

071306T4EEN

ELECTRICAL TECHNICIAN (POWER OPTION)

LEVEL 6 ENG/OS/PO/CR/07/6

**MAINTAIN ELECTRICAL EQUIPMENT AND
SYSTEMS July /August 2024**

Time: 3 Hours



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

WRITTEN ASSESSMENT

ANSWERS

SECTION A (40 MARKS)

1. **Define the term maintenance schedule.** (2 marks)
 - A maintenance schedule is a detailed plan that outlines the specific maintenance tasks, their frequency, and the resources required to ensure that equipment and systems operate efficiently and reliably over time.
2. **Outline three advantages of corrective maintenance on a generator.** (3 marks)
 - **1. Immediate Resolution:** Corrective maintenance addresses issues as they arise, restoring functionality quickly.
 - **2. Cost-Effective:** It can be more economical than preventive maintenance if the generator is not frequently used or if issues are infrequent.
 - **3. Resource Optimization:** Focuses resources on repairs only when necessary, minimizing unnecessary expenditures.
3. **List five tools used during breakdown maintenance of an electrical machine.** (5 marks)
 - **1. Multimeter**
 - **2. Insulation resistance tester**

- 3. Socket and wrench set
 - 4. Screwdrivers
 - 5. Pliers
4. **State five records of information for a D.C motor. (5 marks)**
- 1. Maintenance history
 - 2. Operating hours
 - 3. Performance metrics (e.g., speed, torque)
 - 4. Repair logs
 - 5. Component replacement records
5. **Highlight four safety rules in handling and disposing of waste materials during maintenance. (4 marks)**
- 1. Use appropriate containers for hazardous waste.
 - 2. Label waste materials clearly to identify hazards.
 - 3. Follow local regulations for disposal of electrical waste.
 - 4. Wear appropriate PPE when handling waste materials.
6. **Explain what happens when a D.C motor is connected across an A.C supply. (3 marks)**
- When a D.C motor is connected to an A.C supply, it will not operate properly. The alternating current can cause the motor to overheat, leading to insulation failure and potential damage to the windings. The motor may vibrate excessively and produce noise, and it may even become permanently damaged if the supply is not disconnected promptly.
7. **Identify four tests of electrical system maintenance as applied in transformers. (4 marks)**
- 1. Insulation resistance test
 - 2. Transformer turns ratio test
 - 3. Power factor testing
 - 4. Sweep frequency response analysis
8. **State the main electrical systems in maintenance on a motor during inspection. (4 marks)**
- 1. Power supply system
 - 2. Control circuit system
 - 3. Cooling system
 - 4. Grounding system
9. **List four waste materials after maintenance in any electrical service. (4 marks)**
- 1. Used insulation materials

- 2. Old electrical components (e.g., capacitors, resistors)
- 3. Oil and lubricants
- 4. Cleaning solvents and rags

10. **Outline four PPEs used while performing D.C generator installation.** (4 marks)

- 1. Safety gloves
- 2. Safety goggles
- 3. Hard hat
- 4. Steel-toed boots

11. **Define the term maintenance inspection as used in electrical machines.** (2 marks)

- Maintenance inspection refers to the systematic examination of electrical machines to assess their condition, identify potential issues, and ensure they are operating safely and efficiently.

SECTION B (60 MARKS)

12. a) **Describe the troubleshooting procedure in electrical equipment and systems.** (10 marks)

- **1. Identify the problem:** Gather information about the symptoms and conditions under which the issue occurs.
- **2. Develop a hypothesis:** Formulate potential causes based on the symptoms.
- **3. Test the hypothesis:** Use appropriate tools and methods to confirm or eliminate potential causes.
- **4. Implement a solution:** Apply the necessary repairs or adjustments based on confirmed findings.
- **5. Verify the solution:** Test the equipment to ensure the problem has been resolved.
- **6. Document the process:** Record the findings, actions taken, and outcomes for future reference.

b) **Outline six information that should be included in the documentation of a maintained electrical equipment and system.** (6 marks)

- 1. Equipment specifications (model, serial number)
- 2. Maintenance history (dates and types of maintenance performed)
- 3. Test results and performance metrics
- 4. Replacement parts used
- 5. Safety inspections conducted
- 6. Operator training records

c) **List four common points of faults to be checked in an electrical installation.** (4 marks)

- 1. Circuit breaker function
- 2. Wiring integrity and connections
- 3. Grounding system effectiveness
- 4. Load distribution across circuits

13. a) List seven factors that need to be considered when installing motors for machine drives. (7 marks)

- 1. Motor size and power rating
- 2. Mounting configuration
- 3. Environmental conditions (temperature, humidity)
- 4. Load type and characteristics
- 5. Electrical supply characteristics (voltage, phase)
- 6. Alignment with driven equipment
- 7. Safety and accessibility for maintenance

b) Describe three important things to do when faced with equipment which is not functioning properly. (9 marks)

- 1. **Conduct an initial assessment:** Observe and gather information about the malfunction to identify potential causes.
- 2. **Check power supply:** Ensure that the equipment is receiving the correct power supply and that there are no tripped breakers or blown fuses.
- 3. **Review maintenance logs:** Look at previous maintenance records to identify any recurring issues or recent changes that could be related to the current problem.

c) Differentiate between breakdown maintenance and timely maintenance. (4 marks)

- **Breakdown Maintenance:** Reactive maintenance performed after equipment has failed, focusing on restoring functionality as quickly as possible.
- **Timely Maintenance:** Proactive maintenance performed at scheduled intervals to prevent equipment failure and ensure optimal performance.

14. a) Identify four types of faults during perfective maintenance. (4 marks)

- 1. Functional faults (performance issues)
- 2. Component wear and tear
- 3. Software bugs or glitches
- 4. Incompatibility issues with new updates or components

b) Explain any six general procedures of routine maintenance. (12 marks)

- 1. **Visual inspections:** Regularly check equipment for signs of wear, damage, or leaks.

- **2. Cleaning:** Remove dust, debris, and contaminants from equipment to ensure efficient operation.
- **3. Lubrication:** Apply lubricants to moving parts to reduce friction and wear.
- **4. Calibration:** Ensure that equipment is operating within specified parameters and adjust as necessary.
- **5. Testing:** Conduct functional tests to verify that equipment operates correctly.
- **6. Documentation:** Record maintenance activities, findings, and any corrective actions taken.

c) Differentiate between fuse and circuit breaker. (4 marks)

- **Fuse:** A one-time use device that melts and breaks the circuit when excessive current flows, requiring replacement after tripping.
- **Circuit Breaker:** A reusable device that automatically interrupts the circuit when excessive current flows, allowing for reset after tripping.

15. a) Discuss any six inspection procedures on a faulty transformer. (12 marks)

- **1. Visual inspection:** Check for physical damage, leaks, or signs of overheating.
- **2. Insulation resistance testing:** Measure the insulation resistance to ensure it meets safety standards.
- **3. Transformer turns ratio test:** Verify the turns ratio to ensure proper operation.
- **4. Power factor testing:** Assess the power factor to identify any insulation deterioration.
- **5. Oil analysis:** Conduct tests on transformer oil for moisture content and dissolved gases.
- **6. Thermal imaging:** Use thermal cameras to identify hot spots that may indicate electrical issues.

b) State five components of maintenance checklist in electrical machine. (5 marks)

- **1. Power supply checks**
- **2. Wiring and connections inspection**
- **3. Lubrication status**
- **4. Safety device functionality (fuses, breakers)**
- **5. Performance metrics (speed, temperature)**

c) Outline three documentation of test results of maintenance checklist in electrical machine. (3 marks)

- **1. Test date and time**
- **2. Test conditions and parameters**
- **3. Results and any corrective actions taken**