

071605T4MCT

MECHATRONIC TECHNICIAN LEVEL 5

ENG/OS/MC/CR/02/5/A

Maintain Electro-Mechanical Systems

July/August 2023



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

**WRITTEN
TEST**

INSTRUCTIONS TO CANDIDATES

1. This paper consists of THREE sections: **A**, **B** and **C**
2. Answer ALL questions in sections A and B any TWO in section C.
3. Marks for each question are indicated in brackets.
4. Do not write on this question paper.

This paper consists of NINE printed pages.

Candidate should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A: (20 MARKS)

Each question carries 1 Mark.

1. Identify the main responsibility of a technician on safety in a workshop.
 - A. Ensuring proper wearing of PPE and safety observation
 - B. Attending training sessions on safety
 - C. Being observant on hygiene
 - D. Caring for PPE
2. Identify the tool used in troubleshooting an electrical circuit.
 - A. Spanner
 - B. Hammer
 - C. Tester
 - D. Circuit tracer
3. Which one of the following is a fault indicator in an electro-mechanical system?
 - A. Overheating of components
 - B. Rust
 - C. Electrocution
 - D. Incompetence
4. What is the function of a bearing in a belt transmission system?
 - A. Transmit power
 - B. Provide lubrication
 - C. Change speed of rotation
 - D. Prevent direct contact between shaft and belt thus reducing wear
5. Which one of the following is an element of preventive maintenance?
 - A. Servicing
 - B. Down-time
 - C. Breakdown
 - D. Vibration
6. The time elapsed from the point the machine fails to perform its function to the point it is repaired and brought into operating condition is known as _____.
 - A. Down time
 - B. Dry run
 - C. Breakdown time
 - D. Idle time

7. What is the systematic approach for maintenance of electromechanical systems?
 - A. Problem – Cause – Diagnosis – Rectification
 - B. Problem– Diagnosis – Cause – Rectification
 - C. Problem – Measure – Diagnosis – Rectification
 - D. Problem– Diagnosis – Measure – Rectification
8. Which of the devices is an electrical drive?
 - A. Lead screw
 - B. Motor
 - C. Spur gear
 - D. Capacitor
9. Which of the following is used in cleaning the solenoid valve during maintenance?
 - A. Water
 - B. Pressurized air.
 - C. Sulphuric acid.
 - D. Kerosene
10. Which of the following is a locking device
 - A. Lock Nut
 - B. Screw Driver
 - C. Cap Screw
 - D. Spanner
11. Which one of the following is true for chain drive?
 - A. The chain does not slip
 - B. Chain drive is positive drive
 - C. Chain drive does not require initial tension
 - D. All the above.
12. Why is a thick cable needed to supply power to the starter motor?
 - A. The motor requires large current
 - B. The voltage needed is higher than 200V
 - C. Thick insulation is needed to prevent a short circuit
 - D. Extra strength is needed to resist the vibration

13. Which one of the following can be used for power transmission in intersecting shafts?
- A. Spur gear
 - B. Helical gear
 - C. Bevel gear
 - D. Sprocket gear
14. Identify a mechanical drive.
- A. Steering wheel
 - B. Solenoid
 - C. Sprocket and chain
 - D. Indicator
15. Which of the following tools and equipment is an example of a diagnostic tool/equipment in electromechanical systems?
- A. Mallet
 - B. Ammeter
 - C. Hacksaw
 - D. Dremel
16. Which one of the following is a document used for servicing and maintenance of electromechanical machine?
- A. Inventory
 - B. Budget
 - C. Warning signage
 - D. Operational manual
17. Identify an operational check done in an electromechanical system.
- A. Machine running
 - B. Ensuring various components are working
 - C. Performing Calibrations
 - D. Dis-assembling its components
18. Which one of the following is an inspection method used in diagnosing an electromechanical system?
- A. Visual inspection
 - B. Colour observation
 - C. Sound listening
 - D. Lighting inspection

19. Which of the following is the SI unit of inductance?

- A. Watts
- B. Ohms
- C. Henry
- D. Amperes

20. Which of the devices is an example of an electrical drive?

- A. Lead screw
- B. Motor
- C. Spur gear
- D. Capacitor

SECTION B: (40 marks)

Answer ALL the questions in this section.

21. State THREE basic maintenance procedures. (3 marks)
22. State THREE elements of preventive maintenance. (3 marks)
23. Under permit program, a special permit is required before specified type of maintenance work can be carried out. State TWO precautions which should be taken prior to issuance of work permit for each of the following type of work;
 - a. Hot working e.g. Arc-welding. (2 marks)
 - b. Vessel entry. (2 marks)
24. Identify TWO possible causes of failure of bearings in an electromechanical system. (2 marks)
25. Outline FOUR benefits of developing a critical spares list. (4 marks)
26. Safety is a crucial aspect in maintenance. Highlight THREE Safety and protection measures in an electro-mechanical system. (3 marks)
27. Outline THREE reasons for carrying out preventive maintenance. (3 marks)
28. For a proper operation of a belt shaft assembly, state the importance of proper lubrication. State THREE functions of lubricant in such assembly. (3 marks)
29. State THREE fault troubleshooting methods for electromechanical system. (3 marks)
30. Name FOUR types of maintenance strategies employed in electro-mechanical systems. (4 marks)
31. Highlight TWO essential components of a maintenance report. (2 marks)
32. Name each of the following types of gears (2 marks)

a.



b.



33. Termination is essential in any electrical installation. Name the kind of termination suitable for each of the following cases; (4 marks)

- a. Wires attaching directly to the device
- b. Device requiring a terminal.

SECTION C: (40 MARKS)

Answer any TWO questions in this section.

34.

- a. Troubleshooting is a systematic approach to problem solving that is often used to find and correct issues with complex machines, electronics, computers and software systems.

Discuss SIX steps of troubleshooting electromechanical systems. (12 marks)

- b. Discuss FOUR factors that can be used to justify whether a component should be repaired or replaced when performing maintenance. (8 marks)

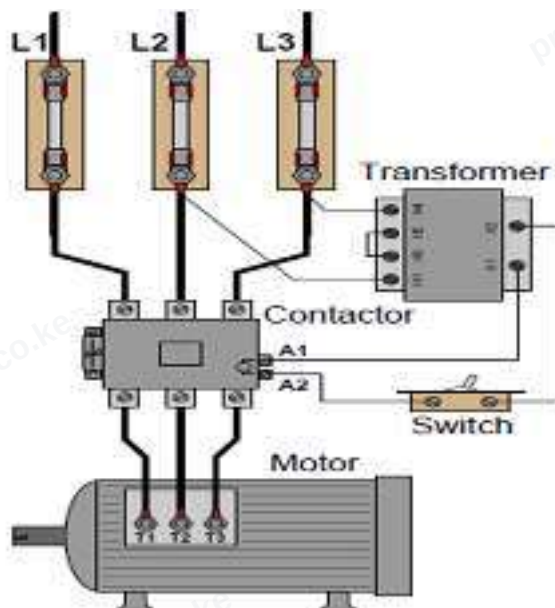
35.

- a. State FOUR symptoms of mechanical fault in a V-belt transmission system, their causes and remedy by filling in the table below. (12 marks)

Symptoms	Cause	Remedy

- b. Explain FOUR methods of inspection employed in service and/or repair of electro-mechanical systems. (8 marks)

36. You have been tasked by your senior technician to carry out maintenance of the system shown below.



- a. Identify FOUR possible faults that would cause the motor not to start and give the corrective action for each fault. (8 marks)
- b. Explain FOUR types of motor testing procedures (8 marks)
- c. Explain each of the following types of machine monitoring and testing procedures. (4 marks)
 - i. Thermography
 - ii. Ultrasonic test.