



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE INDUSTRIAL ELECTRONICS N1

16 November 2022

This marking guideline consists of 8 pages.

QUESTION 1

1.1	1.1.1	F		
	1.1.2	E		
	1.1.3	B		
	1.1.4	A		
	1.1.5	D		
			(5 × 1)	(5)
1.2	1.2.1	One		
	1.2.2	Positive		
	1.2.3	Five		
	1.2.4	10%		
	1.2.5	Intrinsic		
			(5 × 1)	(5)
1.3	• Not rechargeable • Become polarised when connected to a load • Have a relatively short lifespan • Provide small currents • Must be removed from apparatus if not in use for extended periods			(5)
1.4	1.4.1	Preset potentiometer		
	1.4.2	Zener diode		
	1.4.3	Battery		
	1.4.4	PNP transistor		
	1.4.5	Adjustable inductor		
			(5 × 1)	(5)
				[20]

QUESTION 2

2.1 2.1.1

$$R_p = \frac{R_3 \times R_4}{R_3 + R_4}$$

$$R_p = \frac{100 \times 60}{100 + 60}$$

$$R_p = \frac{6000}{160}$$

$$R_p = 37,5 \Omega$$

$$R_T = R_p + R_1 + R_2$$

$$R_T = 37,5 + 40 + 50$$

$$R_T = 127,5 \Omega$$

OR

$$\frac{1}{R_p} = \frac{1}{R_3} + \frac{1}{R_4}$$

$$\frac{1}{R_p} = \frac{1}{100} + \frac{1}{60}$$

$$\frac{1}{R_p} = \frac{6+10}{600}$$

$$\frac{1}{R_p} = \frac{16}{600}$$

$$R_p = 37,5 \Omega$$

$$R_p = R_p + R_1 + R_2$$

$$R_p = 37,5 + 40 + 50$$

$$R_p = 127,5 \Omega$$

(7)

2.1.2

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

$$I_T = \frac{30}{127,5}$$

$$I_T = 0,235 A$$

(3)

$$2.1.3 \quad V_p = I_T R_p$$

$$V_p = 0,235 \times 37,5$$

$$V_p = 8,813 \text{ V}$$

OR

$$V_p = \frac{R_p V_T}{R_T}$$

$$V_p = \frac{37,5 \times 30}{127,5}$$

$$V_p = 8,824 \text{ V} \quad (3)$$

- 2.1.4
- Brown
 - Black
 - Brown
 - Gold
- (4)

- 2.2
- Speakers
 - Telephones
 - Radio and television receivers
- (3)
[20]

QUESTION 3

- 3.1
- | | |
|-------|------------|
| 3.1.1 | Series |
| 3.1.2 | Current |
| 3.1.3 | Parallel |
| 3.1.4 | Voltage |
| 3.1.5 | Parallel |
| 3.1.6 | Resistance |
- (6 × 1) (6)

3.2

$$A = \frac{\pi d^2}{4}$$

$$A = \frac{\pi (1,5 \times 10^{-3})^2}{4}$$

$$A = 1,767 \times 10^{-6} \text{ m}^2 \checkmark \quad (3)$$

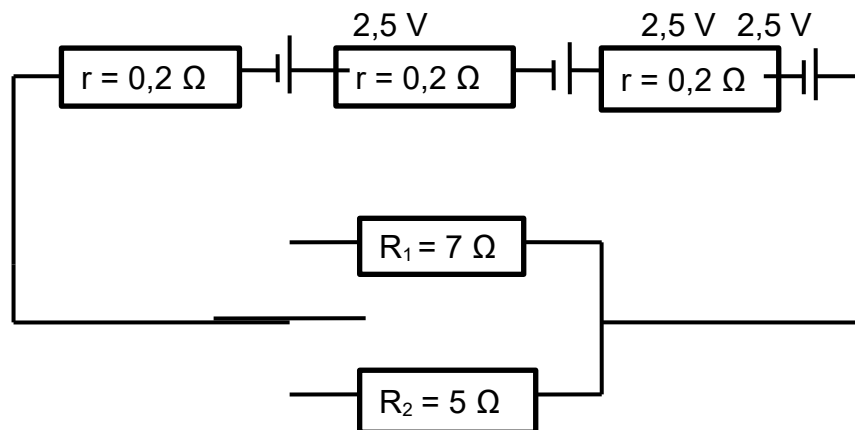
3.3

$$R_t = R_o (1 + \alpha \Delta t)$$

$$R_t = 0,5 (1 + 0,004 \times 25)$$

$$R_t = 0,55 \Omega \quad (3)$$

3.4 3.4.1



1 mark = labels

3 marks = correctness (to be allocated at marker's discretion) (4)

3.4.2

$$R_T = \frac{R_1 \times R_2}{R_1 + R_2}$$

$$R_T = \frac{7 \times 5}{7 + 5}$$

$$R_T = 2.917 \Omega \checkmark$$

$$I = \frac{E}{R_T + r}$$

$$I = \frac{(2.5 \times 4)}{2.917 + 0.8}$$

$$I = \frac{10}{3.717}$$

$$I = 2.69 \text{ A}$$

(4)
[20]**QUESTION 4**

- 4.1
- Eddy current losses
 - Copper losses
 - Hysteresis losses

(3)

4.2 4.2.1 $a = \frac{N_1}{N_2} = \frac{1500}{500} = 3:1$

(2)

4.2.2 $\frac{N_1}{N_2} = \frac{I_2}{I_1}$

$$\frac{1500}{500} = \frac{I_2}{4}$$

$$I_2 = \frac{1500 \times 4}{500}$$

$$I_2 = 12 \text{ A}$$

(4)

- 4.3 Direct current is a current that always flows in one direction✓ of constant magnitude,✓ whereas alternating current is a current that rises to maximum and then falls to zero in one direction,✓ and then rises to maximum and falls to zero in the opposite direction.✓ (4)
- 4.4 The EMF induced is directly proportional✓ to the rate of change of flux✓ linking the coil or circuit✓ **OR** When a conductor moves through a magnetic field,✓✓ a voltage and current are induced in the conductor.✓ (3)
- 4.5
- The number of turns of the coil
 - The cross-sectional area of the coil
 - The length of the coil
 - The permeability of the core material
- (4)
[20]

QUESTION 5

- 5.1
- | | | | |
|-------|-------|--|--|
| 5.1.1 | True | | |
| 5.1.2 | True | | |
| 5.1.3 | False | | |
| 5.1.4 | False | | |
| 5.1.5 | True | | |
- (5 × 1) (5)
- 5.2
- Rectification
 - Protection
 - Switch
- (Any 1 × 1) (1)
- 5.3
- 5.3.1
- $$C_T = C_1 + C_2 + C_3$$
- $$C_T = 10 + 20 + 35✓$$
- $$C_T = 65 \mu f$$
- (3)
- 5.3.2
- $$Q_T = C_T V$$
- $$Q_T = 65 \times 10^{-6} \times 30$$
- $$Q_T = 1950 \mu C$$
- (3)

5.4 5.4.1

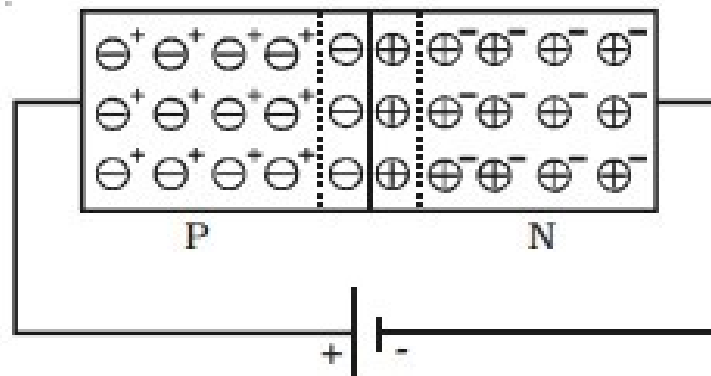


*Fig Forward biased PN
junction diode*

1 mark = depletion region with correct width (narrow)
 1 mark = battery with correct polarity
 2 marks = correctly connected P-type and N-type layers

(4)

5.4.2

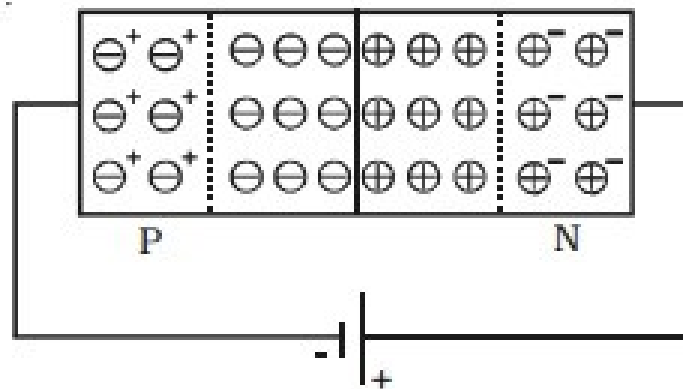


*Fig Reverse biased PN
junction diode.*

1 mark = depletion region with correct width (wide)
 1 mark = battery with correct polarity
 2 marks = correctly connected P-type and N-type layers

(4)

[20]**TOTAL: 100**