071906T4AEN

Agricultural Engineering Level 6

ENG/OS/AGR/CC/07/6/A

Apply Electrical Principles

July /Aug 2023

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

WRITTEN ASSESSMENT

Time: 3 hours

INSTRUCTIONS TO CANDIDATES

1. This paper has **two** sections **A** and **B.**
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 4 printed pages

Candidates 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. Suppose the voltage output of the battery is 12.0V, and resistances are R1=1.0Ω, R2=6.0 Ω, and R3=13.0 Ω are connected in series. Determine;
   (a) The total resistance? (2 marks)
   (b) The current (2 marks)
2. State ONE function of each of the following electrical measuring instruments. (4 marks)
   a) Multimeter
   b) Ohmmeters
   c) Megger tester
   d) Demand meters
3. A farmer uses two 3kW heaters for 20 hours each per week and six 150W lights for 30 hours each per week. If the cost of electricity is 14ksh per unit, determine the weekly cost of electricity the farmer should pay at the end of the week. (4 marks)
4. Resistance is directly proportional to temperature for good conductors. Calculate the new resistance if initial resistance of 25 ohms increases due to temperature increased from room temperature of 20^{o}C to 80^{o}C.
   Given that the temperature coefficient of resistivity is 0.004 /^{o} C. (4marks)
5. State FOUR components of lightning protection systems (4 marks)
6. Explain THREE principle types of power loses in machines. (6 marks)
7. a) Define lightning arrester. (1 mark)
   b) Explain the operation of a lightning arrester. (3 marks)
8. Outline FOUR advantages of parallel connection of loads in an electrical circuit (4 marks)
9. A 100V battery is connected across a resistor and causes a current of 5 mA to flow.
   a) Determine the resistance of the resistor. (2 marks)
   b) If the voltage is reduced to 25V, determine the amount of current flowing. (2 marks)
10. Differentiate between earthing and earth electrodes. (2 marks)

SECTION B (60 Marks)

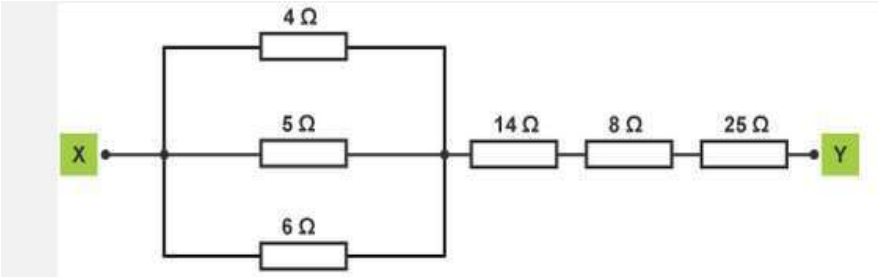
Answer three questions in this section

11. a) State Ohm's law (1mark)

b) i) List SIX apparatus used to verify Ohm's law. (3 marks)

ii) Using a circuit diagram explain the steps used to verify Ohm's law. (9 marks)

c) Study the circuit below and answer the following questions:



i) Determine the total resistance in the circuit between X and Y (3 marks)

ii) Determine the current through the circuit and 4Ω resistor if potential difference across X and Y is (4 marks)

12. A lightening protection inspection officer was going round in an urban setting during a normal working day checking compliance with the law on lightning protection systems as affirmed by law. Lightning strike can cause serious consequences including death.

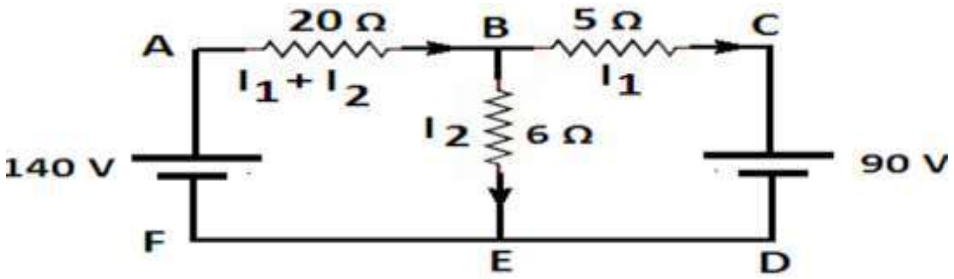
a) Give TWO reasons why one building structure may be prone to more lightening strikes than the other. (2 marks)

b) Explain FIVE places or structures he will visit as per the law where lighting protection systems must be typically installed. (10 marks)

c) Describe FOUR different types of lightening strikes. (8 marks)

13. (a) State Kirchhoff's law of voltage. (2 marks)

(b) Using Kirchhoff's law, calculate the current in each branch of the circuit. (6 marks)



(c) Explain FOUR types of earthing (12marks)

14.(a) i) Define the term "an ideal transformer". (2 marks)

ii) Discuss the working principle of a transformer (6 marks)

iii) A transformer has a primary coil with 1600 loops and a secondary coil with 1000 loops. If the current in the primary coil is 6 Ampere, then what is the current in the secondary coil? (4 marks)

b) i) List FOUR advantages of Alternating Current motors over Direct Current motors. (4 marks)

ii) Describe the working principle of a Direct Current motor (4 marks)

END