july 2014

7. (a) Define the *temperature coefficient of resistance* and state its unit. (3)

(b) A 500 m length of copper wire, of 0.4 mm diameter, has a total resistance of 72 Ω.

Calculate the resistivity of the copper wire. (4)

october 2020

10. (a) Define the resistivity of a material. (3)

(b) The resistance of 1.9 km of copper wire of 0.5 mm diameter is 170 ohms.

Calculate the resistance of 1 km of iron wire of 1 mm diameter. (7)

Note: the resistivity of iron = 5.9 x resistivity of copper

GENERAL ENGINEERING SCIENCE II April 2016

10. (a) Define the resistivity of a material. (3)

(b) The resistance of 1.6 km of copper wire of 0.5 mm diameter is 170 ohms.

Calculate the resistance of 1 km of iron wire of 1 mm diameter. (7)

Note: the resistivity of iron = 7 x resistivity of copper.

Q9 March 2018

(a) Define the temperature coefficient of resistance. (2)

(b) The resistance of a coil of copper wire is 175Ω at a temperature of 15°C.

Calculate the temperature of the coil when the resistance increases to 245Ω. (6)

Note: temperature coefficient of resistance of copper at 15°C = 0.00425/°C

Q7 July 2017

The resistance of a 240 V tungsten filament lamp at its working temperature of 2000°C is 1000 ohms. Calculate the maximum initial current when the lamp is switched on at a room temperature of 20 C. (9)

Note: for tungsten α = 0.005/ C.

7. The resistance of a 240 V tungsten filament lamp at its working temperature of 2000°C is 1000 ohms.

   Calculate the maximum initial current when the lamp is switched on at a room temperature of 20□C. (9)

   Note: for tungsten $\square_0 = 0.005/\square$ *C.*

july 2014

7. (a) Define the *temperature coefficient of resistance* and state its unit. (3)

(b) A 500 m length of copper wire, of 0.4 mm diameter, has a total resistance of 72 Ω.

Calculate the resistivity of the copper wire. (4)

$R_t = R_0(1 + \alpha t)$

units = $/^\circ C$

eg $0.014/^\circ C$

b) $R = \frac{\rho L}{A}$

$L = 500m$

$R = 72\,\Omega$

$0.4mm \xrightarrow{\div 1000} 4 \times 10^{-4} m$

$0.0004\,m$

$d = 0.4mm \rightarrow 0.0004\,m$

$r = 0.0002\,m$

$A = \pi (0.0002)^2 = 1.256637 \times 10^{-7}$

$$72 = \frac{\rho\, 500}{1.256637 \times 10^{-7}}$$

$$\rho = 1.809557 \times 10^{-8}\,\Omega\,m$$

october 2020

10. (a) Define the resistivity of a material. (3)

(b) The resistance of 1.9 km of copper wire of 0.5 mm diameter is 170 ohms.

Calculate the resistance of 1 km of iron wire of 1 mm diameter. (7)

Note: the resistivity of iron = 5.9 x resistivity of copper

copper

$R = \frac{\rho l}{A}$

$l = 1900$

$A = 1.96 \times 10^{-7}$

$R = 170$

$d = 0.5\,mm \xrightarrow{\div 1000} 0.0005\,m$

$r = 0.00025$

$A = \pi (0.00025)^2 = 1.963495 \times 10^{-7}$

$170 = \frac{\rho \times 1900}{1.963495 \times 10^{-7}}$

$\rho = 1.756811681 \times 10^{-8}\ \Omega m$

iron

$5.9\rho = 1.0365 \times 10^{-7}$

$l = 1000\,m$

$d = 1\,mm = 0.001\,m$

$r = 0.0005\,m$

$A = \pi (0.0005)^2 = 7.853981634 \times 10^{-7}\,m^2$

$$R = \frac{\rho l}{A} = \frac{1.0365 \times 10^{-7} \times 1000}{7.853981634 \times 10^{-7}}$$

$R = 131.97\,\Omega$

GENERAL ENGINEERING SCIENCE II April 2016

10. (a) Define the resistivity of a material. (3)
(b) The resistance of 1.6 km of copper wire of 0.5 mm diameter is 170 ohms.

Calculate the resistance of 1 km of iron wire of 1 mm diameter. (7)

Note: the resistivity of iron = 7 x resistivity of copper.

b) $R = \frac{\rho l}{A}$

copper

$l = 1600\,m$

$d = 0.0005\,m$

$r = 0.00025\,m$

$A = \pi(0.00025)^2 = 1.963495 \times 10^{-7}\,m^2$

$R = 170\,\Omega$

$$170 = \frac{\rho \times 1600}{1.963495 \times 10^{-7}}$$

$$\rho = 2.08621 \times 10^{-8}$$

iron

$\rho = 1.46034971 \times 10^{-7}$

$l = 1000$

$d = 0.001\ m$

$r = 0.0005\ m$

$\pi r^2 = \pi (0.0005)^2 = 7.853981643 \times 10^{-7}$

$$R = \frac{\rho l}{A} = \frac{1.46034971 \times 10^{-7} \times 1000}{7.853981643 \times 10^{-7}}$$

$R = 185.9\ \Omega$

Q9 March 2018

(a) Define the temperature coefficient of resistance. (2)

(b) The resistance of a coil of copper wire is 175Ω at a temperature of 15°C.

Calculate the temperature of the coil when the resistance increases to 245Ω. (6)

Note: temperature coefficient of resistance of copper at 15°C = 0.00425/°C

b) $R_T = R_t(1 + \alpha(T - t))$

$R_{15} = 175$

$R_x = 245$

$\alpha = 0.00425$

$$245 = 175\left(1 + 0.00425(x - 15)\right)$$

$$\frac{\left(\frac{245}{175} - 1\right)}{0.00425} + 15 = x$$

$$x = 109.12^{\circ}C$$

Q7 July 2017

The resistance of a 240 V tungsten filament lamp at its working temperature of 2000°C is 1000 ohms. Calculate the maximum initial current when the lamp is switched on at a room temperature of 20 C. (9)

Note: for tungsten α = 0.005/ C.

$$R_T = R_t\left(1 + \alpha(T-t)\right)$$

$R_{1000} = 1000$

$R_{20} = x$

$\alpha = 0.005$

$t = 20$

$T = 2000$

$$1000 = x\left(1 + 0.005(1980)\right)$$

$$1000 = x\ 10.9$$

$$x = 91.743\ \Omega$$

$$R_{20} = 91.743\ \Omega$$

$$I = \frac{240}{91.743}$$

$$I = 2.616\ \text{Amps}$$