higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INDUSTRIAL ELECTRONICS N1

3 AUGUST 2018

This marking guideline consists of 5 pages.

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QUESTION 1

1.1
1.1.1 A
1.1.2 B
1.1.3 D
1.1.4 D
1.1.5 D
1.1.6 D
1.1.7 C
1.1.8 A
1.1.9 A
1.1.10 C

(10 × 1) (10)

1.2 1.2.1

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_T} = \frac{1}{15} + \frac{1}{20} + \frac{1}{30}\surd$$

$$= \frac{4+3+2}{60}$$

$$= \frac{9}{60}\surd$$

therefore

$$R_T = \frac{60}{9}\surd$$

$$= 6,667\ \Omega\surd$$

OR

$$\frac{1}{R_T} = \frac{1}{15} + \frac{1}{20} + \frac{1}{30}\surd$$

$$= 0,06666 + 0,05 + 0,03333\surd$$

$$= 0,14999$$

therefore

$$R_T = \frac{1}{0,14999}\surd$$

$$= 6,667\Omega\surd$$

(4)

1.2.2

$$I = \frac{V}{R}\surd$$

$$= \frac{50}{6,667}\surd$$

$$= 7,5A\surd$$

(3)

1.2.3 Voltage across all resistors are the same = 50 V (1)

1.2.4

$$P = \frac{V^2}{R}\surd$$

$$= \frac{50^2}{30}\surd$$

$$= 83,333W\surd$$

(3)

1.3 Red; Black; Black; Gold (4)
[25]

QUESTION 2

2.1

$$a = \frac{\pi d^2}{4}\surd \qquad R = \frac{\rho \ell}{a}$$

$$= \frac{3,142 \times (6 \times 10^{-3})^2}{4}\surd\surd \qquad = \frac{(0,018 \times 10^{-6}) \times 50}{(2,8278 \times 10^{-5})}\surd\surd$$

$$= 2,8278 \times 10^{-5} m^2 \surd\surd \qquad = 0,032\Omega\surd$$

(8)

2.2

$$R_T = R_0(1 + \alpha t)\surd$$

$$= 15(1 + 0,0058 \times 50)\surd$$

$$= 19,35\Omega\surd$$

(3)

2.3 2.3.1 $emf = 1,5 \times 3 = 4,5V\surd\surd$ (2)

2.3.2 $r_t = 0,5 \times 3 = 1,5\Omega\surd\surd$ (2)

2.3.3

$$R_T = R + r_t\surd$$

$$= 15 + 1,5\surd$$

$$= 16,5\Omega\surd$$

(3)

2.3.4

$$I = \frac{emf}{R + r}\surd$$

$$= \frac{4,5}{15 + 1,5}\surd\surd$$

$$= 0,273A\surd$$

(4)

2.3.5

$$V = I \times R\surd$$

$$= 0,273 \times 15\surd$$

$$= 4,091V\surd$$

(3)

[25]

QUESTION 3

3.1
3.1.1 Mutual induction
3.1.2 Hydrogen bubbles
3.1.3 Two directions
3.1.4 Two
3.1.5 Extrinsic
3.1.6 Direct
3.1.7 Two
3.1.8 South
3.1.9 Open
3.1.10 Valence

(10 × 1) (10)

3.2 3.2.1

$$C_T = C_1 + C_2 + C_3 \surd$$
$$= 10 + 5 + 25 \surd$$
$$= 40\mu F \surd$$

3.2.2

$$Q = C \times V \surd$$
$$= (40 \times 10^{-6}) \times 100 \surd$$
$$= 4 \times 10^{-3} C \surd$$

NB: incorrect unit- deduct 1 mark

(2 × 3) (6)

3.3 3.3.1

$$\frac{I_S}{I_P} = \frac{N_P}{N_S} \surd$$
$$\frac{I_S}{1,25} = \frac{20}{1} \surd$$
$$I_S = 1,25 \times 20$$
$$= 25A \surd$$

3.3.2

$$\frac{V_P}{V_S} = \frac{I_S}{I_P}$$
$$\frac{240}{V_S} = \frac{25}{1,25} \surd$$
$$V_S \times 25 = 240 \times 1,25 \surd$$
$$V_S = \frac{300}{25}$$
$$= 12V \surd$$

OR

$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$
$$\frac{240}{V_S} = \frac{20}{1} \surd$$
$$V_S \times 20 = 240 \times 1 \surd$$
$$V_S = \frac{240}{20}$$
$$= 12V \surd$$

(2 × 3) (6)

3.4
- It provides more current
- It is rechargeable
- It has a longer life span
- It can be used repeatedly
- It has no polarisation (Any 3 × 1) (3)

[25]

QUESTION 4

4.1
4.1.1 False
4.1.2 False
4.1.3 True
4.1.4 True
4.1.5 True

(5 × 1) (5)

4.2
4.2.1 H
4.2.2 M
4.2.3 A
4.2.4 J
4.2.5 B
4.2.6 K
4.2.7 D
4.2.8 N
4.2.9 E
4.2.10 G

(10 × 1) (10)

4.3 4.3.1 The direction of the current induced in a circuit by a changing magnetic field is such that the magnetic field produced by this current will oppose the original field. (4)

4.3.2 The DC voltage required to maintain current flow in a bipolar transistor or diode. A silicon diode will conduct current only if its anode (P-type) is at a positive potential, compared to its cathode (N-type) which is at a negative potential. (3)

4.3.3 The addition of impurities to pure semiconductor (intrinsic) material to form either P-type or N-type materials (extrinsic) (3)

[25]

TOTAL: 100

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