M4 ELT 1

Opgaveark 1

1)

$P = 60\,W$, $U = 230\,V$

$$I = \frac{P}{U} = \frac{60}{230} = \underline{\underline{0{,}263\,A}}$$

2)

$l = 200\,m$, $A = 1{,}5\,mm^2$, $\rho_{Cu} = 0{,}0175\,\frac{\Omega\,mm^2}{m}$

$$R = \rho_{Cu}\frac{l}{A} = 0{,}0175 \cdot \frac{200}{1{,}5} = \underline{\underline{2{,}33\,\Omega}}$$

3)

$d = 30\,mm$, $l = 1000\,m$, $\rho_{Al} = 0{,}029\,\frac{\Omega\,mm^2}{m}$

$$A = \frac{\pi}{4}d^2 = \frac{\pi}{4} \cdot 30^2 = 707\,mm^2$$

$$R = \rho_{Al}\frac{l}{A} = 0{,}029 \cdot \frac{1000}{707} = \underline{\underline{0{,}041\,\Omega}}$$

$$J = 10\,\frac{A}{mm^2} \Rightarrow I = J \cdot A = 10 \cdot 707 = 7070\,A$$

$$\Delta U = R \cdot I = 0{,}041 \cdot 7070 = \underline{\underline{290\,V}}$$

4)

$l = 10\,m$, $A = 0{,}75\,mm^2$, $I = 12\,A$, Cu-tråd

$$R = \rho_{Cu} \cdot \frac{l}{A} = 0{,}0175\,\frac{10}{0{,}75} = 0{,}233\,\Omega$$

$$U = I \cdot R = 12 \cdot 0{,}233 = \underline{\underline{2{,}8\,V}}$$

$$P = I^2 \cdot R = 12^2 \cdot 0{,}233 = \underline{\underline{33{,}6\,W}}$$

5) $R_1 = 4{,}75\,\Omega$, $T_1 = 20\,^\circ C$, $R_2 = 6{,}98\,\Omega$

$\rho_2 = \rho_1 (1 + \alpha (T_2 - T_1))$, $\alpha_1 = 4 \cdot 10^{-3}\,^\circ C^{-1}$

$R_2 = R_1 (1 + \alpha (T_2 - T_1))$

$\frac{R_2}{R_1} = 1 + \alpha (T_2 - T_1)$

$T_2 - T_1 = \frac{1}{\alpha} \left(\frac{R_2}{R_1} - 1 \right)$

$T_2 = T_1 + \frac{1}{\alpha} \left(\frac{R_2}{R_1} - 1 \right)$

$= 20 + \frac{1}{4 \cdot 10^{-3}} \left(\frac{6{,}98}{4{,}75} - 1 \right)$

$= 20 + 117 = \underline{\underline{137\,^\circ C}}$

6) $E = 12{,}4\,V$, $I = 9{,}5\,A$, $U_{kl} = 11{,}9\,V$

$U_{kl} = E - I \cdot R_i$

$R_i = \frac{E - U_{kl}}{I} = \frac{12{,}4 - 11{,}9}{9{,}5} = \underline{\underline{0{,}053\,\Omega}}$