MARKING GUIDELINE

NATIONAL CERTIFICATE

INDUSTRIAL ELECTRONICS N1

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This marking guideline consists of 6 pages.
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CITY & GDRT 2013
QUESTION 1

1.1

![Diagram of AC waveform with labels: Maximum peak value, Amplitude, Cycle, Peak to peak value.]

1.1.1 The strength of the current flows through the coil.
1.1.2 The number of windings in the coil.
1.1.3 The nature of the core (permeability).
1.1.4 The ratio of the coil length to its diameter.
1.2.1 Lenz's Law.

1.3 Hold the fingers of the right hand at right angels to each other. The forefinger represents the direction of the magnetic field, the thumb shows the direction of motion of the conductor and the middle finger shows the direction of current.

1.4 • Outside the magnet they move from the north pole to the south pole
• Inside the magnet they move from the south pole to the north pole
• They are continuous and form a complete path.
• They never intersect i.e. they never cross one another
• They are parallel
• They are invisible and pass through all materials
• They always enter or leave a magnetic material at right angles

(ANY THREE)

1.5 Like poles repel each other; Unlike poles attract each other.

1.6 • Takes time to recharge
• Needs maintenance
• More expensive
• Must be kept upright

(ANY RELEVANT ANSWER)
1.7  
- Electrolyte
- Positive electrode
- Negative electrode

1.8  
\[ E = I(R + r) \]
\[ E = 0.2(47 + 3) \]
\[ E = 10 \text{ V} \]  

**QUESTION 2**

2.1 2.1.1
\[ \frac{1}{R_p} = \frac{1}{R_2} + \frac{1}{R_3} \]
\[ \frac{1}{R_p} = \frac{1}{5} + \frac{1}{5} \]
\[ \frac{1}{R_p} = \frac{1+1}{5} \]
\[ \frac{1}{R_p} = \frac{2}{5} \]
\[ R_p = 2.5 \Omega \]

2.1.2
\[ V = I_r \times R_p \]
\[ V = 2.59 \times 25 \]
\[ V = 64.7 \text{ V} \]

2.1.3
\[ R_p = R_1 + R_2 + R_3 \]
\[ R_p = 15 + 2.5 + 25 \]
\[ R_p = 42.5 \Omega \]

2.1.4
\[ P = I^2 R_p \]
\[ P = 2.59^2 \times 2.5 \]
\[ P = 16.77 \text{ W} \]

2.2  
- When the temperature of the conductor increases, the resistance increases.
- The bigger the cross-sectional area of the conductor, the lower the resistance.
- The longer the conductor, the higher the resistance.
2.3
\[ R = \frac{\Delta I}{A} \]
\[ R = \frac{1.728 \times 10^{-6} \times 65}{6 \times 10^{-6}} \]
\[ R = 18.72 \, \Omega \]  

2.4 2.4.1

2.4.2

2.4.3

QUESTION 3
3.1 5600 \, \Omega

3.2

FIGURE 2

3.3
\[ R_T = R_o (1 + \alpha_o t) \]
\[ R_T = 78(1 + 0.004 \times 60) \]
\[ R_T = 96.72 \, \Omega \]
3.4

![Diagram of a circuit with a load resistor and an ammeter labeled A.]

**FIGURE 3**

3.5 The number of cycles completed in one second.

3.6 3.6.1 \( C_T = C_1 + C_2 + C_3 \)
\( C_T = 1.8 + 4.7 + 5.6 \)
\( C_T = 12.1 \, \mu F \)

3.6.2 \( Q = CV \)
\( Q = 12.1 \times 24 \)
\( Q = 290.4 \, \mu C \)

3.7 3.7.1 Mutual induction
3.7.2 Primary
3.7.3 No losses
3.7.4 Induced EMF
3.7.5 An alternating magnetic field

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(1) (2) (3)
QUESTION 4

4.1 4.1.1 Electrons (1)
4.1.2 Acceptor (1)
4.1.3 Intrinsic (1)
4.1.4 0,6 V (1)
4.1.5 P-type (1)
4.1.6 Low (1)
4.1.7 Against; With (2)
4.1.8 Base (1)
4.1.9 TWO (1)

4.2 The ability of a conductor to induce a voltage in itself when the current changes. (3)

4.3 When the base of the transistor is made more positive than the emitter and the collector is much more positive than the base. (4)

4.4 • 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 THREE) (3)

4.5 Where the output signal is much larger than the input signal. (2)

4.6 4.6.1 • Diodes D2 and D4 are forward-biased and will conduct.
• The current will flow through the circuit.
• Diodes D1 and D3 are reverse-biased and will not conduct (3)

[25] TOTAL: 100