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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

28 November 2023 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 4 pages and 1 formula sheet.

122Q1E2328

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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. Write neatly and legibly.

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QUESTION 1

1.1 Explain the reason for housekeeping. (3)

1.2 Mention THREE aspects with regard to machine guarding. (3)

1.3 Name any FOUR procedures to isolate or lock out a circuit for inspection and repair purposes. (4)

[10]

QUESTION 2

2.1 State any FIVE causes of fire. (5)

2.2 State the use of the following hand tools:

2.2.1 Crimping tool

2.2.2 Cable knife

2.2.3 Hacksaw

2.2.4 Bending spring

2.2.5 Draw tape

(5 × 1) (5)

[10]

QUESTION 3

3.1 Define ohm's law. (5)

3.2 Four cells, each with an EMF of 1,5 V and an internal resistance of 0,4 Ω, are connected in series to make up a battery. Two resistors of 6 Ω and 8 Ω respectively are first connected in parallel and then across the terminals of the battery.

Calculate the following electrical quantities:

3.2.1 The total EMF of the circuit (2)

3.2.2 The total internal resistance of the circuit (2)

3.2.3 The total resistance of the circuit (5)

3.2.4 The current flowing through the cells (2)

3.3 Briefly explain how temperature affects the resistance of the following:

3.3.1 Pure metals (2)

3.3.2 Alloys (3)

3.3.3 Carbon (3)

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3.4 What do you understand by a negative temperature coefficient? (3)

3.5 The coil of a relay is wound with copper wire, which has a resistance of 65 Ω at 0 ˚C. After being energised for several hours, the coil reached a temperature of 70 ˚C. Calculate the resistance of the coil at 70 ˚C if the temperature coefficient of resistance of the copper wire is 0,004 28/ ˚C at 0 ˚C. (3)

[30]

QUESTION 4

4.1 State FIVE characteristics of good insulators. (5)

4.2 Complete the table below. Write only the answer next to the question number (4.2.1–4.2.6) in your ANSWER BOOK.

	Size	Conductor size
Earth leakage	63 A or 82 A	4.2.1
Stove	4.2.2	4 mm^2 or 6 mm^2
Geyser	4.2.3	2, 5 mm^2
Socket outlets	20 A	4.2.4
Lights	10 A or 15 A	4.2.5
Bell	4.2.6	1 mm^2

(6 × 2) (12)

4.3 Draw and label the lighting sub-circuit (one-way switching). (10)

4.4 What is the function of a circuit breaker? (3)

[30]

QUESTION 5

5.1 What is the purpose of a polarity test? (3)

5.2 List any TWO instruments used for polarity tests. (2)

5.3 Name THREE types of magnets. (3)

5.4 Give any FOUR properties of magnetic lines of flux. (4)

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

5.6 Define the term *renewable energy*. (3)

5.7 Explain the term *greenhouse gases*. (2)

[20]

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

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

$S=VI$

$P=VICOS\theta$

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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