

task_kyt15w11e3sempb2_with_calculation

Student Group

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Exercise E1 Resistivity and temperature dependent Resistance (written test, approx. 7 % of a 60-minute written test, SS2023)

The cost-price relationship predicted by the \$50m and \$100m models described by the \$B25\$ and firm capex points as internal, but in case A=1.0 test fit would be a B25 = 15.00\$ for between \$20s of \$60 and \$100m (\$rm °C\$)

Solution
The resistivity of the dielectric material is $\rho_{\text{PP}}(20 \sim \text{°C}) = 10^{17} \sim \Omega \cdot \text{m}$.

For the given material the temperature coefficients in the range of $0 \sim 20^\circ\text{C}$ and $55 \sim 100^\circ\text{C}$ are given as $\alpha = -0.048 \sim 1/\text{K}$ and $\beta = +0.00057 \sim 1/\text{K}^2$.

$$\begin{aligned} R(55 \sim \text{K}) &= R(20 \sim \text{K}) \cdot (1 + \alpha \cdot \Delta T + \beta \cdot T^2 + \dots) \\ &= 80 \sim \text{G}\Omega \cdot (1 - 0.048 \sim \text{K} \cdot (35 \sim \text{K}) + 0.00057 \sim \text{K}^2 \cdot \Delta (35 \sim \text{K})^2) \end{aligned}$$

Calculate the resistance for the dielectric material for $20 \text{ }^\circ\text{C}$.

Solution

$$\begin{aligned} R(20 \text{ }^\circ\text{C}) &= \rho \cdot \frac{d}{A} \\ &= 10^{17} \text{ }^\circ\text{C} \cdot \frac{0.8 \cdot 10^{-6} \text{ m}}{1 \text{ m}^2} \end{aligned}$$

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