higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

22 November 2019 (X-Paper)
09:00–12:00

This question paper consists of 5 pages and 1 formula sheet.

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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. Sketches must be large, neat and fully labelled.
5. Write neatly and legibly.

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QUESTION 1

1.1 Explain FOUR safety precautions that must be adhered to when working in a workshop. (4 × 2) (8)

1.2 Give FOUR reasons why good housekeeping is important. (4)

1.3 What is a *bending spring*? (2)

[14]

QUESTION 2

2.1 State Ohm's law. (4)

2.2 A circuit consists of three resistors in series. The values of the resistors are as follows: 10 Ω, 15 Ω and 20 Ω. The voltage drop across the 15 Ω is 45 V.

Calculate:

2.2.1 The total resistance (2)

2.2.2 The total current flow through the circuit (2)

2.2.3 The voltage drop across the other resistors (4)

2.2.4 The applied voltage (2)

2.3 The field winding of a generator has a resistance of 40 Ω at 0 °C.

What is the resistance at 50 °C? Take the temperature coefficient of resistance of copper as 0,0043/°C at 0 °C. (4)

[18]

QUESTION 3

3.1 Give FOUR advantages of a transformer. (4)

3.2 Name TWO methods to cool transformers. (2)

3.3 An 11 kV/220 V single-phase step-down transformer has 3 000 primary turns.

Ignore losses and calculate:

3.3.1 The transformer ratio

3.3.2 The number of secondary turns

3.3.3 The primary current when the transformer delivers 1 500 A (3 × 2) (6)

3.4 Explain the term *ideal transformer*. (2)

[14]

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QUESTION 4

4.1 Give THREE advantages and THREE disadvantages of both primary and secondary cells. (6 + 6) (12)

4.2 State the function of the commutator on a DC generator. (2)

[14]

QUESTION 5

Complete the following sentences by writing the missing word or words next to the question number (5.1–5.6) in the ANSWER BOOK.

5.1 The … is the time taken for a wave to complete one cycle.

5.2 The … is the maximum value that the wave attains.

5.3 A … wave leads a sine wave by an angle of 90°.

5.4 In a … circuit the current is in phase with the voltage.

5.5 In a purely capacitive AC circuit, the current … the voltage by an angle of 90°.

5.6 In South Africa the standard frequency is …

(6 × 2) **[12]**

QUESTION 6

6.1 Compare *moving-iron* and *moving-coil* instruments. (5 + 5) (10)

6.2 Write each of the following abbreviations in full:

6.2.1 PILCSTA/PILCSWA

6.2.2 XLPE

6.2.3 PVC

(3 × 1) (3)

6.3 What is the purpose of the polarity test on a newly completed electrical installation? (3)

[16]

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QUESTION 7

7.1 Explain the term *fuse*. (5)

7.2 Why are the lights in a domestic installation connected in parallel? (2)

7.3 Give TWO examples where light-emitting diodes (LED) are used in practice. (2)

7.4 Three capacitors of 9 µF, 12 µF and 10 µF respectively are connected in parallel.

Determine the total capacitance of this parallel connection. (3)

[12]

TOTAL: 100

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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

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

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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