

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
ELECTRICAL TRADE THEORY N1
TIME: 3 HOURS
MARKS: 100

APRIL 2013

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 Capacitance is measured in Coulombs.
- 1.2 A millimetre is a thousandth of a metre.
- 1.3 Inspection is done to ensure that installations comply with the SABS: 0142: 1993 standards.
- 1.4 Flame-proofing will prevent the transmission of flames to any flammable material, gases or liquids.
- 1.5 The objectives of NOSA do not include guidance and education in preventing occupational accidents.
- 1.6 Power can be defined as the rate at which work is done.
- 1.7 The voltage always stays the same in an electrical, series circuit.
- 1.8 The total resistance in a parallel circuit equals $1/R_T$.
- 1.9 Internal resistance is an inherent property of a cell because of its construction.
- 1.10 Cells connected in parallel have all the positive electrodes connected together at one point.
- 1.11 When a magnet attracts a piece of steel, the piece of steel becomes a permanent magnet.
- 1.12 Large self-cooled transformers are not expensive.
- 1.13 A battery is made up of a number of identical cells connected in series.
- 1.14 A cosine wave reaches its maximum value 90° before the sine wave does.
- 1.15 $V_{ave} = 0,367 V_{peak}$
- 1.16 Silver is a tough, reddish-brown metal.
- 1.17 Non-metallic conduit shall be joined using couplers.
- 1.18 A screwdriver is an example of a portable appliance.
- 1.19 The earth leakage unit is an automatically operated switch.
- 1.20 A rheostat is a two-terminal device and is used to control current in a circuit.

[20]

QUESTION 2

- 2.1 State FOUR reasons why good housekeeping is important. (4)
- 2.2 Name the THREE elements of a fire which, if one of them is removed, then the fire goes out (3)
- 2.3 Describe the use and care of a hacksaw. (3)
- 2.4 When working with hot or sharp objects, what type of gloves should one wear? (1)
- 2.5 What is the colour of a mandatory (compulsory) safety sign? (1)
- [12]**

QUESTION 3

- 3.1 State Ohm's law. (4)
- 3.2 R_1 and R_2 are TWO resistors with unknown resistance values. The resistors are connected in parallel across a voltage source of 12 volt. The current flowing through R_1 is 0,8 ampere and that through R_2 is 1,2 amperes.
- 3.2.1 Draw a fully labelled circuit diagram from the information given above. (3)
- 3.2.2 Calculate the total current flowing through the circuit. (2)
- 3.2.3 Determine the total resistance of the circuit. (2)
- 3.2.4 What are the values of the unknown resistors, R_1 and R_2 ? (4)
- 3.3 Explain what would happen with respect to the heat generated by a coil if its resistance is decreased and the supply voltage remains constant. (1)
- [16]**

QUESTION 4

- 4.1 What effect does an internal resistance have on the terminal voltage of a cell? (2)
- 4.2 Draw a neat, fully labelled schematic diagram to explain the operation of a single-phase transformer. (10)
- 4.3 Name TWO types of secondary cells. (2)
- [14]**

QUESTION 5

- 5.1 Make a freehand sketch of a sinusoidal waveform of an induced EMF and show 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 x 1) (6)
- 5.2 Explain how Fleming's right-hand rule can be used to determine the direction of the induced EMF in a generator. (4)
- 5.3 Define Faradays *Second Law of Electromagnetic Induction*. (3)
- [13]**

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, that is a potential transformer AND a current transformer, can be used to extend the range of alternating-current (AC) meters. (6)
- 6.3 State THREE advantages of moving-iron ammeters. (3)
- [11]**

QUESTION 7

- 7.1 What is meant by *annealed copper*? (3)
- 7.2 State FOUR useful properties of synthetic thermoplastic resins. (4)
- 7.3 Why are lights in domestic installations connected in parallel? (1)
- 7.4 State TWO advantages of PVC insulated cables when compared to paper insulated cables. (2)
- [10]**

QUESTION 8

- 8.1 A polarity test is carried out to ensure that the three key safety design features of an installation are met. State the THREE aspects that the test ensures. (3)
- 8.2 Name ONE practical use of LEDs. (1)

[4]**TOTAL: 100**

ELECTRICAL TRADE THEORY N1**FORMULA SHEET****RESISTORS**

$$R = \frac{V}{I}$$

$$R_T = R_1 + R_2 + R_3 + \dots$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

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

$$C_T = C_1 + C_2 + C_3 + \dots$$

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

FREQUENCY

$$f = np$$

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