

071605T4MCT

MECHATRONIC TECHNICIAN LEVEL 5

ENG/OS/MC/CR/06/5/A

Operate Programmable Logic Control (PLC) Systems

July/August 2023



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

WRITTEN ASSESMENT

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INSTRUCTIONS TO CANDIDATES

1. This paper has **THREE** sections **A**, **B** and **C**.
2. Answer **ALL** questions in section **A** and **B**, and **TWO** questions in section **C**.
3. You are provided with a separate answer booklet.
4. Marks for each question are as indicated.
5. Do not write on the question paper.

This paper consists of SEVEN printed pages.

Candidate to 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. Which one of the following is a scan operation used to check the status of sensors in a PLC?
 - A. Input scan.
 - B. Program scan.
 - C. Output scan.
 - D. Housekeeping.
2. Which of the following is a component of the PLC?
 - A. Inputs module.
 - B. Outputs module.
 - C. Memory.
 - D. All of the above.
3. Which one of the following is an output device in a PLC system?
 - A. Push button.
 - B. Programming device.
 - C. Motor starters.
 - D. Power supply.
4. Which of the following is an advantage of the unitary PLC?
 - A. It is bigger in size.
 - B. It is usually expensive compared to other types.
 - C. It holds the entire basic component in one unit.
 - D. Programmable module.
5. Which of the following is a programming device for the PLC?
 - A. Desktop consoles.
 - B. Switches.
 - C. Potentiometer.
 - D. Bulb.
6. Which of the following is a programming language for the PLC?
 - A. Ladder diagram.
 - B. Sourcing.
 - C. Sinking.
 - D. Python.
7. In a current sinking DC input module _____

- A. The current flows out of the input field device.
 - B. Requires that AC sources be used with mechanical switches.
 - C. The current flows out of the input module.
 - D. Currents can flow in either direction at the input module.
8. Which of the following is an example of discrete (digital) control??
- A. Varying the volume of a music system.
 - B. Turning a lamp ON or OFF.
 - C. Varying the brightness of a lamp.
 - D. Controlling the speed of a fan.
9. Which of the following is not a type of controllers?
- A. Microprocessor controller.
 - B. Air logic controller.
 - C. Programmable controller.
 - D. Microcontroller.
10. What does DCS stands for?
- A. Distance Control System.
 - B. Distributed Control System.
 - C. Disease Control System.
 - D. District Control System.
11. In a PLC, the scan time refers to the amount of time in which _____.
- A. The technician enters the program.
 - B. One rung of ladder logic takes to complete.
 - C. The entire program takes to execute.
 - D. Timers and counters are indexed.
12. Which of the following is an advantage of using PLC?
- A. Non-flexibility.
 - B. Correcting errors.
 - C. Ease of connection.
 - D. Complexity

13. Which of the following is a basic form of control available in process control?
- A. Embedded control.
 - B. Set- point.
 - C. Open loop control.
 - D. Error signal.
14. Which of the following is a type of PLC;
- A. Modular PLC.
 - B. Siemens PLC.
 - C. Delta PLC.
 - D. Mitsubishi PLC.
15. PLC can be _____ in plant to change the sequence of operation.
- A. Only programmed
 - B. Only reprogrammed
 - C. Programmed and reprogrammed
 - D. Able to give a set point
16. Which of the following is a timer available in a PLC?
- A. System timer.
 - B. Switches.
 - C. Potentiometer.
 - D. On delay timer.
17. In a PLC program, outputs are represented using.
- A. A contact.
 - B. A coil.
 - C. A line.
 - D. A block.
18. Which one of the following provides voltage to PLC primary components?
- A. Level transmitters.
 - B. Control valves.
 - C. Power supply.
 - D. Flow transmitters.

19. Before PLCs were invented many industries used _____ for control.

- A. Capacitors.
- B. Resistors.
- C. Relays.
- D. Transistors.

20. Which one of the following is the oldest programming language?

- A. Structured text (ST).
- B. Function block diagram (FBD).
- C. Instruction list (IL).
- D. Ladder logic.

SECTION B: (40 MARKS)

Answer ALL Questions in this section.

21. Define the term process control as used in PLC? (2 marks)
22. State FOUR basic processes of a control loop system. (4 marks)
23. List FOUR basic forms of control available in process control. (4 marks)
24. Explain the term PLC. (4 marks)
25. List FOUR different PLC programming languages used in the industry. (4 marks)
26. List FOUR different types of timers in PLC. (4 marks)
27. Using block diagram show a compact PLC parts. (4 marks)
28. Differentiate between active and passive inputs/outputs in a PLC? (4 marks)
29. List FOUR disadvantages of unitary PLC. (4 marks)
30. Name FOUR ladder diagram programming rules. (4 marks)
31. List TWO important signals used in process control. (2 marks)

SECTION C: (40 MARKS)*Answer any TWO questions in this section*

32. Using ladder diagrams and truth table, describe the operation of:

- a. NOT gate. (5 marks)
- b. NAND gate. (5 marks)
- c. NOR gate. (5 marks)
- d. XOR gate. (5 marks)

33.

a. Draw the ladder rungs to represent the following:

- i. Two switches are normally open and both have to be closed for a motor to operate. (3 marks)
- ii. Either of two, normally open, switches have to be closed for a coil to be energized and operate an actuator. (3 marks)
- iii. A motor is switched on by ng-return push-button start switch,
and the motor remains spring-return push-button stop
switch is pressed. (4 marks)

b. Describe the structure of a PLC. (10 marks)

34.

- a. Explain the following terms in PLC. (12 marks)
 - i. Input scan
 - ii. Program scan
 - iii. Output scan
 - iv. Housekeeping
- b. Explain FOUR types of memory elements in a PLC system. (8 marks)