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TELECOMMUNICATION ENGINEERING LEVEL 6

ENG/OS/TLE/CC/02/6/A

Apply Electrical Principles

November/ December 2025



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

WRITTEN ASSESSMENT

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INSTRUCTIONS TO CANDIDATES

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A and **ANY THREE** (3) questions in section B
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet.
5. Do not write on this question paper.

This paper consists of FOUR (4) 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 questions in this section.

1. Electrical quantities are the fundamental properties that are used to describe and analyze electrical circuits. Define the following quantities and highlight their respective SI units.
 - a) Current
 - b) Voltage. (4 Marks)
2. Fundamental laws describe how electrical charges interact with each other and how they produce electric fields and currents. State Ohm's law. (2 Marks)
3. Calculate the resistance of a 2km length of aluminum overhead power cable if the cross-sectional area of the cable is 100mm^2 . Take the resistivity of aluminum to be $0.03 \times 10^{-6} \Omega\text{m}$. (4 Marks)
4. Earthing and bonding are essential protective measures. State FOUR differences between earthing and bonding. (4 Marks)
5. Both generators and motors are key electrical machines that deal with electricity, but in opposite ways. Differentiate between a generator and a motor. (4 Marks)
6. Capacitors are used to store charge in circuit. State factors affecting the capacitance of a parallel plate capacitor. (3 Marks)
7. Many electrical devices and applications require rectification to function. Define rectification in installation. (2 Marks)
8. The input power to a 3-phase a.c motor is measured as 5kW. If the voltage and current to the motor are 400V and 8.6A respectively, determine the power factor of the system. (4 Marks)
9. State FOUR safety precautions when working on electrical machines. (4 Marks)
10. Calculate the power loss in a circuit where a source of 100V produces 4A in a 25Ω resistor. (2 Marks)
11. A refrigeration system works based on the principles of thermodynamics to remove heat from a designated space and maintain a cool temperature. List THREE elements of the system. (3 Marks)
12. A battery of electromotive force (emf) 6V has an internal resistance of 0.15Ω . Calculate its terminal potential difference (p. d) when delivering a current of:
 - a) 0.5A: (2 Marks)
 - b) 2A: (2 Marks)

SECTION B:(60 MARKS)

Answer **THREE** questions in this section.

13.

- a) The resistance of the field winding of a shunt generator is 200Ω . When the machine is delivering 80kW the generated emf and terminal voltage are 475V and 450V respectively. Calculate:
- The armature resistance: (5 Marks)
 - The value of generated e.m.f when the output is 50kW, the terminal voltage then being 460V. (5 Marks)
- b) A moving coil meter is rated $10\text{ k}\Omega/\text{V}$. The coil has a resistance of 50Ω . Calculate the value of multiplier required for:
- The 10V d.c range; (5 Marks)
 - The 10V (a.c) range. (5 Marks)

14.

- a) State the Superposition theorem. (2 Marks)
- b) Using Nodal analysis, calculate the voltage V_2 in the circuit of Figure 1 below. (13 Marks)

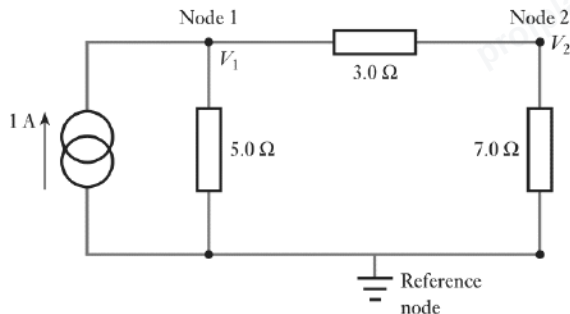


Figure 1

- c) Lightning arrestors are vital components in electrical power systems that protect equipment from damaging voltage spikes caused by lightning strikes. List FIVE main lightning arresters. (5 Marks)

15.

- a) Single-phase electrical machines are widely used in residential and industrial applications which are typically powered by single-phase AC power sources. List FIVE types of Single-phase machines which can be found in a training workshop. (5 Marks)
- b) Using a well labelled diagram Explain the construction and operation of Single-phase capacitor start motors and their phasor representation. (9 Marks)
- c) Explain types of transformer losses. (6 Marks)

16.

- a) A transformer has a rated output of 200 kVA at a power factor of 0.8. Determine the rated power output and the corresponding reactive power. (6 Marks)
- b) A resistor of 10Ω , an inductor of $0.5H$ and a capacitor of $100\mu F$ are connected in series across a 240V 50Hz supply, calculate: (8 Marks)
 - i. The impedance of the circuit
 - ii. The supply current
 - iii. The power factor
 - iv. The power
- c) Power factor (PF) is a crucial concept in engineering, representing the efficiency of how electrical power is used in a circuit REE methods used to improve the power factor in an electrical installation. (6 Marks)