higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T450**(E)**(A1)T

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

1 August 2017 (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. Write neatly and legibly.

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QUESTION 1

1.1 State FOUR aspects with regard to good housekeeping. (4)

1.2 What is the most important aspect to bear in mind with regard to your job as an electrician? (2)

1.3 When are leather gloves required to be worn? (2)

1.4 How can you determine whether a conductor or terminal is 'live'? (2)

1.5 Describe how you would isolate a section of a factory before carrying out maintenance on that section. (4)

[14]

QUESTION 2

2.1 Define *Ohm's law*. (3)

2.2 Two resistors of 8 ohms and 4 ohms are connected in series. When connected across a certain supply, the current through each resistor is 2 amperes.

Calculate the following:

2.2.1 The supply voltage (3)

2.2.2 The volt drop across the 8 ohms resistor (2)

2.3 List FOUR factors that influence the resistance of a conductor. (4)

2.4 Calculate the resistance of copper conductor which has a cross-sectional area of 28,27 mm^2 and a length of 500 m. take the resistivity of copper as 0,0172 µΩ.m. (4)

[16]

QUESTION 3

3.1 What do you understand by flux density? (2)

3.2 What can be done to increase the strength of the flux? (4)

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3.3 A single-phase transformer has 600 turns on the primary winding which is connected to a 220 V AC supply. The voltage and the current on the secondary side are 16,13 volts and 5 amperes respectively.

Determine the following:

3.3.1 The number of turns on the secondary side

3.3.2 The value of the primary current

(2 × 3) (6)
[12]

QUESTION 4

4.1 Explain the difference between *primary cells* and *secondary cells*. (2)

4.2 What type of cell is used in a normal torch (flashlight)? (1)

4.3 Name THREE methods of producing electricity, and give ONE example of each method. (3 × 2) (6)
[9]

QUESTION 5

5.1 Make a freehand sketch of a sinusoidal waveform of an induced EMF and indicate the following features on the sketch:

5.1.1 Periodic time

5.1.2 Peak value

5.1.3 Peak-to-peak value

5.1.4 Root mean square (RMS) value

5.1.5 Average value

5.1.6 Instantaneous value

(6 × 1) (6)

5.2 State Faraday's second law of electromagnetic induction. (3)
[9]

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QUESTION 6

6.1 What are the TWO methods of damping used in measuring instruments? (2)

6.2 Show, by means of a single-circuit diagram, how instrument transformers (a potential transformer and a current transformer) can be used to extend the range of alternating-current (AC) meters. (8)
[10]

QUESTION 7

7.1 State FOUR useful properties of synthetic thermoplastic resins. (4)

7.2 Why are copper conductors tinned when vulcanised rubber is used as an insulating material? (2)

7.3 What do you understand by the term *earthed*? (4)

7.4 What does the abbreviation *MCB* stand for? (1)

7.5 List FOUR disadvantages of overhead lines. (4)
[15]

QUESTION 8

8.1 Which test is carried out after the supply is connected? (1)

8.2 What does SANS 10142 stipulate with regard to the voltage to be used when carrying out an insulation test? (3)

8.3 Name ONE practical use of LEDs. (1)

8.4 Determine the ohm value of resistors painted blue, red, yellow and gold. (5)

8.5 Three capacitors of 9 µF, 7 µF and 18 µF are connected in series.

What is the total capacitance of this series circuit? (5)
[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

$$R_t = R_o(1 + L_o t)$$

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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