

071305T4EOP

Electrical Operator Level 5 (Power Option)

ENG/OS/PO/CR/02/5

Install Electrical power lines

July/August 2023



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

WRITTEN ASSESSMENT

3 HOURS

INSTRUCTIONS TO CANDIDATE

This paper consists of sections A, B and C.

*Answer **all** questions in section A & B and any **two** questions from section C in the answer booklet and drawing papers provided.*

Do not write on the question paper.

Marks for each question are indicated in the brackets.

***Only** use CAD software for the specified questions.*

This paper consists of seven (7) 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)

*Answer **all** questions in this section. Each question carries one (1) mark.*

1. What is the typical length of a span on an electrical transmission line? (1 Mark)
 - A. 10-50 meters
 - B. 100-500 meters
 - C. 1-5 kilometers
 - D. 10-20 kilometers

2. Which of the following factor influences the length of a span on an electrical transmission line the most? (1 Mark)
 - A. Voltage level
 - B. Weather conditions
 - C. Terrain
 - D. Conductor type

3. Which type of cable is commonly used for long-distance electrical transmission lines? (1 Mark)
 - A. Coaxial cable
 - B. Fiber optic cable
 - C. Shielded twisted pair cable
 - D. Overhead bare conductor cable

4. What is one of the following is the main factor that affects the spacing of conductors in an electrical transmission line? (1 Mark)
 - A. Voltage level
 - B. Line length
 - C. Conductor diameter
 - D. Weather conditions.

5. Which test is typically performed to assess the integrity and strength of a transmission line's conductors? (1 Mark)
- A. Impedance test
 - B. Short-circuit test
 - C. Tension test
 - D. Dielectric test
6. Which of the following factors does NOT affect the sag in an electrical transmission line? (1 Mark)
- A. Length of the span
 - B. Temperature
 - C. Wind speed
 - D. Insulator type
7. What is the primary purpose of earthing in an electrical transmission line? (1 Mark)
- A. Protecting against lightning strikes
 - B. Reducing electrical losses
 - C. Preventing short circuits
 - D. Ensuring voltage stability
8. The resistance of the grounding system for a transmission line is primarily determined by? (1 Mark)
- A. Soil resistivity
 - B. Tower height
 - C. Conductor size
 - D. Length of span
9. The grounding of a transmission line is typically done through the following, except? (1 Mark)
- A. Ground rods
 - B. Grounding mats
 - C. Tower grounding systems
 - D. Supporting insulators

10. Which type of termination is commonly used for overhead transmission lines? (1 Mark)

- A. Compression termination
- B. Heat shrink termination
- C. Cold shrink termination
- D. Slip-on termination

11. Which of the following terminations is suitable for both indoor and outdoor applications?

(1 Mark)

- A. Porcelain termination
- B. Oil-filled termination
- C. Resin-filled termination
- D. Pre-molded termination

12. Which of the following structures is commonly used to support overhead distribution lines?

(1 Mark)

- A. Poles
- B. Towers
- C. Substations
- D. Insulators.

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13. Which material is commonly used for overhead conductors in electrical transmission lines

(1 Mark)

- A. Copper
- B. Aluminum
- C. Steel
- D. Silver

14. Which type of structure is used to connect multiple power transmission lines at a substation?

(1 Mark)

- A. Busbars
- B. Transformers
- C. Capacitors
- D. Surge arresters

15. The presence of corona discharge on a transmission line tends to? (1 Mark)
- A. Increase losses and decrease efficiency
 - B. Decrease losses and increase efficiency
 - C. Have no significant impact on efficiency
 - D. Improve insulation properties
16. The resistance of a transmission line depends primarily on? (1 Mark)
- A. Line voltage
 - B. Conductor material
 - C. Weather conditions
 - D. Length of the transmission line
17. Which type of structure is commonly used for supporting overhead electrical transmission lines? (1 Mark)
- A. Poles
 - B. Towers
 - C. Cables
 - D. Insulators
18. What is a key reason for choosing underground transmission systems in areas prone to severe weather conditions? (1 Mark)
- A. Enhanced safety during storms
 - B. Increased power efficiency
 - C. Greater resistance to lightning strikes
 - D. Improved insulation properties
19. The main disadvantage of underground transmission systems is? (1 Mark)
- A. Higher installation costs
 - B. Greater susceptibility to electromagnetic interference
 - C. Limited power transmission capacity
 - D. Decreased system reliability
20. Why is testing an electrical transmission line important? (1 Mark)
- A. To ensure compliance with environmental regulations
 - B. To verify proper installation and functionality
 - C. To minimize construction costs
 - D. To improve aesthetic appeal

SECTION B (40 MARKS)

Answer all questions in this section.

21. Explain the following terms as used in protective devices of electrical power lines. (4 Marks)
 - a) Current rating;
 - b) Fusing factor.

22. Explain **three** advantages of Miniature Circuit breakers (MCBs) over fuses. (6 Marks)
23. List six factors which affect tension of a conductor in overhead transmission lines. (6 Marks)
24. State **four** causes of voltage surges in transmission lines. (4 Marks)
25. State **four** ways of reducing corona effect in a transmission lines. (4 Marks)
26. Define 'skin effect'. (2 Marks)
27. List **four** factors that skin effect depends on. (4 Marks)
28. Explain 'corona effect'. (2 Marks)
29. List four parts of a transmission tower. (4 Marks)
30. Describe types of transmission in electrical power lines. (4 marks)

SECTION C (40 marks)

Answer any two questions in this section.

31. (a) Discuss **four** types of insulators used in overhead transmission lines. (8 marks)
- (b) Discuss the following terms as applied to transmission lines:
- i. Voltage regulation
 - ii. Transmission efficiency. (8 marks)
- (c) Explain any two factors which affect spacing of between conductors in an electrical transmission line. (4 Marks)
32. (a) Explain three types of tests carried out in electrical transmission power lines. (6 marks)
- (b) What are the key components of a typical transmission line earthing system? (8 marks)
- (c) What are the different types of earthing systems used in transmission lines? (6 marks)
33. (a) Explain the relationship between tension and sag in power line conductors. (4 Marks)
- (b) Describe the factors that influence the tension and sag characteristics of power line conductors. (6 Marks)
- (c) Explain methods of conductor terminations used in electrical transmission lines. (6 Marks)
- (d) Describe the various types of supports commonly used for power lines with different voltage levels. (4 Marks)

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