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071306T4EEN**ELECTRICAL ENGINEERING (POWER OPTION) LEVEL 6****ENG/OS/PO/CC/03/6** Printed By: Technical And Vocational College

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Apply Electrical Principles**July/August 2025**

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

WRITTEN ASSESSMENT

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Time: 3 HOURS

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INSTRUCTIONS TO CANDIDATE

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

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This paper consists of FOUR (4) printed pages**Candidates should check the question paper to ascertain that all pages**Printed By: College

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are present and that no questions are missing.

SECTION A (40 MARKS)

Attempt ALL the questions in this section.

1. Power is one of the by electrical billing companies like Kenya Power and Lighting Company (KPLC) in domestic and industrial setups. Define the term 'electrical power' and state its SI unit. (2 marks)
2. Calculate the resistance of a conductor if a voltage of 24V produces a current of 3A. (2 Marks)
3. Three resistors of 2Ω , 3Ω , and 6Ω are connected in parallel. Calculate the total resistance. (3 Marks)
4. While installing or maintaining industrial motor systems, identify THREE commonly used methods of starting a three-phase induction motor. (3 marks)
5. Explain the meaning of the term "lagging power factor". (4 marks)
6. A 3-phase load draws a line current of 15 A from a 400 V system with a power factor of 0.85 lagging. Calculate the real power consumed. (4 marks)
7. In relation to DC transients, define the term "time constant" of an RC circuit and calculate the time constant for a $100\text{ k}\Omega$ resistor and a $10\text{ }\mu\text{F}$ capacitor. (4 marks).
8. Earthing is critical in ensuring the safety of both the user and the electrical appliances. Identify FOUR commonly used methods of earthing (4 marks).
9. A 3-phase star-connected system has a line voltage of $\sqrt{3}$ phase voltage. (2 marks).
10. In relation to the development of electronic systems that sense light or radiation, identify FOUR detectors commonly used to measure electromagnetic radiation. (4 marks)
11. In the study of electromagnetic field theory as applied in communication systems, state TWO fundamental laws used to analyze magnetic fields. (2 marks)
12. Poor Earthing in an installation can cause serious consequences. State and explain two consequences of poor earthing in a high-voltage installation. (4 marks).
13. Transformers are rated in kVA and not kW. Explain (2 marks)

SECTION B (60 MARKS)**Attempt Any THREE Questions in this Section**

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14.

- a) In a parallel circuit, three resistors of 10Ω , 15Ω , and 30Ω are connected across a 120V supply. Calculate:

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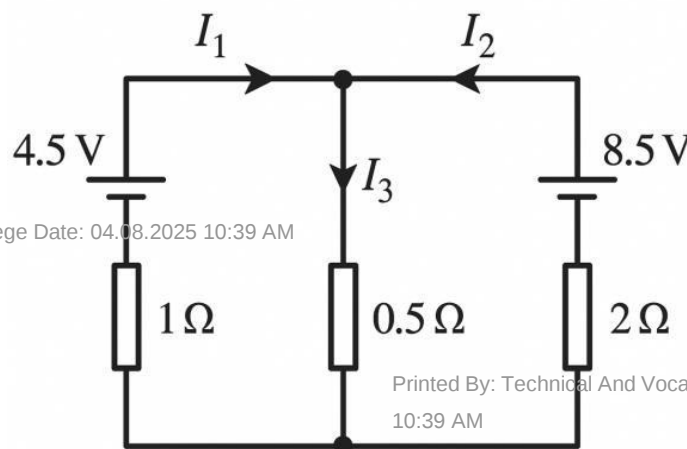
- ii. The current through each resistor

- iii. The total power consumed (8 marks)

- b) Use the superposition theorem to find the currents I_1 , I_2 and I_3 flowing in each branch

of Figure 1.

(12 marks)



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Fig.1

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- a) "Lightning strikes pose a significant threat to buildings and their occupants. Discuss the importance of lightning protection in buildings. (4 marks)

- b) A well-designed lightning system is essential for safeguarding structures from lightning strikes. Explain four components of a lightning protection system. (8 marks)

- c) To ensure the effectiveness of an earthing system, regular continuity testing is required. Outline the procedure for testing the continuity of an earthing system. (8 marks)

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16.

- a) A $5\ \mu\text{F}$ capacitor is connected in series with a $200\ \Omega$ resistor to a $10\ \text{V}$ DC supply.

Calculate:

- The initial current at the moment of switching
- The voltage across the resistor and capacitor after $5\ \text{ms}$
- Sketch the growth curve of voltage across the capacitor (10 marks)

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- b) A $230\ \text{V}$ single-phase motor draws $8\ \text{A}$ and has a power factor of 0.7 lagging.

Calculate:

- Active power
- Apparent power
- Reactive power
- Power factor angle (10 marks)

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17.

- a) A $240\ \text{V}$, $50\ \text{Hz}$ single-phase supply is connected to a series circuit comprising a resistor of $20\ \Omega$ and an inductor with a reactance of $15\ \Omega$.

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- i. Calculate the total impedance of the circuit.

- Determine the current flowing through the circuit.
- Calculate the power factor and state whether it is leading or lagging.
- Sketch the phasor diagram representing.

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(12 marks)

- b) A shunt generator supplies a $20\ \text{kW}$ load at $200\ \text{volts}$ through cables of $100\ \text{mW}$ resistance. If the field winding resistance is $50\ \Omega$ and the armature resistance $40\ \text{m}\Omega$.

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Calculate the;

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- Terminal voltage
- E.M.F generated in the armature (8 marks)

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