NEISSE - ELEKTRO 2000

LÖSUNGEN

1

$$R_a = 12{,}5\ \Omega$$

$$I_{tot} = \frac{U_q}{R_i + R_a} = 1\ A$$

$$I_{tot} = 1\ A \qquad U_i = R_i \cdot I_{tot} = 7{,}5\ V$$

$I_1 = 0{,}25\ A$	$U_1 = 2{,}5\ V$	12,5 V
$I_2 = 0{,}5\ A$	$U_2 = 5\ V$	
$I_3 = 0{,}25\ A$	$U_3 = 2{,}5\ V$	
$I_4 = 0{,}25\ A$	$U_4 = 2{,}5\ V$	
$I_5 = 0{,}25\ A$	$U_5 = 2{,}5\ V$	
$I_6 = 0{,}25\ A$	$U_6 = 2{,}5\ V$	
$I_7 = 0{,}25\ A$	$U_7 = 2{,}5\ V$	
$I_8 = 0{,}25\ A$	$U_8 = 2{,}5\ V$	
$I_9 = 0{,}25\ A$	$U_9 = 2{,}5\ V$	12,5 V
$I_{10} = 0{,}5\ A$	$U_{10} = 5\ V$	
$I_{11} = 0{,}5\ A$	$U_{11} = 5\ V$	

2

$$R_{20} = \frac{\ell}{\chi \cdot A}$$

$$A = \frac{\pi}{4} \cdot d^2$$

$$= \frac{\pi}{4} \cdot 6^2 mm^2 = 28{,}26\ mm$$

a)

$$R_{20} = \frac{2\ m \cdot \Omega \cdot mm^2}{35\ m \cdot 28{,}26\ mm^2}$$

$$= 2{,}022\ m\Omega$$

b)

$$R_{120} = R_{20}\left(1+\alpha\cdot\left(120^{o}-20^{o}\right)\right)$$

$$= 2{,}022\ \text{m}\Omega\ (1+0{,}377)$$

$$\underline{\underline{= 2{,}784\ \text{m}\Omega}}$$

c)

$$I_{20} = \frac{U}{R_{20}} = \frac{400\ \text{V}}{2{,}022\ \text{m}\Omega} = 197{,}82\ \text{kA}$$

$$I_{120} = \frac{U}{R_{120}} = \frac{400\ \text{V}}{2{,}784\ \text{m}\Omega} = 143{,}67\ \text{kA}$$

d)

$$H = \frac{2\times I}{4\,\pi\cdot a}\left(\cos\alpha_1 - \cos\alpha_2\right)$$

$$(0{,}995-0)$$

$$H = \frac{I}{2\,\pi\cdot 10\ \text{cm}}\cdot 0{,}995 = I\cdot 1{,}5836$$

$$\underline{\underline{= 313{,}266\ \frac{\text{kA}}{\text{m}}}}$$

$$\underline{\underline{= 227{,}516\ \frac{\text{kA}}{\text{m}}}}$$

3

$$\underline{\underline{U_q = 12\ \text{V}}}$$

$$\underline{\underline{R_i = 1{,}714\ \Omega}}$$

$$R_i = \frac{3\ \Omega\cdot 4\ \Omega}{3\ \Omega+4\ \Omega} = \frac{12}{7}\ \Omega = 1{,}714\ \Omega$$

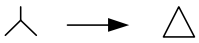
$$I_{K1} = \frac{12\ \text{V}}{3\ \Omega} = 4\ \text{A}$$

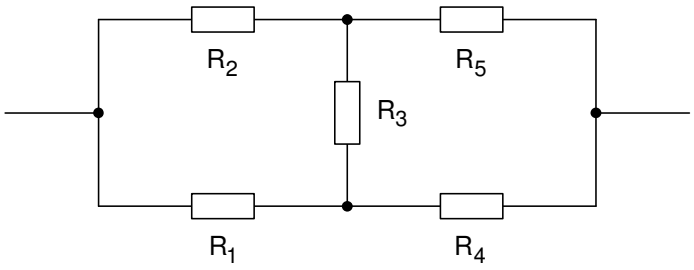
$$I_{K2} = \frac{12\ \text{V}}{4\ \Omega} = 3\ \text{A}$$

$$I_K = 7\ \text{A}$$

$$U_q = R_i\cdot I_K = 1{,}714\ \Omega\cdot 7\ \text{A}$$

$$= 12\ \text{V}$$





$$R_{12} = R_{10} + R_{20} + \frac{R_{10} \cdot R_{20}}{R_{30}}$$

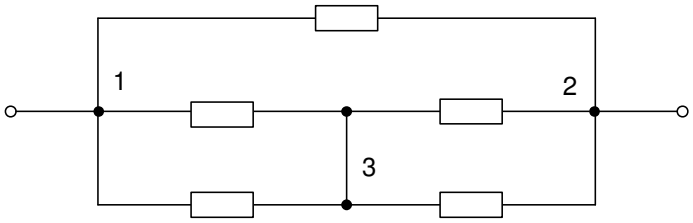
$$= 1\Omega + 2\Omega + \frac{1\Omega \cdot 2\Omega}{3\Omega} = 3{,}67\,\Omega$$

$$R_{23} = R_{20} + R_{30} + \frac{R_{20} \cdot R_{30}}{R_{10}}$$

$$= 2\Omega + 3\Omega + \frac{2\Omega \cdot 3\Omega}{1\Omega} = 11\Omega$$

$$R_{31} = R_{30} + R_{10} + \frac{R_{30} \cdot R_{10}}{R_{20}}$$

$$= 3\Omega + 1\Omega + \frac{3\Omega \cdot 1\Omega}{2\Omega} = 5{,}5\,\Omega$$



$$R_a = R_{12} \,//\, (R_{13} \,//\, 2\Omega + R_{23} \,//\, 1\Omega) = R_{12} \,//\left(\frac{5{,}5\Omega \cdot 2\Omega}{7{,}5\Omega} + \frac{11\Omega \cdot 1\Omega}{12\Omega} \right) = R_{12} \,//\, 2{,}38\,\Omega$$

$$R_a = \frac{3{,}67\,\Omega \cdot 2{,}38\,\Omega}{3{,}67\,\Omega + 2{,}38\,\Omega} = 1{,}44\,\Omega$$

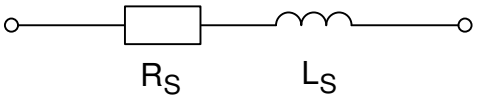
$$\underline{\underline{R_a = 1{,}44\ \Omega}}$$

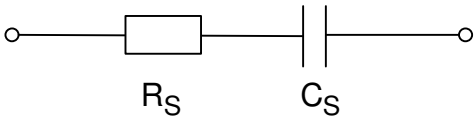
$$I = \frac{U_q}{R_i + R_c} = \frac{12\ \text{V}}{1{,}714\ \Omega + 1{,}44\ \Omega} = \frac{12\ \text{V}}{3{,}154}$$

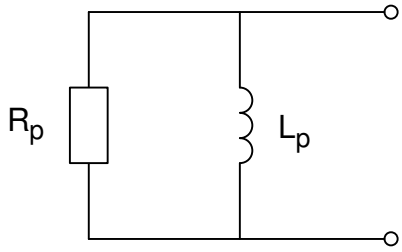
$$\underline{\underline{I = 3{,}804\ \text{A}}}$$

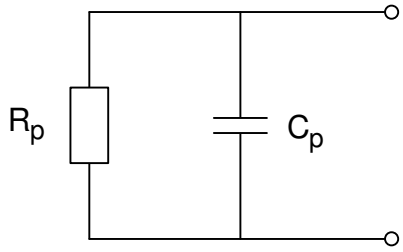
$$U_{AB} = R_a \cdot I = \underline{\underline{5{,}478\ \text{V}}}$$

4









U = 24 V

f = 50 Hz

$I = 1{,}1\ A$

$$R_s \cdot I^2 = p = \frac{U^2}{R_p}$$

$$Q = U \cdot I \cdot \sin\varphi$$

$$\rho = U \cdot I \cdot \cos\varphi$$

$$\sin\varphi = 0{,}663$$

$$\rho = 41{,}52$$

$$\underline{\cos\rho = 0{,}748}$$

$$I^2 \cdot x_s = Q = I^2 \cdot \frac{U^2}{X_p}$$

$$R_S = \frac{P}{I^2} = \frac{79{,}2\,W}{(2{,}2\,A)^2} = 16{,}4\,\Omega \qquad R_P = \frac{U^2}{P} = \frac{(48\,V)^2}{79{,}2\,W} = 29{,}1\,\Omega$$

$$X_S = \frac{Q}{I^2} = \frac{69{,}8\,var}{(2{,}2\,A)^2} = 14{,}4\,\Omega \qquad X_P = \frac{U^2}{Q} = \frac{(48\,V)^2}{69{,}8\,var} = 160\,\Omega$$

$$X_S = \omega \cdot L_s \quad L_S = \frac{X_S}{2\pi \cdot f} = 45{,}9\,mH \qquad X_P = \omega \cdot L_P \quad L_P = \frac{X_P}{2\pi \cdot f} = 508\,mH$$

$$X_S = \frac{1}{\omega \cdot C_S} \quad C_S = \frac{1}{2\pi \cdot f \cdot X_S} = 221\,\mu F \qquad X_P = \frac{1}{\omega \cdot C_P} \quad C_P = \frac{1}{2\pi \cdot f \cdot X_P} = 19{,}9\,\mu F$$

5

$$U_{iq} = \frac{d\Phi}{dt} \qquad \Phi = B \cdot A(t)$$

$$v = \frac{x}{t} \qquad x = v \cdot t$$

$$U_{iq} = \frac{d\Phi}{dt} = B \cdot \frac{dA(t)}{dt} = -B \cdot s \cdot v$$

$$= 1{,}2 \frac{V_s}{m^2} \cdot 0{,}4\ m \cdot 0{,}5 \frac{m}{s}$$

$$= 0{,}24\ V$$