

071306T4EEN

ELECTRICAL ENGINEERING (POWER OPTION) TECHNOLOGY

LEVEL 6

ENG/OS/PO/CR/05/6

Install Security Systems

July/ August 2024

Time: 3Hours



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

Answers

SECTION A (40 Marks)

1. **State three IEEE regulations to be followed when installing Biometric Security system control panel. (3 Marks)**
 - **1. IEEE 802.3:** Standards for Ethernet networking, ensuring proper communication protocols.
 - **2. IEEE 802.11:** Standards for wireless networking, applicable for wireless biometric devices.
 - **3. IEEE 1471:** Guidelines for system and software engineering architecture, ensuring integration and interoperability.
2. **State three reasons why it's important to segregate cables when installing security systems in a new building. (3 Marks)**
 - **1. Reduced Interference:** Segregating cables minimizes electromagnetic interference between power and data cables.
 - **2. Easier Troubleshooting:** Organized cables simplify the identification of issues during maintenance.
 - **3. Enhanced Safety:** Proper segregation reduces the risk of accidental damage or short circuits.
3. **Mention any four components of a CCTV system. (4 Marks)**
 - **1. Cameras**

- **2. Digital Video Recorder (DVR) or Network Video Recorder (NVR)**
 - **3. Monitors**
 - **4. Cables (coaxial or Ethernet)**
4. **Highlight three advantages of Network Video Recorders over Digital Video Recorder CCTV systems. (3 Marks)**
- **1. Higher Resolution:** NVRs support higher resolution cameras, providing better image quality.
 - **2. Remote Access:** NVRs allow for remote monitoring and management via the internet.
 - **3. Scalability:** NVR systems can easily integrate additional cameras without significant reconfiguration.
5. **List four types of Security systems used today. (4 Marks)**
- **1. Intrusion Alarm Systems**
 - **2. Access Control Systems**
 - **3. Video Surveillance Systems (CCTV)**
 - **4. Fire Alarm Systems**
6. **Explain two types of cables used in a Security system. (4 Marks)**
- **1. Coaxial Cable:** Used for transmitting video signals from CCTV cameras to DVRs; offers good resistance to interference.
 - **2. Ethernet Cable (Cat5/Cat6):** Used for network connections in IP-based security systems; supports data transmission and can power devices (PoE).
7. **Give steps you would follow to install an Electric fence in a garden. (6 Marks)**
- **1. Plan the Layout:** Determine the perimeter where the fence will be installed.
 - **2. Gather Materials:** Obtain the electric fence wire, insulators, energizer, and grounding rod.
 - **3. Install Fence Posts:** Set up posts at regular intervals along the planned perimeter.
 - **4. Attach Insulators:** Secure insulators to the posts to hold the electric wire.
 - **5. Run the Wire:** String the electric wire through the insulators, ensuring it is taut.
 - **6. Connect the Energizer:** Attach the wire to the energizer and ensure proper grounding.
8. **List Four types of CCTV cameras. (4 Marks)**
- **1. Dome Cameras**
 - **2. Bullet Cameras**
 - **3. PTZ (Pan-Tilt-Zoom) Cameras**
 - **4. Thermal Cameras**
9. **Outline three Factors to consider when laying security system cables. (3 Marks)**

- **1. Cable Length:** Ensure cables are of sufficient length to reach all devices without excessive slack.
- **2. Environmental Conditions:** Consider exposure to moisture, temperature extremes, and potential physical damage.
- **3. Routing Path:** Plan for minimal interference and obstacles, avoiding high-traffic areas where cables might be damaged.

10. Differentiate between Screw terminal and Clamp type terminal as techniques used in security system cable termination. (2 Marks)

- **Screw Terminal:** Uses screws to secure wires, providing a strong connection but requiring tools for installation.
- **Clamp Type Terminal:** Uses a clamping mechanism to hold wires in place, allowing for quicker installation without tools.

11. Outline four factors that affect the choice of a smoke detector. (4 Marks)

- **1. Sensitivity:** The detector's ability to respond to different types of smoke.
- **2. Location:** Placement in the building, considering areas prone to false alarms.
- **3. Power Source:** Battery-operated vs. hardwired options based on installation needs.
- **4. Type of Detector:** Ionization vs. photoelectric detectors based on the environment.

SECTION B (60 Marks)

12. (a) Describe six essential documentation needed for the installation of security systems. (12 Marks)

- **1. Site Survey Report:** Details the assessment of the installation location.
- **2. Installation Plan:** A schematic showing the layout of the security system.
- **3. Equipment List:** Inventory of all equipment and materials needed.
- **4. Wiring Diagrams:** Detailed diagrams of electrical connections.
- **5. Compliance Certificates:** Documentation proving adherence to local regulations.
- **6. User Manuals:** Guides for operating and maintaining the installed systems.

(b) Explain four types of video surveillance zoning which you would use. (8 Marks)

- **1. Perimeter Zone:** Monitoring the outer boundary of the property.
- **2. Entry/Exit Zone:** Surveillance of doors and access points to track entries and exits.
- **3. High-Security Zone:** Areas requiring tighter security measures, such as server rooms.
- **4. General Surveillance Zone:** Overseeing common areas like parking lots or hallways.

13. (a) Identify and state the function of the parts labelled A, B, C, D, E, F and G in the electric fence diagram. (6 Marks)

- **A:** Electric Fence Wire - Carries the electric current.
- **B:** Insulator - Prevents the electric current from grounding through the fence posts.
- **C:** Energizer - Powers the electric fence and generates pulses of electricity.
- **D:** Grounding Rod - Grounds the system to ensure safety and proper operation.
- **E:** Fence Posts - Support the electric wire and maintain the structure.
- **F:** Control Panel - Manages the system and monitors performance.
- **G:** Warning Sign - Alerts individuals of the electric fence presence.

(b) Explain three important safety hints in the installation of an Electric fence. (3 Marks)

- **1. Disconnect Power:** Ensure the energizer is off during installation to prevent shocks.
- **2. Use Insulated Tools:** Utilize tools with insulated handles to minimize shock risk.
- **3. Follow Local Regulations:** Adhere to legal requirements and safety standards for electric fences.

14. (a) Explain six factors to consider before buying a CCTV camera solution. (14 Marks)

- **1. Resolution:** Higher resolution cameras provide clearer images.
- **2. Field of View:** Determine the area each camera can cover.
- **3. Night Vision Capability:** Essential for low-light environments.
- **4. Storage Options:** Evaluate cloud vs. local storage solutions.
- **5. Connectivity:** Check for compatibility with existing systems (wired vs. wireless).
- **6. Budget:** Consider the total cost, including installation and maintenance.

(b) Outline four Differences between Network Video Recorder and Digital Video Recorder. (8 Marks)

Feature	Network Video Recorder (NVR)	Digital Video Recorder (DVR)
Type of Cameras	Supports IP cameras	Supports analog cameras
Resolution	Higher resolution capabilities	Limited by analog signal quality
Installation	Typically easier with fewer cables	More complex due to coaxial cables
Remote Access	Easily accessible via network	Limited remote access options

15. (a) Explain five steps you would follow during maintenance of the fire alarm system. (10 Marks)

- **1. Visual Inspection:** Check for physical damage and ensure all components are intact.
- **2. Test Alarm Functionality:** Trigger alarms to verify they sound properly.
- **3. Check Battery Backup:** Ensure batteries are charged and replace if necessary.
- **4. Clean Detectors:** Remove dust and debris from smoke detectors for optimal performance.
- **5. Review System Logs:** Check for any faults or issues recorded in the system logs.

(b) Using a well-labelled diagram explain the operation of a simple bell alarm circuit. (10 Marks)