T700(E)(N21)T
NOVEMBER 2003

NATIONAL TECHNICAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

21 November (X-Paper)
09:00 – 12:00

NO graph paper is required.
Calculators may be used.
DEPARTMENT OF EDUCATION
NATIONAL TECHNICAL 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 question.
6. 1 mark = 1%

A formula sheet is attached to this question paper.

QUESTION 1

1.1 What is the purpose of isolating and locking out a circuit? (4)

1.2 When are leather gloves required to be worn? (4)

1.3 What is meant by a class 'B' fire? What types of fire extinguishers should be used for such a fire? (4) [12]

QUESTION 2

2.1 Explain the electromotive force (EMF). (4)

2.2 What is the standard unit for EMF? (1)
2.3 THREE resistors with values of 2 ohms, 3 ohms and 5 ohms respectively are connected in series across a 20-volt supply. 

Draw a neat, fully labelled diagram of the circuit and then calculate the following quantities:

2.3.1 The total resistance of the circuit 
2.3.2 The current following through each resistor 
2.3.3 The potential difference across each resistor 
2.3.4 The total power dissipated in the circuit 

2.4 The open circuit EMF of a certain cell is 1.52 volts when a 2 ohm resistor is connected across the terminals. A current of 0.4 amperes flows through the circuit.

Determine:

2.4.1 The internal resistance of the cell 
2.4.2 The terminal voltage with a 2 ohm resistor connected 

QUESTION 3

3.1 Describe how Fleming's left-hand rule may be used to determine the direction of the force exerted on a current-carrying conductor when it is placed in a magnetic field.

3.2 Draw a neat, fully labelled circuit diagram that shows the principle of operation of a single-phase autotransformer.

QUESTION 4

4.1 Explain briefly the difference between a 'primary' and a 'secondary' cell.

4.2 Explain, with the aid of a drawing, the discharging action of a lead-acid cell.

QUESTION 5

5.1 Define Faraday's First Law of Electromagnetic Induction.
5.2 Explain, with reference to the sine wave, the following terms:

5.2.1 1 cycle (2)
5.2.2 Period time (1)
5.2.3 Frequency (3)
5.2.4 Instantaneous value (1)
5.2.5 Average value (2)
5.2.6 RMS value (2)

QUESTION 6
Make a neat, labelled sketch of a polyvinyl chloride (PVC), steel, wire-armoured cable. [8]

QUESTION 7

7.1 Make neat drawings of the following standard IEC electrical wiring symbols:

7.1.1 Variable capacity (2)
7.1.2 Fuse (1)
7.1.3 Voltmeter (1)
7.1.4 Battery of primary cells (2)

7.2 Name the THREE parts that an effective earthing system must have. (3)

QUESTION 8

8.1 Make use of a representative circuit diagram as well as input and output waveforms to describe the principle of operation of a junction diode when it is FORWARD-biased. (6)

8.2 TWO capacitors of 4 µF and 6 µF are connected in series. Calculate the total capacitance of the circuit. (4)

TOTAL: 100
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**

\[ W = P \times t \]

\[ W = VI \times t \]

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

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

**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**

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

**TRANSFORMERS**

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

**TEMPERATURE COEFFICIENT**

\[ R_i = R_0 (1 + \alpha t) \]

**RESISTIVITY**

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

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