



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INDUSTRIAL ELECTRONICS N1

9 April 2024

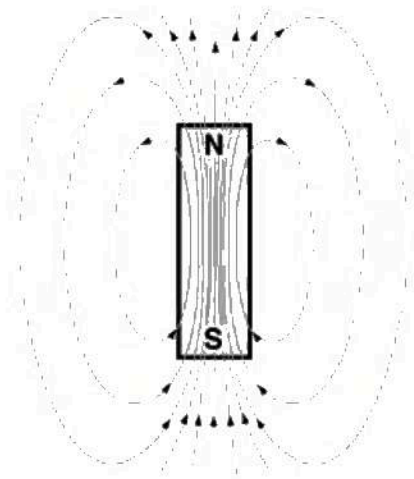
This marking guideline consists of 8 pages.

QUESTION 1

- | | | |
|-----|--------|-------|
| 1.1 | 1.1.1 | False |
| | 1.1.2 | False |
| | 1.1.3 | True |
| | 1.1.4 | True |
| | 1.1.5 | True |
| | 1.1.6 | False |
| | 1.1.7 | False |
| | 1.1.8 | True |
| | 1.1.9 | False |
| | 1.1.10 | False |

(10 × 1) (10)

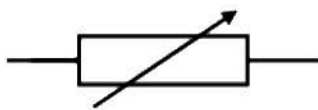
1.2



- North and south pole correct labels = 1 mark each ✓✓
Magnetic lines from north to south = 1 mark ✓
Magnetic lines outwards from north pole = 1 mark ✓
Magnetic lines towards the south pole = 1 mark ✓

(5)

1.3 1.3.1



1.3.2



1.3.3



1.3.4



1.3.5



(5 × 1)

(5)
[20]

QUESTION 2

2.1 2.1.1

$$\frac{1}{R_{P1}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{P1}} = \frac{1}{100} + \frac{1}{150} \checkmark$$

$$\frac{1}{R_{P1}} = \frac{3 + 2}{300}$$

$$\frac{1}{R_{P1}} = \frac{5}{300}$$

$$R_{P1} = 60\Omega \checkmark$$

$$\frac{1}{R_{P2}} = \frac{1}{R_4} + \frac{1}{R_5}$$

$$\frac{1}{R_{P2}} = \frac{1}{50} + \frac{1}{200} \checkmark$$

$$\frac{1}{R_{P2}} = \frac{4 + 1}{200}$$

$$\frac{1}{R_{P2}} = \frac{5}{200}$$

$$R_{P2} = 40\Omega \checkmark$$

$$R_T = R_{P1} + R_{P2} + R_3 \checkmark$$

$$150 = 60 + 40 + R_3 \checkmark$$

$$R_3 = 50\Omega \checkmark$$

OR

$$R_{P1} = \frac{R_1 \times R_2}{R_1 + R_2}$$

$$R_{P1} = \frac{100 \times 150}{100 + 150} \checkmark$$

$$R_{P1} = \frac{15000}{250}$$

$$R_{P1} = 60\Omega \checkmark$$

$$R_{P2} = \frac{R_4 \times R_5}{R_4 + R_5}$$

$$R_{P2} = \frac{50 \times 200}{50 + 200} \checkmark$$

$$R_{P2} = \frac{10000}{250}$$

$$R_{P2} = 40\Omega \checkmark$$

$$R_T = R_{P1} + R_{P2} + R_3 \checkmark$$

$$150 = 60 + 40 + R_3 \checkmark$$

$$R_3 = 50\Omega \checkmark$$

(7)

2.1.2

Band no	Band 1	Band 2	Band 3	Band 4
Colour	Green✓	Black✓	Black✓	Silver✓

(4)

2.1.3

$$I_3 = \frac{V_T}{R_T} \checkmark$$

$$I_3 = \frac{200}{150} \checkmark$$

$$I_3 = 1.333A \checkmark$$

(3)

2.1.4

$$R_{P1} = 60\Omega$$

$$R_{P2} = 40\Omega$$

$$R_T = R_{P1} + R_{P2} \checkmark$$

$$R_T = 60 + 40 \checkmark$$

$$R_T = 100\Omega \checkmark$$

$$I_T = \frac{V}{R_T}$$

$$I_T = \frac{200}{100} \checkmark$$

$$I_T = 2A \checkmark$$

Therefore, the current will increase✓

(6)

[20]

QUESTION 3

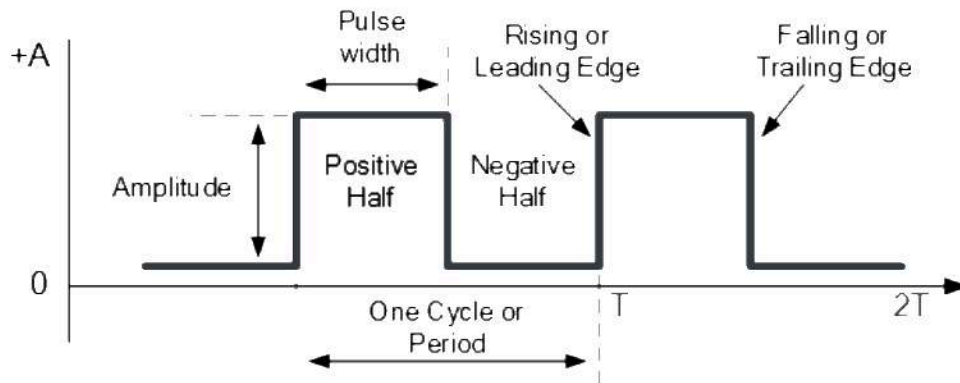
- 3.1 $A = \frac{\pi d^2}{4} = \frac{\pi (0.003)^2 \checkmark}{4 \checkmark} = 7.068 \times 10^{-6} m^2 \checkmark$
- $$0.2 = \frac{0.017 \times 10^{-6} \times l \checkmark}{7.068 \times 10^{-6} \checkmark}$$
- $$l = 83.153 m \checkmark \quad (6)$$
- 3.2 A voltmeter has a very high internal resistance $\checkmark$ whereas an ammeter has a very low internal resistance. $\checkmark$ (2)
- 3.3
- Difficult to read values.
 - They have no revers polarity indications.
 - They are inaccurate, due to the effect of earth magnetic field.
 - Parallax error may occur.
 - Not easy to use.
 - They have no auto-range feature.
 - They cannot read negative values.
- (Any relevant 3 × 1) (3)
- 3.4
- $$\frac{1}{r_T} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$$
- $$\frac{1}{r_T} = \frac{1}{0.1} + \frac{1}{0.1} + \frac{1}{0.1} \checkmark$$
- $$\frac{1}{r_T} = \frac{2 + 2 + 2}{0.2} \checkmark$$
- $$\frac{1}{r_T} = \frac{6}{0.2} \checkmark$$
- $$r_T = 0.033 \Omega \checkmark$$
- $$I = \frac{E}{R_T + r}$$
- $$I = \frac{20}{\frac{3}{0.033} \checkmark}$$
- $$I = \frac{20.033}{3}$$
- $$I = 0.149 A \checkmark \quad (7)$$
- 3.5 Wet cells are those batteries, which contain liquid chemicals as an electrolyte $\checkmark$ whereas dry cells contain paste or jelled chemicals $\checkmark$ and are less subject to spoilage. (2)

[20]

QUESTION 4

- 4.1 4.1.1 $\frac{V_1}{V_2} = \frac{N_1}{N_2}$
- $\frac{230}{V_2} = \frac{10}{1} \checkmark$
- $V_2 = \frac{230 \times 1}{10} \checkmark$
- $V_2 = 23V \checkmark$ (3)
- 4.1.2 $\frac{V_1}{V_2} = \frac{I_2}{I_1}$
- $\frac{230}{23} = \frac{I_2}{2} \checkmark$
- $I_2 = \frac{230 \times 2}{23} \checkmark$
- $I_2 = 20A \checkmark$ (3)
- 4.1.3 Transformers are also used as coupling devices between stages of electronic circuits. (1)
- 4.2
 - Zero winding resistance.
 - Infinite primary and secondary inductance.
 - Perfect coupling between the primary and secondary windings.
 - Zero capacitance between the turns. (Any relevant 3 × 1) (3)
- 4.3 4.3.1 Period is the time required to complete one full cycle✓ of 360° of an alternating voltage or current waveform.✓
- 4.3.2 Frequency is the number of times a full cycle (360°) of alternating current✓ repeats itself in one second.✓
- 4.3.3 Peak to peak value is the value measured between the positive and the negative✓ peak values. ✓ (3 × 2) (6)

4.4



Correctly labelled amplitude and period = 1 mark each✓✓
Shape and overall impression= 1 mark each✓✓

(4)
[20]

QUESTION 5

5.1

5.1.1

$$C_T = C_1 + C_2$$

$$C_T = 10 + 2✓$$

$$C_T = 12f✓$$

$$Q_T = C_T V_T$$

$$Q_T = 12 \times 10^{-6} \times 30✓$$

$$Q_T = 360C✓$$

(4)

5.1.2

$$C_T = \frac{C_1 \times C_2}{C_1 + C_2}$$

$$C_T = \frac{10 \times 2}{10 + 2}✓$$

$$C_T = \frac{20}{12}✓$$

$$C_T = 1.667f✓$$

$$Q_T = C_T V_T$$

$$Q_T = 1.667 \times 10^{-6} \times 30✓$$

$$Q_T = 50.01C✓$$

OR

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

$$\frac{1}{C_T} = \frac{1}{10} + \frac{1}{2} \checkmark$$

$$\frac{1}{C_T} = \frac{1+5}{10}$$

$$\frac{1}{C_T} = \frac{6}{10} \checkmark$$

$$C_T = 1.667 \text{f}\checkmark$$

$$Q_T = C_T V_T$$

$$Q_T = 1.667 \times 10^{-6} \times 30 \checkmark$$

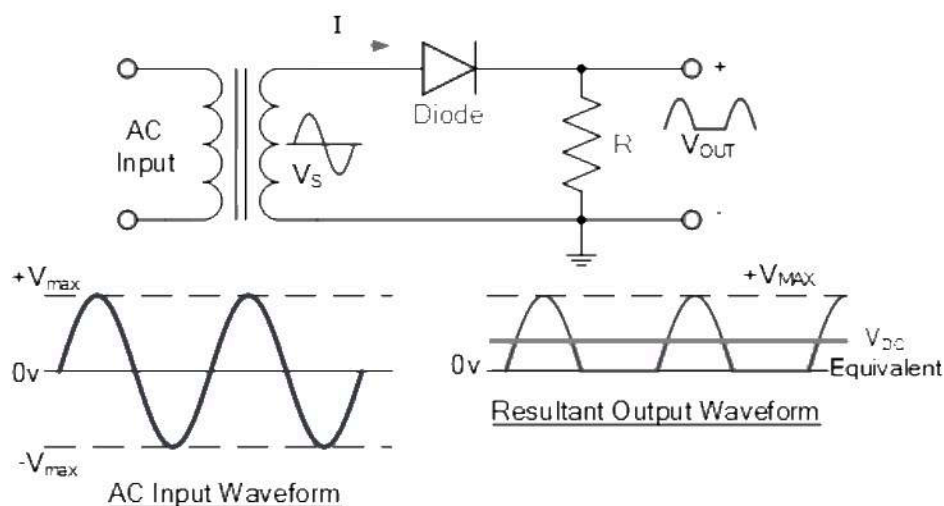
$$Q_T = 50.01 \text{C} \checkmark$$

(5)

- 5.2 5.2.1 Three
 5.2.2 OFF
 5.2.3 Voltage regulation
 5.2.4 Light sensitive devices
 5.2.5 High

(5 × 1) (5)

5.3



DRAWING MARK ALLOTION:

- Correct input and output waveforms = 2 marks✓✓
 Correct transformer = 1 mark✓
 Correctly connected diode = 1 mark✓
 Correctly connected load resistor = 1 mark✓
 Correctness = 1 mark✓

(6)
[20]

TOTAL: