higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

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NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

2 August 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 Name FOUR safety devices known to you. (4)

1.2 Give THREE examples where colour-coding can be used for identification purposes. (3)

1.3 Describe the care and use of a crimping tool. (4)

[11]

QUESTION 2

2.1 Explain what you understand by electrical current. (2)

2.2 Six cells, each with an EMF of 2,2 V and an internal resistance of 0,1 Ω are connected in series and then across a 10 Ω resistor.

Calculate the following:

2.2.1 Total EMF of the battery (2)

2.2.2 Total internal resistance of the battery (2)

2.2.3 Total resistance of the circuit (2)

2.2.4 Current flow through the circuit (3)

2.2.5 Potential difference across the 10 Ω resistors (2)

2.2.6 Voltage drop of the battery (2)

2.3 Calculate the resistance of a copper conductor with a diameter of 6 mm and a length of 500 metres. Take resistivity of copper to be 0,0172 micro-ohm per metre. (3)

[18]

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QUESTION 3

3.1 Name THREE types of magnets. (3)

3.2 A single-phase 2 200/440 V step-down transformer has 200 secondary turns. Ignore losses.

Calculate the following:

3.2.1 Number of primary turns

3.2.2 Primary current when 60 A is drawn from the secondary current

3.2.3 Maximum allowable secondary current when the transformer is rated at 50 kVA

(3 × 2) (6)

3.3 Name THREE circuits found in a transformer. (3)
[12]

QUESTION 4

4.1 State FIVE factors that influence the choice of the cells for particular applications. (5)

4.2 Name FOUR methods of producing electricity and give ONE example of each. (8)
[13]

QUESTION 5

5.1 With regard to alternating current, what do you understand by RMS (root mean square)? (4)

5.2 State TWO advantages of using a three-phase alternating current. (2)

5.3 Name TWO methods that can be used to extend the range of a moving iron instrument. (2)

5.4 Show, by means of circuit diagrams, how the following instruments are connected directly in a circuit:

5.4.1 An ammeter

5.4.2 A voltmeter

(2 × 3) (6)
[14]

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QUESTION 6

6.1 Define the term *conductor.* (2)

6.2 State FOUR basic requirements of conductors. (4)

6.3 Name THREE types of appliances and give ONE example of each. (6)

6.4 State the purpose of earthing. (4)
[16]

QUESTION 7

7.1 Name the instruments used to carry out the following electrical tests:

7.1.1 Continuity of conductors

7.1.2 Insulation resistance test between conductors

7.1.3 Insulation resistance test between conductors and earth

7.1.4 Earth and bonding continuity test

(4 × 1) (4)

7.2 What is the maximum allowable resistance of the earth continuity conductor path in an installation? (2)

7.3 What is the practical feature of an LED? (2)

7.4 Calculate the total capacitance of two capacitors of 6 µF and 20 µF when they are connected in parallel. (3)

7.5 Beginning with the colours closest to one end of a carbon resistor, the painted rings are as follows: blue, orange, yellow and silver.

Determine the value of the resistor. (5)
[16]

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

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

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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