higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INDUSTRIAL ELECTRONICS N1

1 April 2020

This marking guideline consists of 6 pages.

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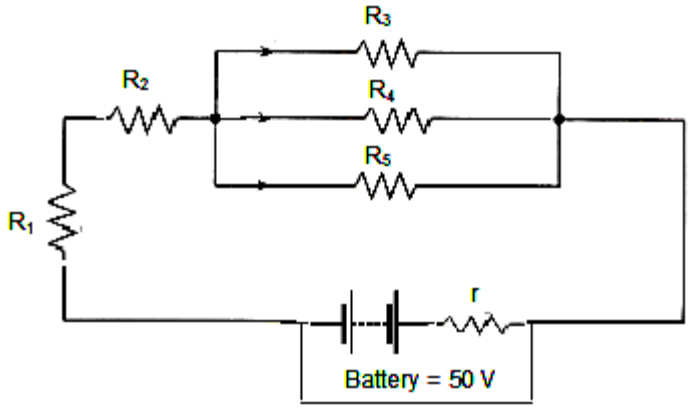
QUESTION 1

1.1	1.1.1	D		
	1.1.2	D		
	1.1.3	C		
	1.1.4	D		
	1.1.5	B		
			(5 × 1)	(5)
1.2	1.2.1	Switch		
	1.2.2	One		
	1.2.3	No		
	1.2.4	Recharged		
	1.2.5	Dielectric		
			(5 × 1)	(5)
1.3	1.3.1	G		
	1.3.2	D		
	1.3.3	A		
	1.3.4	B		
	1.3.5	C		
			(5 × 1)	(5)
1.4	1.4.1	True		
	1.4.2	True		
	1.4.3	False		
	1.4.4	False		
	1.4.5	False		
			(5 × 1)	(5)
1.5	1.5.1	Direct		
	1.5.2	Two		
	1.5.3	North pole to south pole		
	1.5.4	Forward or reverse biased		
	1.5.5	Mutual induction		
			(5 × 1)	(5)
				[25]

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QUESTION 2

2.1 2.1.1



ONE mark for each correctly placed resistor = FIVE marks
ONE mark for the battery including the internal resistor
NB: Circuit may differ but must be electrically correct (6)

2.1.2

$$R_S = R_1 + R_2 = 1,2 + 8,8 = 10\ \Omega \quad ✓$$

$$\frac{1}{R_{//}} = \frac{1}{3,3} + \frac{1}{1000} + \frac{1}{10} \quad ✓$$

$$= 0,303 + 0,001 + 0,1$$

$$= 0,404\Omega \quad ✓$$

$$R_{//} = \frac{1}{0,404}$$

$$= 2,475\ \Omega \quad ✓$$

$$R_T = R_S + R_{//} + r$$

$$= 10 + 2,475 + 1 \quad ✓$$

$$= 13,475\ \Omega \quad ✓$$ (6)

2.1.3

$$I_T = \frac{V_T}{R_T} = \frac{50}{13,475} \quad = 3,711\ A \quad ✓$$ (3)

✓✓ ✓✓

2.1.4

$$P = V \times I = 50 \times 3,711 \quad = 185,55\ W \quad ✓$$

OR

$$P = \frac{V_2}{R} = \frac{50^2}{13,475} = 185,53\ W$$

OR

$$P = I_2 \times R = 3,711^2 \times 13,475 = 185,57\ W$$ (3)

2.1.5
- Brown
- Black
- Gold
- Brown (4)

2.1.6
$$V_r = I_r \times r \quad \checkmark$$
$$= 3,711 \times 1 \quad \checkmark$$
$$= 3,711\ V \quad \checkmark$$ (3)

[25]

QUESTION 3

3.1 3.1.1
$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$
$$= \frac{1}{5} + \frac{1}{15} + \frac{1}{25} \quad \checkmark$$
$$= 0,2 + 0,0667 + 0,04 \quad \checkmark$$
$$= 0,3067\mu F \quad \checkmark$$
$$C_T = \frac{1}{0,3067}$$
$$= 3,261\mu F \quad \checkmark$$ (4)

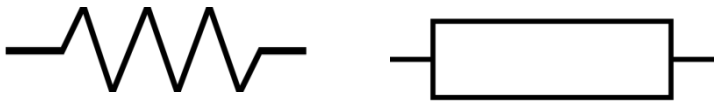
3.1.2
$$Q = C \times V \quad \checkmark$$
$$= (3,261 \times 10^{-6}) \times 50 \quad \checkmark$$
$$= 1,6305 \times 10^{-4} C \quad \checkmark$$
$$OR$$
$$= 163,05\mu C$$ (3)

3.2 3.2.1
$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$
$$\frac{240}{V_S} = \frac{5}{1} \quad \checkmark$$
$$V_S = \frac{240}{5} \quad \checkmark$$
$$= 48\ V \quad \checkmark$$ (3)

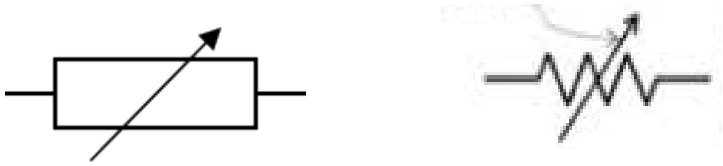
3.2.2
$$\frac{I_S}{I_P} = \frac{N_P}{N_S} \quad \checkmark$$
$$I_P \times 5 = 1 \times 1 \quad \checkmark$$
$$= 0,2\ A \quad \checkmark$$ (3)

3.3 Step-down transformer (1)

3.4 3.4.1



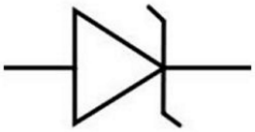
3.4.2



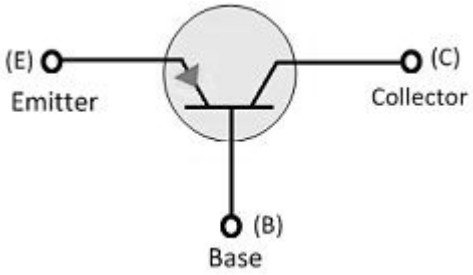
3.4.3



3.4.4



3.4.5



3.4.6



3.4.7



(7 × 1) (7)

3.5 3.5.1 Watt

3.5.2 Ampere-hour

3.5.3 Ohms

3.5.4 Volts

(4 × 1) (4)
[25]

QUESTION 4

4.1 4.1.1 The formation of hydrogen bubbles around the positive carbon rod of a carbon-zinc cell that prevents electrons from passing through

4.1.2 Pure semiconductor material that has been doped or impurities have been added

4.1.3 Materials that are neither good conductors nor good insulators

4.1.4 A chemical bond formed between two ions with opposite charges.

4.1.5 An atom that has FIVE valence electrons

(5 × 2) (10)

4.2 4.2.1 $Emf = 1,5 \times 4 = 6V$ ✓✓

4.2.2 $R_T = R + r = (1 \times 4) + 25 = 29\Omega$ ✓✓

4.2.3 $r_T = 1 \times 4 = 4\Omega$ ✓✓

4.2.4 $I_T = \frac{V_T}{R_T} = \frac{6}{29} = 0,207A$ ✓

therefore

$I_R = 0,207A(series)$ ✓

4.2.5 $V_R = I_R \times_R$

$= 0,207 \times 25$ ✓

$= 5,17\ V$ ✓

(5 × 2) (10)

4.3

ADVANTAGES – SECONDARY CELLS	DISADVANTAGES – PRIMARY CELLS
Can be recharged	Cannot be recharged
Has a higher current capacity	Provides small current
Lasts longer	Has a short service life
Can be used repeatedly	Becomes polarised after a while
(Any THREE)	(Any TWO)

(5)

[25]

TOTAL: 100

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