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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

22 November 2022 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 6 pages and 1 formula sheet.

124Q1E2222

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
ELECTRICAL TRADE THEORY N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use only a blue or black pen.
5. Drawings should be neat and clear and may be done in pencil.
6. Write neatly and legibly.

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QUESTION 1

1.1 State THREE steps that should be taken to ensure good and proper housekeeping in a factory or workshop. (3)

1.2 State THREE ways in which an electrical circuit could be isolated to prevent an accident. (3)

1.3 State TWO important aspects to keep in mind regarding machines and machine guards. (2)

1.4 Write out the following abbreviations in full:

1.4.1 OHS

1.4.2 PPE

(2 × 1) (2)

1.5 Name the types of extinguishers that could be used for each class of fire indicated in the following table. Write only the answer next to the question number (1.5.1–1.5.4) in the ANSWER BOOK.

CLASS	TYPE OF EXTINGUISHER
A	1.5.1
B	1.5.2
C	1.5.3
D	1.5.4

(4 × 1) (4)

1.6 Briefly describe what a fire extinguisher is. (1)

1.7 State FIVE safety precautions to be observed when working with power tools. (5)

[20]

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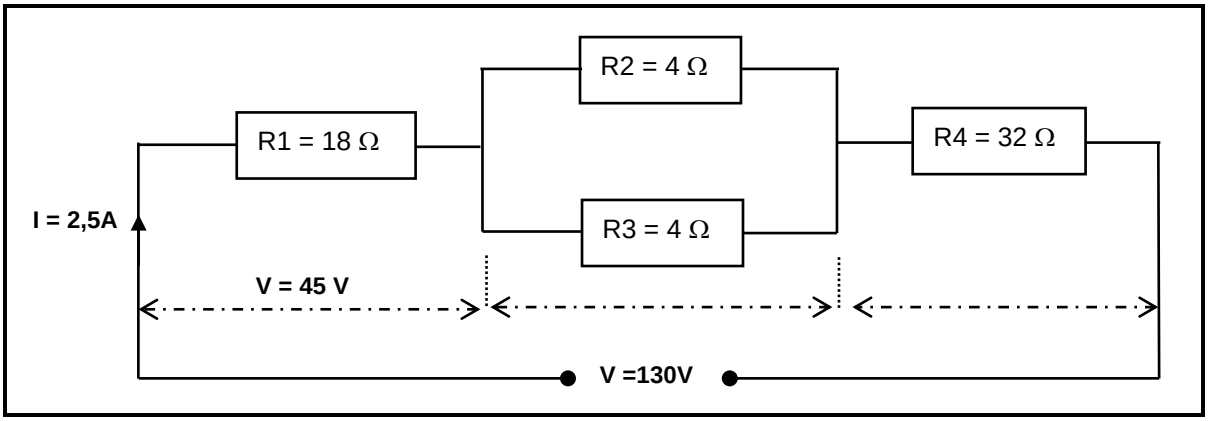
QUESTION 2

2.1 State Ohm's law in words. (3)

2.2 Refer to the diagram below when answering the questions.



Calculate the following:

2.2.1 The resistance across the parallel section (5)

2.2.2 The voltage across resistor R4 (3)

2.2.3 The total resistance of the circuit (3)

2.2.4 The power consumed by the resistors in the parallel section (4)

2.3 What are the FOUR factors affecting the resistance of a conductor? (4)

2.4 FOUR cells, each with an EMF of 2,2 V and an internal resistance of 0,5 ohms are connected in parallel across TWO series-connected resistors of 5 ohms and 3 ohms respectively.

Calculate the following:

2.4.1 The total EMF

2.4.2 The total internal resistance

2.4.3 The current flow through the circuit

2.4.4 The potential difference across the 5 ohm resistor

(4 × 2) (8)

[30]

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QUESTION 3

3.1 Define a *conductor* as a practical component. (1)

3.2 Aluminium is also used extensively for the … of electrical conductors. (1)

3.3 What is the function of insulating material? (3)

3.4 Draw the IEC symbols of the following components:

3.4.1 A battery

3.4.2 An inductor

3.4.3 A variable resistor

3.4.4 A transformer

3.4.5 A capacitor

(5 × 2) (10)

3.5 Briefly explain the operation of the following switches in a light circuit:

3.5.1 A two-way switch

3.5.2 An intermediate switch

(2 × 2) (4)

3.6 State the purpose of the following electrical components in electrical circuits:

3.6.1 An earth-leakage relay

3.6.2 A lightning arrestor

3.6.3 A fuse

(3 × 2) (6)

3.7 What does SANS 10142 stipulate with regard to the position of a switch disconnector for a cooking appliance? (5)

[30]

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QUESTION 4

4.1 What are the precautionary measures to be taken into account when conducting an insulation resistance test between conductors? (5)

4.2 Name the TWO rules that may be applied to determine the direction of the flux relative to the current. (2)

4.3 State Faraday's first law of electromagnetic induction. (3)

[10]

QUESTION 5

5.1 Briefly explain the difference between the following in terms of the direction of the current flow:

5.1.1 DC (2)

5.1.2 AC (3)

5.2 State FIVE activities that can lead to climate change. (5)

[10]

TOTAL: 100

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ELECTRICAL TRADE THEORY N1

FORMULA SHEET

RESISTORS

$$R = \frac{V}{I}$$

$$R_T = R_1 + R_2 + R_3 + ...$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ...$$

POWER

$$P = V \times I$$

$$P = I^2 \times R$$

$$P = \frac{V^2}{R}$$

ENERGY

$$W = P \times t$$

$$W = VI \times t$$

$$W = I^2 R \times t$$

$$W = \frac{V^2}{R} \times t$$

CELLS

$$E = V + (I \times r)$$

$$R_T = R + r$$

$$I = \frac{V}{R}$$

$$I = \frac{E}{(R + r)}$$

RESISTIVITY

$$R = \frac{\rho \times \ell}{a}$$

$$a = \frac{\pi \times d^2}{4}$$

TEMPERATURE COEFFICIENT

$R_t = R_O (1 + \alpha t)$

TRANSFORMERS

$$\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

$$S = VI$$

$$P = VI\cos\theta$$

Efficiency = P_{OUT} / P_{IN}

CAPACITORS

$$C_T = C_1 + C_2 + C_3 + ...$$

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + ...$$

FREQUENCY

$$f = np$$

$$f = \frac{1}{T}$$

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