higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

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AUGUST EXAMINATION

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

3 August 2015 (Y-Paper)
13:00–16:00

This question paper consists of 4 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

1.1 What precautionary measures should be taken to protect maintenance crews when working on electrical equipment? (5)

1.2 Colour coding is used extensively in the electrical industry.

List FIVE advantages of colour coding. (5)

1.3 Name FIVE basic hand tools that are used in the electrical trade. (5)
[15]

QUESTION 2

2.1 Define *electromotive force* (EMF). (3)

2.2 Name THREE devices that have the ability to develop (generate) an EMF. (3)

2.3 THREE resistors of 10 Ω, 20 Ω and 30 Ω respectively are connected in series across a voltage supply of 60 V.

Draw a fully labelled circuit diagram and calculate the following: 4)

2.3.1 The total resistance of the circuit (2)

2.3.2 The total current flowing through the circuit (2)

2.3.3 The voltage drop across each resistor (7)

2.3.4 The total power consumed in the circuit (2)

2.3.5 The energy dissipated in the circuit in 2 minutes (4)
[27]

QUESTION 3

3.1 Make a neat, simple, fully labelled sketch showing the magnetic field set-up around a solenoid.

Also include the supply circuit. (8)

3.2 State THREE advantages of a transformer. (3)

3.3 Calculate the secondary voltage of a transformer with a supply voltage of 550 V. The transformer has a winding ratio of 55 : 1. (3)
[14]

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QUESTION 4

4.1 State SIX precautions that must be taken when a lead-acid battery is being charged. (6)

4.2 How does the number of the plates in the construction of a lead-acid cell influence the cell? (2)

4.3 What is the basic difference in construction between an AC generator (alternator) and a DC generator? (4)
[12]

QUESTION 5

5.1 Explain the following terms with reference to a sine wave:

5.1.1 Cycle (2)

5.1.2 Average value (5)

5.2 State THREE advantages and TWO disadvantages of a moving-coil measuring instrument. (5)
[12]

QUESTION 6

6.1 Define the term *conductor*. (3)

6.2 Give THREE examples of conductors generally used in the electrical industry. (3)

6.3 State the purpose of an earth leakage unit with regard to safety. (5)

6.4 State TWO advantages that a miniature circuit breaker (mcb) has over a fuse. (2)
[13]

QUESTION 7

7.1 What instruments can be used to perform a polarity test? (4)

7.2 Three capacitors of 30 pF, 25 pF and 345 pF are connected in parallel.

Calculate the total capacitance of the combination. (3)
[7]

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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