

071605T4MCT

MECHATRONIC TECHNICIAN LEVEL 5

ENG/OS/MC/CR/04/5/A

Operate Robotic and Automated Systems

July/August 2023

Time: 3 Hours



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

**WRITTEN
TESTS**

INSTRUCTIONS TO CANDIDATES

1. This paper has three sections A, B and C.
2. You are provided with a separate answer booklet.
3. Marks for each question are as indicated.
4. Do not write on the question paper.

This paper consists of SEVEN printed pages.

Candidates 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 one mark

1. Which of the following controllers is commonly used in robotics?
 - A. Drum controller.
 - B. Air logic controller.
 - C. Programmable controller
 - D. Microprocessor-based controller.
2. The main function of a robot is_____?
 - A. Sensing the environment by external sensors.
 - B. Decision making based on the information received from the sensors.
 - C. Performing the task decided.
 - D. All of the above.
3. The smallest change in measured value to which the instrument will respond is called_____?
 - A. Accuracy
 - B. Precision
 - C. Sensitivity
 - D. Resolution
4. The quantity or condition of the controlled system which is directly measured or controlled is _____?
 - A. Set point
 - B. Deviation
 - C. Controlled variable
 - D. Command signal
5. A controller action in which there is a predetermined relation between the values of the controlled variable and the rate of motion of a final control element._____
 - A. Floating controller action
 - B. Proportional-position controller action
 - C. Two-position controller action
 - D. Proportional-speed floating controller action
6. Which of the following drives are clean and quiet with a high degree of accuracy and reliability?
 - A. Pneumatic drives.

- B. Hydraulic drives.
 - C. Electrical drives.
 - D. All of the above.
7. Which of the following methods of gripping is used in a robot?
- A. Mechanical gripping
 - B. Magnetic gripping.
 - C. Caecum gripping.
 - D. Hydraulic gripping.
8. Which of the following configurations has three mutually perpendicular axes?
- A. Cartesian coordinate configuration.
 - B. Cylindrical configuration.
 - C. Spherical configuration.
 - D. None of the above.
9. Which of the following drives are clean and quiet with a high degree of accuracy and reliability?
- A. Pneumatic drives.
 - B. Hydraulic drives.
 - C. Electrical drives.
 - D. All of the above.
10. Which of the following is the function of a hydraulic pump?
- A. To provide flow to the hydraulic system.
 - B. To create the pressure required in a hydraulic system.
 - C. To control the pressure required in a hydraulic system.
 - D. To compensate for atmospheric pressure at varying altitudes.
11. Tele-robots are_____?
- A. built to mimic humans
 - B. so designed as to navigate and carry out the task with the intervention of human beings
 - C. provided with feedback of video, sound and other data
 - D. guided by human operators through remote control
12. The steady state performance is evaluated in terms of the_____?
- A. Maximum overshoot
 - B. Delay time
 - C. Error

- D. input signal
13. The overshoot and the settling time are maximum with_____?
- A. Underdamped system
 - B. Overdamped system
 - C. Critically damped system
 - D. Damped system
14. A device used for measuring the specific gravity of a liquid is known as?
- A. Hydrography.
 - B. Hydrometer.
 - C. Hydroscope.
 - D. Hydrostat.
15. Which one of the following is a type of proximity sensor?
- A. Resistance dependent resistor
 - B. Ultrasonic sensors.
 - C. Linear variable differential tran
 - D. Light dependent resistor
16. The ratio of amplitude of response to _____ t is called_____?
- A. Response
 - B. Gain
 - C. Phase
 - D. Frequency
17. A controller includes which of the following components?
- A. Generator
 - B. Motor.
 - C. Actuator
 - D. Programming cable
18. The following are contact robotic sensors except?
- A. Proximity sensors.
 - B. Electro-optical sensors.
 - C. Range-imaging sensors.
 - D. motion sensor
19. Which one of the following is a component of a measurement system?
- A. Sensor
 - B. Memory device

C. Power supply

D. Generator

20. What is the function of a comparator in a control system?

A. Amplify the input

B. Amplify the error

C. Generates the error

D. Control the plant

SECTION B (40 MARKS)

Answer ALL the questions in this section

21. Briefly describe an industrial robot. (4 marks)
22. Robots have a wide industrial application. State any FOUR applications of industrial robots. (4 marks)
23. As a mechatronic technician you have been invited by a production industry to elaborate the importance of robotics in the production machines. State FOUR objectives of using industrial robots in production lines. (4 marks)
24. Industrial robots are broadly divided into TWO main groups. Differentiate the TWO main groups. (4 marks)
25. Robotics is dynamic with changes being implemented occasionally, state FOUR advanced technological features of modern robots. (4 marks)
26. Differentiate between Robot arms and Robot hands. (4 marks)
27. State FOUR components of a robotic (4 marks)
28. State FOUR strategies that should be tomation'. (4 marks)
29. There are various sensors and transdu in robotics. State FOUR contact type sensors. (4 marks)
30. Explain the difference between service requests and robot requests. (4 marks)

SECTION C: (40 MARKS)

Answer any TWO questions in this section

31.

- a) Explain briefly FIVE types of joints as used in robots. (10 marks)
- b) Explain any THREE methods used to drive the manipulator of a robot. (6 marks)
- c) Different component manuals are referred to during robotic operation. List FOUR types of manuals you may be required to use during a robotic system operation. (4 marks)

32.

- a) Explain any TWO types of welding that robots can do. (4 marks)
- b) Gears are made in many sizes and with different numbers of teeth. Explain any THREE types of gears used to drive a robotic system. (6 marks)
- c) Explain any FIVE types of robots based on the end effector. (10 marks)

33.

- a) Describe FIVE factors which should be considered while installing a robot or robotic system to ease its operation. (10 marks)
- b) Briefly explain the TWO basic laws of robotics followed during installation for safety operation of a robot. (4 marks)
- c) Describe any THREE classifications of industrial manipulators based on geometric configuration. (6 marks)