higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T500**(E)**(A4)T

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

4 April 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 State FOUR ways to isolate an electrical circuit to prevent an accident. (4)

1.2 Name THREE common causes of fire which could have been easily avoided. (3)

1.3 List THREE basic hand tools. (3)
[10]

QUESTION 2

2.1 Name FOUR devices which have the ability to develop (generate) an EMF. (4)

2.2 Two resistors with values of 6 ohms and 4 ohms respectively are connected in parallel. This combination is connected in series with a third resistor of 2,6 ohms and then this circuit is connected to a 20 volts supply.

Calculate each of the following:

2.2.1 Total resistance of the circuit (4)

2.2.2 Total current flow (3)

2.2.3 Voltage drop across each resistor (6)

2.2.4 Power dissipated in the circuit (3)
[20]

QUESTION 3

3.1 What happens when an alternating voltage is applied to a primary winding? (4)

3.2 A single-phase step-down transformer with a ratio of 6 600/220 V delivers 40 A at 220 V. The load has a power factor of 0,8 and it is assumed that the transformer has an efficiency of 100%.

Calculate each of the following:

3.2.1 Input KVA

3.2.2 Input power

3.2.3 Primary current

(3 × 3) (9)
[13]

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QUESTION 4

4.1 Give FIVE advantages of a lead/acid cell. (5)

4.2 What is the function of an electrical cell? (4)

4.3 What is the approximate EMF per cell of a lead/acid cell? (2)
[11]

QUESTION 5

5.1 Name the FOUR major components of a voltmeter or an ammeter. (4)

5.2 Give TWO disadvantages of a moving-coil meter. (2)

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

5.4 What is the frequency of alternating current supplies in South Africa? (2)

5.5 Which material is used for the brushes of an alternator? (2)
[13]

QUESTION 6

6.1 Name any FIVE materials commonly used for electrical insulation and give ONE example of the use of each. (5 × 2) (10)

6.2 Explain each of the following and give ONE example for each:

6.2.1 Stationary appliance

6.2.2 Portable appliance

(2 × 3) (6)

6.3 Define *bonding*. (2)
[18]

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QUESTION 7

7.1 Which test is carried out after a supply has been connected? (2)

7.2 Describe the purpose of each of the following:

7.2.1 Earth leakage

7.2.2 Lightning arrestors

7.2.3 Load distribution

(3 × 2) (6)

7.3 Name TWO semiconductor materials. (2)

7.4 THREE capacitors of 60 µF, 100 µF and 120 µF respectively are connected in series across a 100 V DC supply.

Calculate each of the following:

7.4.1 Total capacitance (3)

7.4.2 Charge across each capacitor (2)

[15]

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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