higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T430**(E)**(N11)T

NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

11 November 2014 (Y-Paper)
13:00–16:00

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

ENGINEERING

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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

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1–1.20) in the ANSWER BOOK.

1.1 Rigid non-metallic conduit should be fixed at distances of one meter.

1.2 A moving coil instrument can be an attractive or a repelling type of instrument.

1.3 Average value of a sinusoidal waveform is 0,707 of the maximum value.

1.4 Rigid non-metallic conduit cannot be used where temperatures are too high.

1.5 An earthing lead is a conductor with which connection to a consumer's earthing terminal is made.

1.6 Fuses are used to protect appliances against lightning.

1.7 An ohmmeter is used to test the windings of a motor.

1.8 Split-phase motors have only one coil.

1.9 Zener diodes are used to keep the voltage constant.

1. 10 The value of the blue band on a resistor is SIX.

1.11 Leather gloves must be worn when working with hot or sharp objects.

1.12 In electrical work inexperience may cause accidents.

1.13 Housekeeping means a place for everything and everything in its place.

1.14 The colour black is used to identify the neutral conductor in domestic installations.

1.15 Safety goggles are not required when a grinding wheel is used.

1.16 Ladders used in the electrical industry should preferably be made of non-conductive material such as wood.

1.17 Interlocking guards are used to prevent the operation of the controls until the guards are moved into place.

1.18 A hacksaw is used to cut through metal.

1.19 The purpose of a commutator is to change direct current into alternating current.

1.20 A magnetic field develops around a conductor when current flows through it.

(20 × 1) **[20]**

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QUESTION 2

2.1 What checks should be made when portable appliances are inspected? (4)

2.2 What are the FOUR situations where red is used as the basic colour for colour coding? (4)

2.3 State the FOUR different classes of fire. (4)
[12]

QUESTION 3

3.1 Name the symbols used in the equation:

$Q = I^2 R t$. (4)

3.2 An electric lamp generates 3,6 MJ of heat energy in ONE hour. The filament of the lamp has a resistance of 1 kΩ.

3.2.1 Determine the current flow (5)

3.2.2 What is the power rating of the lamp? (3)

3.3 Two resistors of 6 Ω and 3 Ω are connected in parallel. The circuit is supplied from a voltage source of 12 V.

3.3.1 Determine the total resistance of the circuit. (3)

3.3.2 Calculate the total current flow. (2)
[17]

QUESTION 4

4.1 Make a neat, simple, fully labelled sketch of a bar magnet.

Show the direction and shape of the magnetic lines of force. (6)

4.2 Name the windings of a transformer. (2)

4.3 A single-phase transformer has a supply voltage of 220 V and a primary current of 10 A. The number of windings on the primary coil is 250 turns and on the secondary coil 50 turns.

Calculate the following:

4.3.1 The turns ratio

4.3.2 The secondary voltage

4.3.3 The secondary current (3 × 2) (6)
[14]

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QUESTION 5

5.1 Draw a neat, labelled diagram of an alternating current (AC) waveform.

Indicate the following features on the diagram:

5.1.1 Period time

5.1.2 Peak value

5.1.3 Peak-to-peak value

5.1.4 Instantaneous value

5.1.5 Average value

5.1.6 Root-mean-square value **[10]**

QUESTION 6

6.1 What is the purpose of earthing? (4)

6.2 Briefly describe how the windings of an electric motor can be tested. (2)

6.3 What is the purpose of performing a polarity test? (3)
[9]

QUESTION 7

7.1 Three capacitors of 2 µF, 5 µF and 10 µF respectively are connected in series.

(5)

Calculate the total capacitance of the circuit.

7.2 Write down the resistance value for a resistor marked with the following colour bands:

Red, Violet, Brown (5)
[10]

QUESTION 8

8.1 State FOUR reasons why a charged capacitor may be regarded as a reservoir of electricity (4)

8.1 Draw a neat, full diagram of a *voltage* stabiliser. (4)
[8]

TOTAL: 100

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ELECTRICAL TRADE THEORY N1
FORMULA SHEET

RESISTORS/WEERSTANDE

$$I = \frac{V}{R} ; R_T = R_1 + R_2 + R_3 ; \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

POWER/DRYWING

$$P = V \times I \ ; \ P = I^2 \times R \ ; \ P = \frac{V^2}{R}$$

ENERGY/ENERGIE

$$W = P \times t \ ; \ W = VI \times t \ ; \ W = I^2 R \times t \ ; \ W = \frac{V^2}{R} \times t$$

CELLS/SELLE

$$E = V + (I \times r) \ ; \ R_T = R + r \ ; \ I = \frac{V}{R} \ ; \ I = \frac{Emf}{R + r}$$

RESISTIVITY/RESISTIWITEIT

$$R = \frac{\rho \times L}{a} \ ; \ a = \frac{\pi \times d^2}{4}$$

TEMPERATURE COEFFICIENT/TEMPERATUURKOëFFISIëNT

$$R_t = R_o \ (1 + \alpha t)$$

TRANSFORMERS/TRANSFORMATORS

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

CAPACITORS/KAPASITORS

$$C_T = C_1 = C_2 + C_3$$

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$

FREQUENCY/FREKWENSIE

$$f = np$$

$$f = \frac{1}{T}$$

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