higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INDUSTRIAL ELECTRONICS N1

10 APRIL 2018

This marking guideline consists of 7 pages.

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QUESTION 1

1.1

1.1.1	F
1.1.2	M
1.1.3	J
1.1.4	B
1.1.5	C
1.1.6	D
1.1.7	E
1.1.8	G
1.1.9	H
1.1.10	I

(10 × 1) (10)

1.2 1.2.1

$$\frac{1}{R_{//}} = \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_{//}} = \frac{1}{15} + \frac{1}{20} \surd$$

$$\frac{1}{R_{//}} = \frac{4+3}{60} \surd$$

$$\frac{1}{R_{//}} = \frac{7}{60}$$

therefore

$$R_{//} = \frac{60}{7} \surd$$

$$R_{//} = 8,571\Omega \surd$$

OR

$$R_{//} = \frac{R_2 \times R_3}{R_2 + R_3} \surd$$

$$R_{//} = \frac{15 \times 20}{15 + 20} \surd$$

$$R_{//} = \frac{300}{35} \surd$$

$$R_{//} = 8,571\Omega \surd$$

(4)

1.2.2

$$R_S = R_1 + R_4$$

$$= 10 + 25 \surd$$

$$= 35\Omega \surd$$

(2)

1.2.3

$$R_T = R_{//} + R_S \surd$$

$$= 8,571 + 35 \surd$$

$$= 43,571\Omega \surd$$

(3)

1.2.4

$$I_T = \frac{V_T}{R_T} \surd$$

$$= \frac{50}{43,571} \surd$$

$$= 1,148A \surd$$

(3)

1.2.5
$$V_{//} = I_T \times R_{//} \surd$$
$$= 1,148 \times 8,571 \surd$$
$$= 9,840V \surd$$
(3)

1.2.6
$$P_{//} = V_{//} \times I \surd$$
$$= 9,480 \times 1,148 \surd$$
$$= 11,3W \surd$$
OR
$$P_{//} = \frac{V_{//}^{\ 2}}{R_{//}} \surd$$
$$= \frac{9,840^2}{8,571} \surd$$
$$= 11,3W \surd$$
OR
$$P_{//} = I^2 \times R_{//} \surd$$
$$= 1,148^2 \times 8,571 \surd$$
$$= 11.3W \surd$$
(3)

1.2.7 Red, green, black, red (4)

1.2.8
$$I_{R2} = \frac{V_{//}}{R_2} \surd$$
$$= \frac{9,840}{15} \surd$$
$$= 0,656A \surd$$
(3)
[35]

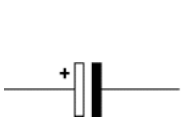
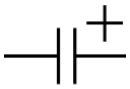
QUESTION 2

2.1 2.1.1
$$\frac{I_S}{I_P} = \frac{N_P}{N_S}$$
$$\frac{I_S}{4,5} = \frac{5}{25} \surd$$
$$I_S \times 25 = 4,5 \times 5$$
$$I_S = \frac{4,5 \times 5}{25} \surd$$
$$= 0,9A \surd$$
(3)

2.1.2
$$\frac{V_P}{V_S} = \frac{I_S}{I_P}$$
$$\frac{240}{V_S} = \frac{0,9}{4,5} \surd$$
$$V_S \times 0,9 = 240 \times 4.5$$
$$V_S = \frac{240 \times 4,5}{0,9} \surd$$
$$= 1200V \surd$$
OR
$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$
$$\frac{240}{V_S} = \frac{5}{25} \surd$$
$$V_S \times 5 = 240 \times 25$$
$$V_S = \frac{240 \times 25}{5} \surd$$
$$= 1200V \surd$$
(3)

2.1.3
- Burnt-out windings caused by excessive current.
- Short-circuit windings between primary and secondary windings.
- Open-circuit primary and/or secondary windings.
- Windings grounded to the core.
- Shorts between adjacent turns of wire. (Any 3 × 1) (3)

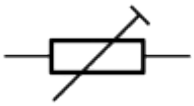
2.2 2.2.1


OR


2.2.2



2.2.3



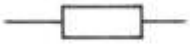
2.2.4



2.2.5



2.2.6


OR


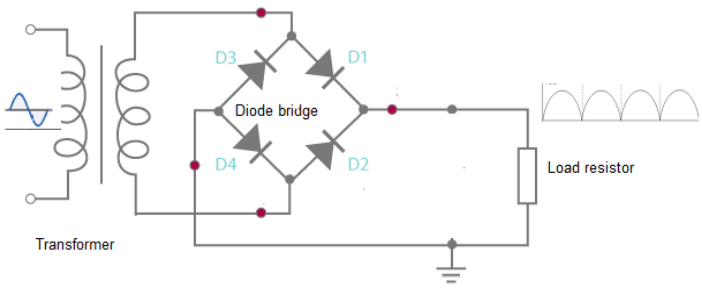
(6 × 1) (6)

2.3 2.3.1 Ohm
2.3.2 Henry
2.3.3 Farad
2.3.4 Volt
2.3.5 Volt

(5 × 1) (5)
[20]

QUESTION 3

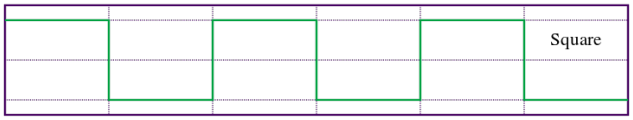
3.1



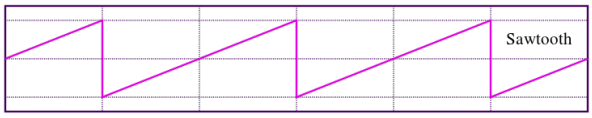
(Correct diagram = 6 marks)
(Waveforms and labels = 4 marks)
(If diodes are not positioned correctly, deduct 2 marks) (10)

3.2
- Length
- Cross-sectional area
- Type of material
- Temperature (4)

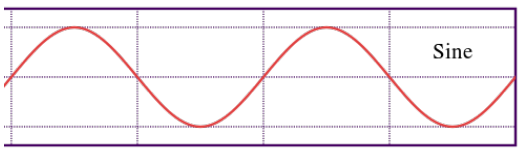
3.3 3.3.1



3.3.2



3.3.3



(3 × 2) (6)

3.4 3.4.1
- Accurate
- Autorange feature
- Auto-off feature
- No error of parallax
- Large display
- Easy to use
- Has a hold function to store readings. (Any 3 × 1) (3)

3.4.2
- Error of parallax
- Not accurate
- Ohms scale is nonlinear
- Difficult to use
- Pointer must be constantly zeroed (Any 2 × 1) (2)

[25]

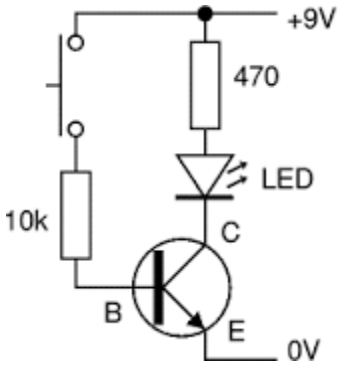
QUESTION 4

4.1

4.1.1	D
4.1.2	D
4.1.3	D
4.1.4	C
4.1.5	C
4.1.6	D
4.1.7	D
4.1.8	B
4.1.9	B
4.1.10	C

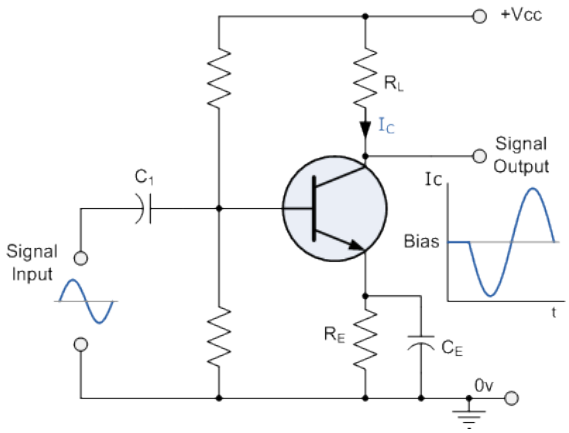
(10 × 1) (10)

4.2 4.2.1



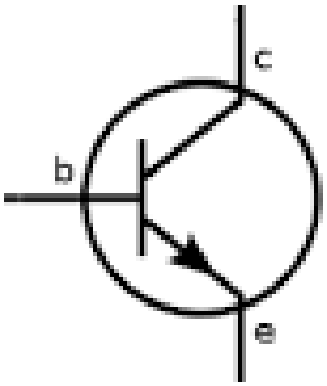
(Any similar diagram = 3 marks)
(Base must be switched + for NPN)
(Labels = 1 mark) (4)

4.2.2

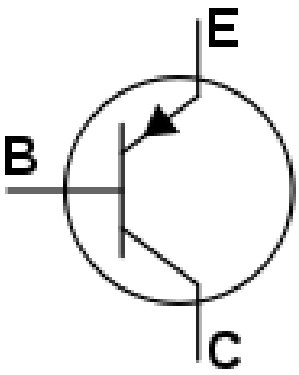


(Any similar diagram = 3 marks)
(Correct input and output waveforms = half mark each) (4)

4.2.3



NPN



PNP

(2)
[20]

TOTAL: 100

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