examination (UTME) as a case study. To achieve this aim they Assess the impact of CCTV surveillance on reducing examination malpractice and also Identify challenges associated with the implementation of CCTV systems in examination settings.. Empirical study involving data collection from examination centers utilizing CCTV surveillance, this method was use to achieve the aim. The results of this was that CCTV systems contributed to a reduction in examination malpractice incidents . Taiwo recommended that the Integration of inverter systems to ensure

uninterrupted CCTV functionality during examinations and to ensure regular maintenance and monitoring of surveillance equipment to enhance effectiveness.

Agboluaje, T. M. (2021) – Appraising the Roles of Closed-Circuit Television as a Security Tool on Examination Malpractice. The paper reviews prior studies on examination malpractice and surveillance systems in Nigerian schools. It discusses how CCTV has been adopted in exam halls to deter cheating, but highlights the challenges posed by power outages.The aim is to To examine the role of CCTV in reducing examination malpractice. In achieving this Agboluaje Identify how CCTV has been used in exam centers and also determine the challenges associated with its use. The method which was useful by Agboluaje was to do a Descriptive survey using structured questionnaires and interviews with JAMB officials, invigilators, and students in UTME centers. The results of is work was to use CCTV to reduced malpractice rates; however, power instability led to system downtimes.. He recommended that the Integrate inverters and solar systems to power CCTV for uninterrupted operation.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 METHODOLOGY

Analogue design was use in installation of the device Intalling am invert-powered analogue CCTV involves integrating a CCTV surveillance setup with a power backup system (inverte + battery) , ensuring continuous operation even during power outages. This are the step by step guide to analogue CCTV systems (e.g using 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

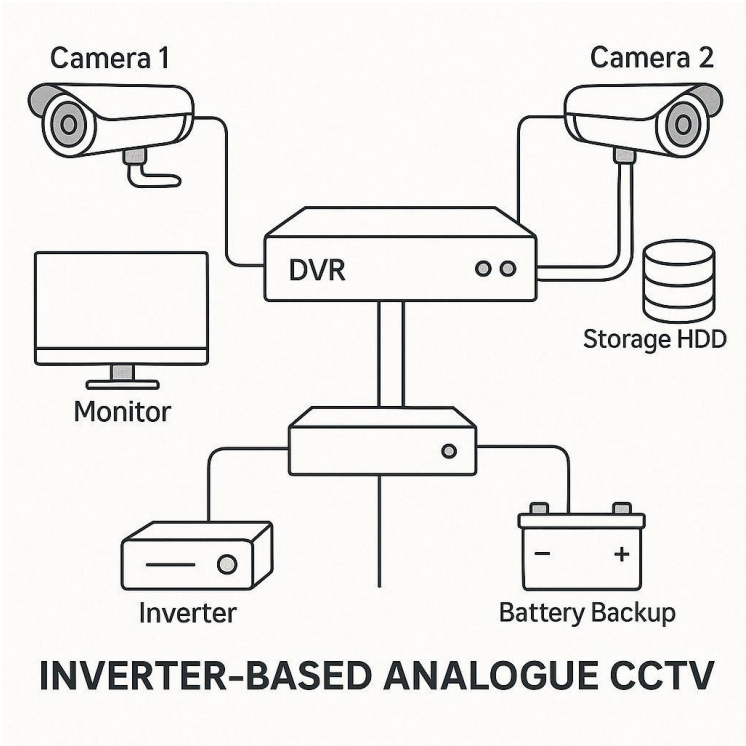
→ Choose at least 100Ah battery for safety and longevity.

3.4 Step-by-Step Installation

1. Mount Batteries & Inverter ○ In a ventilated, dry enclosure near your DVR rack. ○ Install a DC-rated fuse/breaker as close to the battery's positive terminal as possible.
2. Connect Batteries to Inverter ○ Run short, thick cables (e.g. 25 mm²) from battery +/− to inverter +/−.
    - ○ Observe correct polarity, secure connections.
3. Powering the DVR ○ Plug DVR's 230 VAC input into one of the inverter's AC outlets or hard-wire via a distribution board.

4. Powering Cameras ○ Connect the 12 VDC CCTV power supply's AC input to the inverter as well.
    - Run 12 VDC output to each camera (use appropriate gauge; 2.5 mm² for runs under 30 m).
5. Video Cabling ○ Run RG-59 coax from each camera's BNC video out to the DVR's BNC inputs.
    - Secure and label cables.
6. Grounding & Surge Protection ○ Ground the battery negative, chassis of inverter, CCTV PSU, and DVR to a common earth rod.
    - Consider surge protectors on AC mains and coax lines.
7. Initial Power-Up & Testing ○ With no load, switch on inverter—verify 230 VAC output. ○ Power DVR and CCTV PSU—confirm they boot correctly.
    - Turn on each camera—check video feed on DVR. ○ 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 5. 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

4.1 THE INPUT PROCEDURE

System implementing Tools

Implementing an inverter-powered CCTV monitoring system requires a combination of physicaltools, electronic devices, software platforms, and electrical components to ensure accurate installation, seamless operation, and long-term reliability. These tools are essential for bothhardware integration and software configuration. They can be broadly categorized into installation tools**,** electrical and power tools**,** network and connectivity tools**,** and software tools**.**

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 units. **Measuring Tape and Spirit Level:** To ensure accurate positioning and alignment of equipment.
- **Ladders and Safety Gear:** For reaching elevated mounting locations safely.

4.2 Electrical and Power Tools

These tools help in the integration of the inverter system and electrical wiring:

- **Multimeter:** To measure voltage, current, and resistance during connection setup and testing.
- **Cable Stripper and Crimper:** For stripping insulation and crimping terminals to wires and connectors.
- **Battery Connectors and Inverter Cables:** For connecting the batteries and inverter to the CCTV power system.
- **Surge Protectors and Circuit Breakers:** To protect the system from electrical spikes and overloads.

3. Network and Connectivity Tools

These are required to establish strong data and communication channels between devices:

RJ45 Connectors and Crimping Tool: For making Ethernet cables to connect IP cameras to the NVR or router.

- **Network Switches and Routers:** To manage IP camera feeds and enable remote monitoring via internet access.
- **LAN Tester:** For testing the integrity and speed of network cables.
- **CAT6 or Fiber Optic Cables:** Used for high-speed and high-quality data transmission.

4. Software Tools

Software is vital for configuration, management, and monitoring of the system:

24 **Video Management Software (VMS):** Allows centralized control of all CCTV feeds, playback, motion alerts, and data storage.

- **Remote Access Apps:** Applications such as XMeye, Hik-Connect, or mobile-friendly VMS apps for viewing feeds remotely.
- **Inverter Monitoring Software (if supported):** For tracking battery performance, power usage, and switch-over efficiency.
- **Backup and Recovery Software:** To automatically back up recorded data and facilitate easy recovery when needed.

These implementation tools work together to ensure the system is professionally installed, correctly configured, securely powered, and consistently monitored. Their availability and proper usage are critical for the success of the inverter-powered CCTV system in examinati

4.3 INSTALLATION OF CCTV AND INVERTER

Fig 4.1 inverter

An **inverter** is an electrical device that converts **Direct Current (DC)** into **Alternating Current (AC)**. It is commonly used in power backup systems and renewable energy setups like solar power systems.

Fig 4.2 Battery

A **battery** is a device that stores chemical energy and converts it into electrical energy to power electronic devices and systems. then make sure to check if the power supply in running smoothly.

Then putting that aside we move to connecting the power and BNC to the cuaxian cable The power is connected by cutting a small part of the cable inside the cable we have the two wires which the blue and red in this case blue is negative and red is positive make sure you check the sign (+)(-)on the power before fixing the wire inside to avoid burning your camera due to wrong connection . connectors are commonly used in electronic devices to supply direct current (DC) power. When the connection is done then connect it to your camera

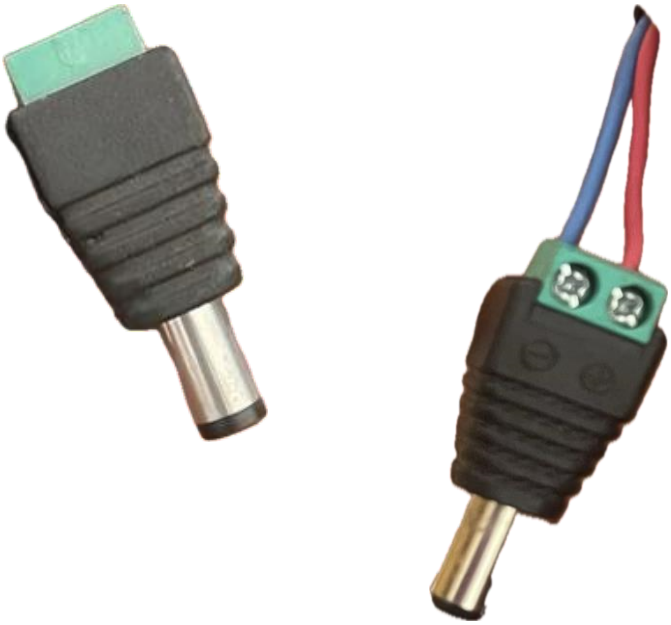


Fig 4.3 power

Power is a critical component in the effective operation of CCTV systems, especially in examination environments where continuous surveillance is required to prevent malpractice. CCTV systems rely on a stable power supply to ensure uninterrupted video recording and realtime monitoring. However, in many regions particularly in developing countries irregular power supply poses a significant challenge.

The power is connected by cutting a small part of the cable inside the cable we have the two wires which the blue and red in this case blue is negative and red is positive make sure you check the sign (+)(-)on the power before fixing the wire inside to avoid burning your camera due to wrong connection . connectors are commonly used in electronic devices to supply direct current (DC) power. When the connection is done then connect it to your camera

Fig 4.4 BNC

The BNC connector (short for Bayonet Neill-Concelman) is a type of coaxial cable connector commonly used in applications that require high-frequency signal transmission. It is known for its distinctive bayonet-style lockingo mechanism, which ensures a secure connection and makes it easy to attach and detach. When the connection his done then connect it to your camera. After connecting the power and BNC to the cable then you connect it to the CCTV power supply

Fig 4.5 DVR

DVRs are commonly used in television systems for time-shifting content (allowing users to record and watch later) and in surveillance systems to store footage from security camerasan electronic device that records video in a digital format to a disk drive, USB flash drive, SD memory card, SSD, or other local or networked mass storage device. DVRs

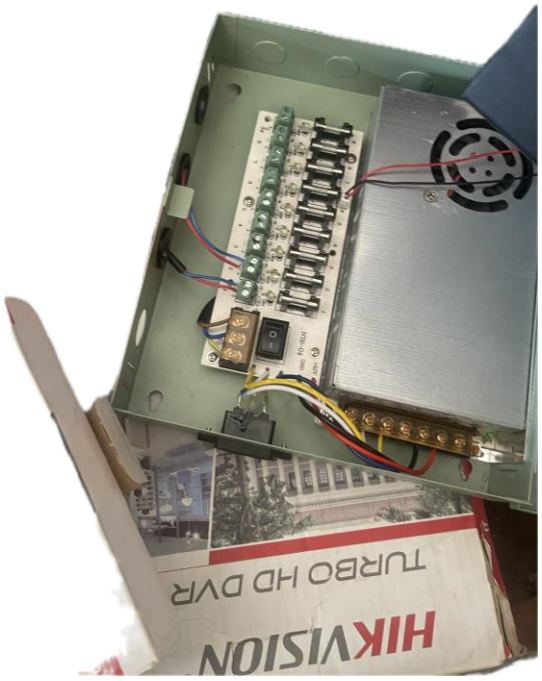


Fig 4.6 power supply box

A power supply box is a centralized unit used to distribute electrical power to multiple CCTV cameras. It serves as a critical component in both analogue and IP surveillance setups, especially in structured environments like examination halls, where and neat cable management are important.

Fig 4.7 camera 1

Installation of camera one

Fig 4.8 output of camera 1

Outp of installed camera one

This displaying chair and other items of students

Fig 4.9 camera 2

Installation of camera 2

Fig 4.10 output of camera 2

Output of installed camera 2

This displaying the student gathering together

4.4. OUTPUT PROCEDURES

The monitor plays an important role in this aspect. A **monitor** is an output device that displays visual information from a computer or video source. It is commonly used in computing, television systems, and surveillance setups.

When the necessary things are done the Monitor is plugged tho the power supply and the connection are good it should be able to show the outcome of the video CCTV where it mounted

NB: This prove that the camera works and displays the video in real time.

CHAPTER FIVE

SUSUMMARY, CONCLUSION AND RECOMMENDATION

5.1 SUMMARY

This research explores the use of inverter-powered CCTV systems in monitoring examinations, aiming to provide a more reliable and efficient solution to traditional exam surveillance methods. The study highlights the growing need for enhanced security during examinations to prevent malpractice and ensure integrity. It examines the benefits of integrating inverter technology with

CCTV systems, focusing on continuous power supply and system reliability during power outages. The research also discusses the design and implementation of a surveillance system, including the selection and installation of CCTV cameras, the inverter system for power backup, and the necessary system configurations for optimal performance. It also identifies challenges faced by traditional examination monitoring systems, such as limited camera coverage, dependency on manual intervention, and vulnerability to power disruptions. The proposed system addresses these challenges by incorporating inverter-powered cameras that ensure uninterrupted surveillance, even during power outages. Testing of the system's performance and power backup capabilities was conducted to verify its efficiency and reliability. The findings suggest that the inverter-powered CCTV system can significantly improve examination monitoring by providing continuous surveillance, ensuring data security, and enhancing overall examination integrity. This research contributes to the development of more robust and efficient examination monitoring technologies

5.2 CONCLUSION

In conclusion, this research demonstrates the significant advantages of integrating inverter-powered CCTV systems for monitoring examinations, addressing critical challenges associated with traditional monitoring methods. The use of inverter technology ensures a reliable and uninterrupted power supply, safeguarding the continuous operation of the CCTV system during power outages, which is essential for maintaining the integrity of examination environments. By incorporating both advanced surveillance technology and power backup solutions, the proposed system offers enhanced security, better coverage, and greater reliability, overcoming the limitations of conventional systems that are prone to power disruptions and manual monitoring errors. The system's design and implementation, including the careful installation of cameras and inverters, contribute to an efficient and effective examination monitoring solution. Power backup

testing further validates the system's robustness, confirming its ability to operate without interruptions for extended periods. Overall, the findings of this research provide a solid foundation for improving examination monitoring practices, ensuring that surveillance systems remainoperational throughout the examination process. The successful integration of inverterpowered CCTV not only enhances security but also contributes to the overall success of examination management, offering a more reliable, cost-effective, and efficient solution for educational institutions. This research provides valuable insights into the future of automated examination monitoring.

5.3 RECOMMENDATIONS

i. It is recommended that educational institutions should adopt inverter-powered CCTV systems for monitoring examinations to ensure continuous operation even during power outages.

ii. Also, regular maintenance and testing of the inverter and battery backup systems should be conducted to ensure optimal performance during examinations. CCTV camera placements should be regularly reviewed and adjusted to ensure comprehensive coverage of examination halls, minimizing blind spots.

iii. The integration of remote access features should be implemented for administrators and supervisors to monitor live feeds from examination halls in real-time. iv. Institutions should invest in high-quality inverters with sufficient power capacity to ensure

v. the backup system can support all critical devices for extended periods.

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