Q 03

Two conductors have the same resistance at 0°C but their temperature coefficients of resistance are α_1 and α_2. The respective temperature coefficients of their series and parallel combinations are nearly **[2010]**

(a) $\frac{\alpha_1+\alpha_2}{2}, \alpha_1+\alpha_2$ (b) $\alpha_1+\alpha_2, \frac{\alpha_1+\alpha_2}{2}$

(c) $\alpha_1+\alpha_2, \frac{\alpha_1\alpha_2}{\alpha_1+\alpha_2}$ (d) $\frac{\alpha_1+\alpha_2}{2}, \frac{\alpha_1+\alpha_2}{2}$

answer

(d) $R_1 = R_0[1+\alpha_1\Delta t]$: $R_2 = R_0[1+\alpha_2\Delta t]$

In Series, $R = R_1 + R_2$

$= R_0[2+(\alpha_1+\alpha_2)\Delta t]$

$= 2R_0\left[1+\left(\frac{\alpha_1+\alpha_2}{2}\right)\Delta t\right]$

$\therefore \alpha_{eq} = \frac{\alpha_1+\alpha_2}{2}$

In Parallel, $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

$= \frac{1}{R_0[1+\alpha_1\Delta t]} + \frac{1}{R_0[1+\alpha_2\Delta t]}$

$= \alpha_{eq} = \frac{\alpha_1+\alpha_2}{2}$