1. Na ohmskem uporu s temperaturnim koeficientom $\alpha = 5 \cdot 10^{-3}\ °C^{-1}$ je pri temperaturi $\upsilon_1 = 30\ °C$ padec napetosti $U_1 = 20\ V$ Pri kateri temperaturi bo na istem uporu padec napetosti $U_2 = 15\ V$, če je tok skozi upor v obeh primerih enak.

2. Ohmska upora $R_1 = 10\ \Omega$ in $R_2 = 5\ \Omega$ (pri 20°C) s temperaturnimi koeficienti $\alpha_1 = 4 \cdot 10^{-3}\ °C^{-1}$ in $\alpha_2 = -1\ 10^{-3}\ °C^{-1}$ sta vezana zaporedno. Pri kateri temperaturi bo nadomestna upornost vezave dvakrat večja kot je pri 20°C.

3. Pri kateri temperaturi bo ohmska upornost žice s temperaturnim koeficientom $\alpha = 4 \cdot 10^{-2}\ °C^{-1}$ za 20 % manjša kot pri temperaturi 120°C.

4. Po priključitvi na napetost se vodnik segreje za 40°C (od 20°C na 60°C). Kakšen je temperaturni koeficient prevodnika α, če se tok medtem zmanjša za 20%.
Napetost je konstantna.

Rešitve

1. $\vartheta = -22{,}5\ ^0C$

2. $\vartheta = 448\ ^0C$

3. $\vartheta = 95\ ^0C$

4. $\alpha = 6{,}25 \cdot 10^{-3}\ ^0C^{-1}$

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ZADATAK 1

$\vartheta_1 = 30°C \qquad \Delta\vartheta_1 = \vartheta_1 - \vartheta_0 = 30°C - 20°C = 10°C$

$\alpha = 5\,10^{-3}\,°C^{-1}$

$U_1 = 20V \qquad I_1 = I_2$

$U_2 = 15V$

$$\frac{U_1}{R_1} = \frac{U_2}{R_2}$$

$$\frac{U_1}{R_0(1+\alpha\Delta\vartheta_1)} = \frac{U_2}{R_0(1+\alpha\Delta\vartheta_2)}$$

$$U_2(1+\alpha\Delta\vartheta_1) = U_1(1+\alpha\Delta\vartheta_2)$$

$$\frac{\frac{U_2(1+\alpha\Delta\vartheta_1)}{U_1} - 1}{\alpha} = \Delta\vartheta_2$$

$$\Delta\vartheta_2 = \frac{\frac{15\,V\,(1+5\cdot10^{-3}\,°C^{-1}\cdot 10°C)}{20\,V} - 1}{5\,10^{-3}\,°C^{-1}} = -42{,}5\,°C$$

$\Delta\vartheta_2 = \vartheta_2 - \vartheta_0$

$\vartheta_2 = \Delta\vartheta_2 + \vartheta_0 = -42{,}5°C + 20°C = \boxed{-22{,}5°C}$

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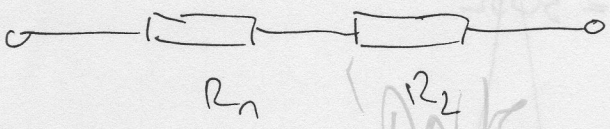
NALOGA 2

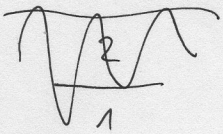


$$30\,\Omega = \overset{10}{R_1}(1+\alpha_1 \cdot \Delta\vartheta) + \overset{5}{R_2}(1+\alpha_1 \cdot \Delta\vartheta)$$

$$30 = 10 + 10\alpha_1\Delta\vartheta + 5 + 5\alpha_2\Delta\vartheta$$

$$30 = 15 + 10\alpha_1\Delta\vartheta + 5\alpha_2\Delta\vartheta$$

$$\frac{15}{10\alpha_1 + 5\alpha_2} = \Delta\vartheta$$



$$\Delta\vartheta = \frac{R_1 + R_2}{R_1\alpha_1 + R_2\alpha_2} = 428{,}57$$

$$\Delta\vartheta = 428{,}57\ °C$$

$$\vartheta = \Delta\vartheta + \vartheta_0 = 428{,}57 + 20 = \boxed{448{,}57\ °C}$$

$\alpha = 4 \cdot 10^{-2}\ °C^{-1}$

$\Delta \vartheta_1 = 100°C$

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$\vartheta_1 = 120°C$

$\vartheta_2 = ?$

$$R = \frac{R_0 (1 + \alpha_1 \cdot \Delta \vartheta_1)}{\alpha_2} = R$$

$$\frac{4}{5} R =$$

$$\frac{R_0 (1 + \alpha_1 \Delta \vartheta_2)}{\frac{4}{5}} = R_0 (1 + \alpha_1 \Delta \vartheta_1)$$

$$\frac{1 + \alpha_1 \Delta \vartheta_2}{\frac{4}{5}} = 1 + \alpha_1 \Delta \vartheta_1$$

$$\frac{5 + 5\alpha_1 \Delta \vartheta_2}{4} = \frac{1 + \alpha_1 \Delta \vartheta_1}{1}$$

$$5 + 5\alpha_1 \Delta \vartheta_2 = 4 + 4\alpha_1 \Delta \vartheta_1$$

$$\Delta \vartheta_2 = \frac{4 + 4\alpha_1 \Delta \vartheta_1 - 5}{5\alpha_1}$$

$$\boxed{\Delta \vartheta_2 = 75°C}$$

$$\boxed{\vartheta_2 = 75 + 98°C}$$

DNS

4

DNS / NALOGA 4

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$\Delta\vartheta_1 = 0$

$\Delta\vartheta_2 = 40°$

$\alpha = ?$

$U_1 = U_2$ $\quad$ U

$I_1 \cdot R_1 = I_2 R_2$ $\quad$ $I_1 R_1 = \frac{4}{5} I_1 R_1$

$R_1 = \frac{4}{5} R_1$

$\frac{I_1 R_1}{1} = \frac{4 I_2 R_2}{5}$ $\quad$ $R_0(1 + \alpha_1 \Delta\vartheta_1) = \frac{4}{5}\left(R_0(1 + \alpha_1 \Delta\vartheta_2)\right)$

$1 = \frac{4}{5} + \frac{4}{5}\alpha_1 \Delta\vartheta_2$

$\Delta\vartheta_2 = \frac{1 - \frac{4}{5}}{\frac{4}{5}\alpha_1}$

$R_1 = R_0(1 + \alpha_1 \Delta\vartheta_1) = \frac{6}{5} \cdot R_0(1 + \alpha_1 \Delta\vartheta_2)$

$1 = \frac{6}{5} + \frac{6}{5}\alpha_1 \Delta\vartheta_2$

$\alpha_1 = \frac{1 - \frac{6}{5}}{\frac{6}{5} \Delta\vartheta_2}$

$\frac{1 - \frac{6}{5}}{\Delta\vartheta_2} = \alpha_1$

$\alpha_1 = 0{,}00625\ °C^{-1}$

$\alpha_1 = 6{,}25 \cdot 10^{-3}\ °C^{-1}$

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