higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

INDUSTRIAL ELECTRONICS N1

1 AUGUST 2014

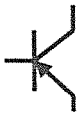
This marking guideline consists of 6 pages.

QUESTION 1

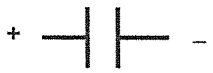
1.1	1.1.1	D	
	1.1.2	J	
	1.1.3	O	
	1.1.4	I	
	1.1.5	A	
	1.1.6	F	
	1.1.7	G	
	1.1.8	M	
	1.1.9	H	
	1.1.10	E	
			(10 x 1) (10)

1.2	1.2.1	Henry	
	1.2.2	Volt	
	1.2.3	Per degree Celcius	
	1.2.4	Volt	
	1.2.5	Hertz	
			(5 x 1) (5)

1.3 1.3.1

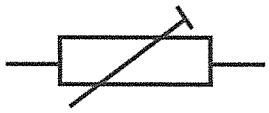


1.3.2



1.3.3

1.3.4



1.3.5

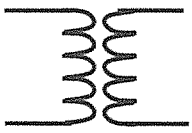


FIGURE 1 (5 x 1) (5)

[20]

QUESTION 2

2.1 2.1.1

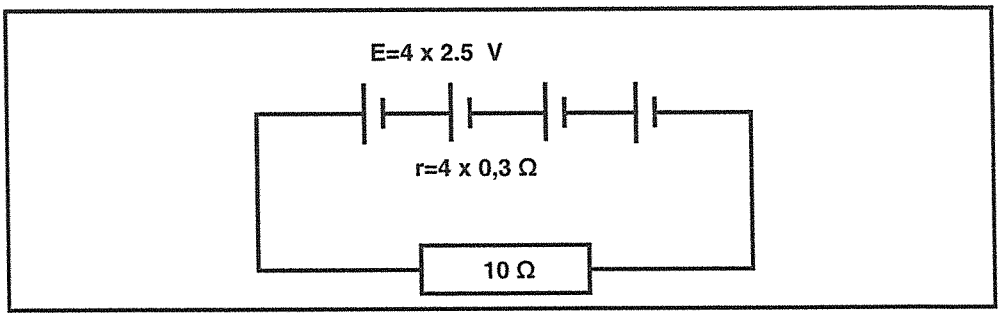


FIGURE 2 (2)

2.1.2

$$I = \frac{E}{R + r_T}$$

$$I = \frac{(4 \times 2{,}5)}{10 + (4 \times 0{,}3)}$$

$$I = 0{,}89A$$ (4)

2.2 21 000 Ω, ± 10% (4)

2.3
- The strength of an electromagnet
- The amount of turns in the coil
- The type of material used in the core
- The ratio of the coil length to the coil diameter (4)

2.4
- Have a greater capacity than primary cells
- Ideally suited for emergency backup
- Rechargeable
- Have a longer life span (Any 2 x 1) (2)

2.5 Permanent magnet: It is a magnetised material that keeps its magnetism for a long.

Electromagnet: A magnetised material that keeps its magnetism for as long as there is electric current flowing (4)

[20]

QUESTION 3

3.1
$$R = \frac{\rho L}{A}$$
$$R = \frac{0,058\times10^{-6}\times6}{1,1\times10^{-5}}$$
$$R = 0,32\ \Omega$$ (3)

3.2
$$R_T = R_0(1+\alpha_0\Delta t)$$
$$R_T = 18[1+0,0042\times(80-18)]$$
$$R_T = 18[1+0,042\times62]$$
$$R_T = 22,84\ \Omega$$ (4)

3.3
$$V_P = \frac{Vs\times Is}{Ip}$$
$$Vp = \frac{24\times4}{500\times10^{-3}}$$
$$Vp = 192\ Volts$$ (4)

3.4 3.4.1
$$R_T = R_1 + R_2 + R_3$$
$$R_T = 27+30+36$$
$$R_T = 93\ \Omega$$

3.4.2
$$P = I^2\times R$$
$$P = 1,3^2\times30$$
$$P = 50,7\ W$$

3.4.3
$$V = \frac{P}{I}$$
$$V = \frac{50,7}{1,3}$$
$$V = 39\ A$$

(3 x 3) (9)
[20]

QUESTION 4

4.1 4.1.1

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

$$\frac{1}{C_T} = \frac{1}{10} + \frac{1}{15}$$

$$\frac{1}{C_T} = \frac{3+2}{30}$$

$$C_T = \frac{30}{5}$$

$$C_T = 6\mu F$$ (4)

4.1.2

$$Q = C_T \times V$$

$$Q = 6\times10^{-6}\times12$$

$$Q = 72\mu C$$ (3)

4.2 4.2.1 The longer the distance between the capacitors, the smaller the capacitance (or vice versa).

4.2.2 The larger the surface area, the greater the capacitance (or vice versa).

4.2.3 The poor the insulating material, the lower the capacitance (or vice versa).

(3 x 3) (9)

4.3 4.3.1 The collection of hydrogen around the positive electrode of a cell. (2)

4.3.2 The unit of measure used to indicate the capacity of lead-acid cell. (2)

[20]

QUESTION 5

5.1 When impurity atoms are intentionally added to the intrinsic or pure semi-conductor material, the semi-conductor is said to be doped. (4)

5.2 The direction of the induced current must be such that its own magnetic field will oppose the action that produced the induced current.

OR

The emf induced in an electric circuit always acts in such a direction that the current it drives around the circuit opposes the change in magnetic flux which produced the emf. (4)

5.3

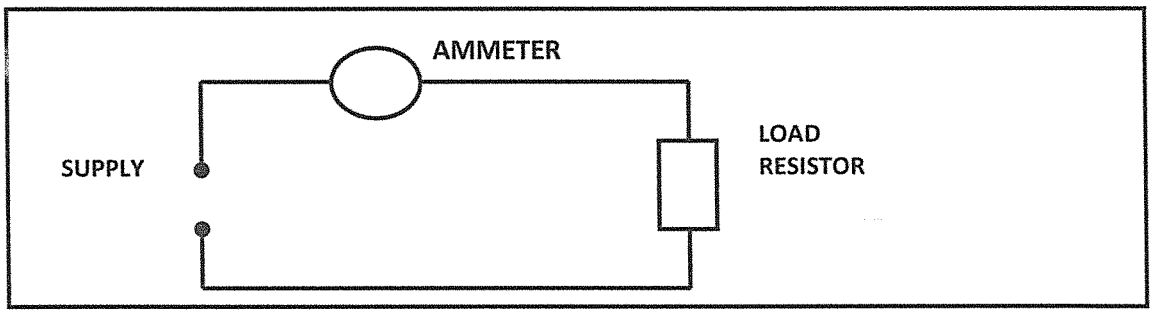


FIGURE 3 (4)

5.4 Anode; Cathode (2)

5.5 The holes will diffuse into the N-type semi-conductor while some of the valence electrons will diffuse into the P-type semi-conductor. (4)

5.6
- A small base-emitter current can switch the transistor 'on' or 'off'.
- There is no wear and tear on switchgear.
- Switching times are faster.
- There is control over long distances. (Any 2 x 1) (2)

[20]

TOTAL: 100