

071606T4IMT

Industrial Mechatronics Technology Level 6

ENG/OS/IMT/CR/01/6/A

Design Electromechanical Systems

July/August 2023

Time: 3 Hours



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

WRITTE T

3 HOURS

INSTRUCTIONS TO CANDIDATE:

1. *This paper consists of sections A and B.*
2. *Answer ALL questions in section A and ANY THREE questions in section B.*
3. *Do not write on the question paper.*
4. *You will be provided with a separate answer booklet.*

This paper consists of THREE printed pages.

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

SECTION A (40 MARKS)

Answer ALL the questions in this section.

1. Product specification is crucial in designing of mechatronic systems. Define the term product specification. (2 marks)
2. Name THREE components of a mechatronic system. (3 marks)
3. State FOUR reasons of using simulations in electromechanical design. (4 marks)
4. Outline FOUR benefits of housekeeping. (4 marks)
5. Highlight THREE methods used to collect data during design process. (3 marks)
6. State FOUR ergonomic factors that are considered during engineering design. (4 marks)
7. Outline THREE importance of patenting a product. (3 marks)
8. Highlight FOUR limitations of simulation models. (4 marks)
9. State THREE classifications of engineering design models. (3 marks)
10. Highlight FOUR importance of design process documentation. (4 marks)
11. State FOUR stages of product life cycle. (4 marks)
12. Outline TWO major categories of requirements for electromechanical design. (2 marks)

SECTION B (60 MARKS)

Answer any THREE questions in this section.

13.

- a) Describe FIVE steps involved in material selection of a design product. (10 marks)
- b) Explain FIVE market-oriented factors that should be considered during the design process. (10 marks)

14.

- a) Explain FIVE steps involved in simulation process. (10 marks)
- b) Discuss FIVE components of a controller. (10 marks)

15.

- a) Differentiate between a sensor and an actuator and give an example in each case. (4marks)
- b) Name THREE types of sensors and explain their functions. (6 marks)
- c) Explain FIVE factors to consider when selecting sensors. (10 marks)

16.

- a) Breaking down larger problems into smaller tasks is an essential skill for effective problem-solving and project management. Explain SIX steps involved in this process. (6 marks)
- b) Each design problem is unique and may necessitate various types of analysis to arrive at effective solutions. Explain FIVE types of analysis that designers often employ. (10 marks)
- c) Explain FOUR benefits of documenting design work. (4 marks)

THIS IS THE LAST PRINTED PAGE.