Assignment

ELECTROTECHNOLOGY
ELTK1100
QUIZ #6
SOLUTIONS

Complete the following:

As the temperature goes down, the resistance of a pure metal __*goes down*__.

A wire made from the material __*Manganin or Constantin*__ is unaffected by temperature.

Answer only 1 of the following:

Find the resistance at -25°C for 25000 ft of copper 0.289 inches in diameter.

$$d = 0.289\,in * \frac{1\ mil}{0.001\,in} = 289\,mils \qquad A = d^2 = (289\,mils)^2 = 83{,}521\,CM$$

$$R = \frac{\rho * \ell}{A} = \frac{10.37\ \frac{\Omega \cdot CM}{ft.} * 25{,}000\,ft}{83{,}521\,CM} = 3.10\Omega\ @20\,^\circ C$$

$$R_{T2} = \frac{1 + \alpha_o T_2}{1 + \alpha_o T_1} * R_{T1}$$

$$= \frac{(1 + 0.00427 * -25\,^\circ C)}{(1 + 0.00427 * 20\,^\circ C)} * 3.10\Omega = \frac{0.89325}{1.0854} * 3.10\Omega = 2.55\Omega\ @ -25\,^\circ C$$

or

Find the resistance at -25°C for 7500 m of aluminum 7.34 mm in diameter.

$$d = 7.34\,mm. = 0.00734\,m. \qquad A = \frac{\pi\, d^2}{4} = \frac{\pi * (0.00734\,m)^2}{4} = 4.23 * 10^{-5}\ m^2$$

$$R = \frac{\rho * \ell}{A} = \frac{2.83 * 10^{-8}\ \Omega \cdot m * 7{,}500\,m}{4.23 * 10^{-5}\ m^2} = 5.02\Omega\ @20\,^\circ C$$

$$R_{T2} = \frac{1 + \alpha_o T_2}{1 + \alpha_o T_1} * R_{T1}$$

$$= \frac{(1 + 0.00424 * -25\,^\circ C)}{(1 + 0.00424 * 20\,^\circ C)} * 5.02\Omega = \frac{0.894}{1.0848} * 5.02\Omega = 4.13\Omega\ @ -25\,^\circ C$$

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Complete the following:

As the temperature goes up, the resistance of a pure metal *goes up*.

A wire made from the material *Manganin or Constantin* is unaffected by temperature.

Answer only 1 of the following:

Find the resistance at -25°C for 25000 ft of aluminum 0.289 inches in diameter.

$$d = 0.289\,in * \frac{1\ mil}{0.001\,in} = 289\,mils \qquad A = d^2 = (289\,mils)^2 = 83{,}521\,CM$$

$$R = \frac{\rho * \ell}{A} = \frac{17.0\ \frac{\Omega \cdot CM}{ft.} * 25{,}000\,ft}{83{,}521\,CM} = 5.09\,\Omega\ @20\,^{\circ}C$$

$$R_{T2} = \frac{1 + \alpha_o T_2}{1 + \alpha_o T_1} * R_{T1}$$

$$= \frac{(1 + 0.00424 * -25\,^{\circ}C)}{(1 + 0.00424 * 20\,^{\circ}C)} * 5.09\,\Omega = \frac{0.894}{1.0848} * 5.09\,\Omega = 4.19\,\Omega\ @-25\,^{\circ}C$$

or

Find the resistance at -25°C for 7500 m of copper 7.34 mm in diameter.

$$d = 7.34\,mm. = 0.00734\,m. \qquad A = \frac{\pi\ d^2}{4} = \frac{\pi * (0.00734\,m)^2}{4} = 4.23 * 10^{-5}\ m^2$$

$$R = \frac{\rho * \ell}{A} = \frac{1.72 * 10^{-8}\ \Omega \cdot m * 7{,}500\,m}{4.23 * 10^{-5}\ m^2} = 3.05\,\Omega\ @20\,^{\circ}C$$

$$R_{T2} = \frac{1 + \alpha_o T_2}{1 + \alpha_o T_1} * R_{T1}$$

$$= \frac{(1 + 0.00427 * -25\,^{\circ}C)}{(1 + 0.00427 * 20\,^{\circ}C)} * 3.05\,\Omega = \frac{0.89325}{1.0854} * 3.05\,\Omega = 2.51\,\Omega\ @-25\,^{\circ}C$$