T630(E)(J26)T
AUGUST 2004

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

26 July (X-Paper)
09:00 – 12:00

No graph paper is required.

Calculators may be used.
DEPARTMENT OF EDUCATION
NATIONAL CERTIFICATE
ELECTRICAL TRADE THEORY N1
TIME: 3 HOURS
MARKS: 100

Answer ALL the questions.

INSTRUCTIONS

1. Questions relating to the wiring of premises must be in accordance with the SABS Code of Practice.

2. Candidates will be penalised for untidy and illegible work.

3. Read the questions carefully and answer only what has been asked.

4. Questions may be answered in any order, but subsections of questions must NOT be separated.

5. Rule off on completion of each answer.

NOTE: 1 mark = 1%

Formula sheets are attached to this question paper.

QUESTION 1

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

1.2 What are the advantages of colour coding? (5)

1.3 Give FIVE examples of basic tools used in the electrical trade. (5) [15]
QUESTION 2

2.1 Define Ohm's law. (4)

2.2 THREE similar resistors of 3 Ω each are connected in parallel. A voltage source of 6 volts is connected across the terminals of this circuit.

Draw a fully labelled diagram of the circuit and determine the following quantities:

2.2.1 The total resistance of the circuit (4)
2.2.2 The current flowing through each individual resistor (7)
2.2.3 The total current flowing through the circuit (2)
2.2.4 The power consumed in the circuit (2)
2.2.5 The energy required in ONE HOUR (27)

QUESTION 3

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

QUESTION 4

4.1 Make a comparative tabulation of FIVE aspects with regard to advantages and disadvantages of primary cells and secondary cells (lead-acid cells). (10)

4.2 From what material are generator brushes made? (1)

4.3 What instrument is used to measure the relative density of the electrolyte in a lead-acid cell? (1)

[PTO]
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 an insulator and give FIVE examples of insulators most generally used in the electrical industry. (8)

6.2 What is understood by the term earthed? (5) [13]

QUESTION 7

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

7.2 Three capacitors of 30 p, 25 pF and 345 pF are connected in parallel. Calculate the total capacitance. (3) [7]

TOTAL: 100
ELECTRICAL TRADE THEORY N1

FORMULA SHEET

RESISTORS

\[ R = \frac{V}{I} \]

\[ R_T = R_1 + R_2 + R_3 + \ldots \]

\[ \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots \]

RESISTIVITY

\[ R = \frac{\rho \times \ell}{a} \]

\[ a = \frac{\pi \times d^2}{4} \]

TEMPERATURE COEFFICIENT

\[ R_t = R_0 (1 + \alpha) \]

TRANSFORMERS

\[ \frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1} \]

CAPACITORS

\[ C_T = C_1 + C_2 + C_3 + \ldots \]

\[ \frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \ldots \]

FREQUENCY

\[ f = np \]

\[ f = \frac{1}{T} \]

POWER

\[ P = V \times I \]

\[ P = I^2 \times R \]

\[ P = \frac{V^2}{R} \]

ENERGY

\[ W = P \times t \]

\[ W = VI \times t \]

\[ W = I^2R \times t \]

\[ W = \frac{V^2}{R} \times t \]

CELLS

\[ E = V + (I \times r) \]

\[ R_T = R + r \]

\[ I = \frac{V}{R} \]

\[ I = \frac{E}{(R + r)} \]