

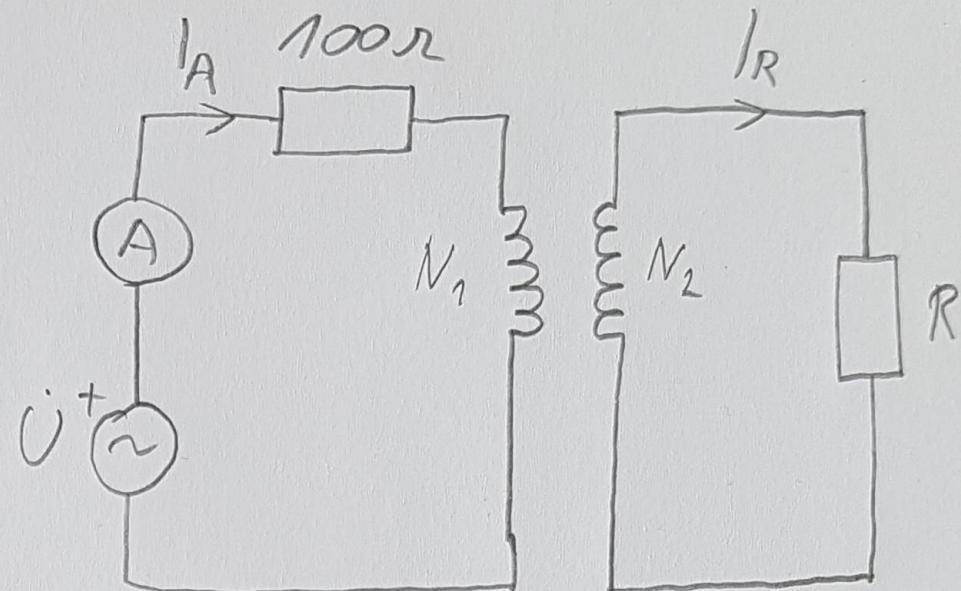
①

$$I_A = 2 \text{ A}$$

$$R = 50 \Omega$$

$$N_1 : N_2 = 1 : 2 \Rightarrow \frac{N_1}{N_2} = \frac{1}{2}$$

$$P_R = ?$$



$$P_R = U_R \cdot I_R = I_R^2 \cdot R$$

$$I_A \cdot N_1 = I_R \cdot N_2 \Rightarrow I_R = \frac{N_1}{N_2} \cdot I_A$$

$$P_R = \left(\frac{N_1}{N_2} \cdot I_A \right)^2 \cdot R$$

$$P_R = \left(\frac{1}{2} \cdot 2 \text{ A} \right)^2 \cdot 50 \Omega = \boxed{50 \text{ W}}$$

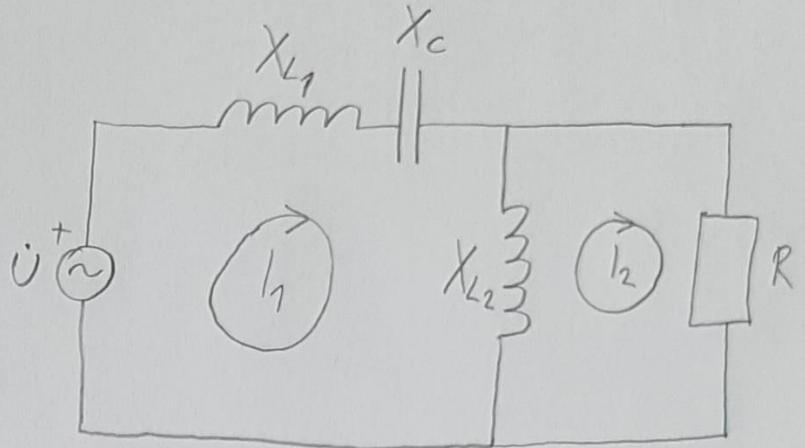
DR-2019-A
②

$$\dot{U} = 20V$$

$$R = X_{L_1} = X_{L_2} = 10\Omega = a$$

$$X_C = 20\Omega$$

KONTURNA STRUJKA $i_1 = ?$



$$I. \quad \dot{U} + i_1 (X_{L_1} + X_C + X_{L_2}) + i_2 X_{L_2} = 0$$

$$II. \quad i_1 X_{L_2} - i_2 (X_{L_2} + R) = 0$$

$$20 - i_1 (10j - 20j + 10j) + i_2 \cdot 10j = 0$$

$$i_1 \cdot 10j - i_2 (10j + 10) = 0$$

$$20 + 10j \cdot i_2 = 0 \Rightarrow i_2 = \frac{-20}{10j} = \boxed{2j}$$

$$10j \cdot i_1 - i_2 (10j + 10) = 0$$

$$10j \cdot i_1 - 2j (10j + 10) = 0$$

$$10j \cdot i_1 + 20 - 20j = 0$$

$$i_1 = \frac{-20 + 20j}{10j} = \frac{-2}{j} + 2$$

$$\boxed{i_1 = 2 + 2j}$$

3.

$$S = 100 \text{ cm}^2$$

$$d = 1 \text{ cm}$$

$$\epsilon_r = 3$$

$$U = 200 \text{ V}$$

$$W = ?$$

$$W = C \cdot \frac{U^2}{2}$$

$$W = 26,562 \cdot 10^{-12} \text{ F} \cdot \frac{(200 \text{ V})^2}{2}$$

$$W = 5,3124 \cdot 10^{-7}$$

$$W = 531,24 \text{ nJ}$$

$$C = \epsilon_0 \cdot \epsilon_r \cdot \frac{S}{d}$$

$$\epsilon_0 = 8,854 \cdot 10^{-12} \frac{\text{F}}{\text{m}}$$

$$C = 3 \cdot 8,854 \cdot 10^{-12} \frac{\text{F}}{\text{m}} \cdot \frac{100 \text{ cm}^2}{1 \text{ cm}}$$

$$C = 3 \cdot 8,854 \cdot 10^{-12} \frac{\text{F}}{\text{m}} \cdot \frac{100 \text{ cm}^2}{1 \text{ m}}$$

$$C = 26,562 \cdot 10^{-12} \text{ F}$$

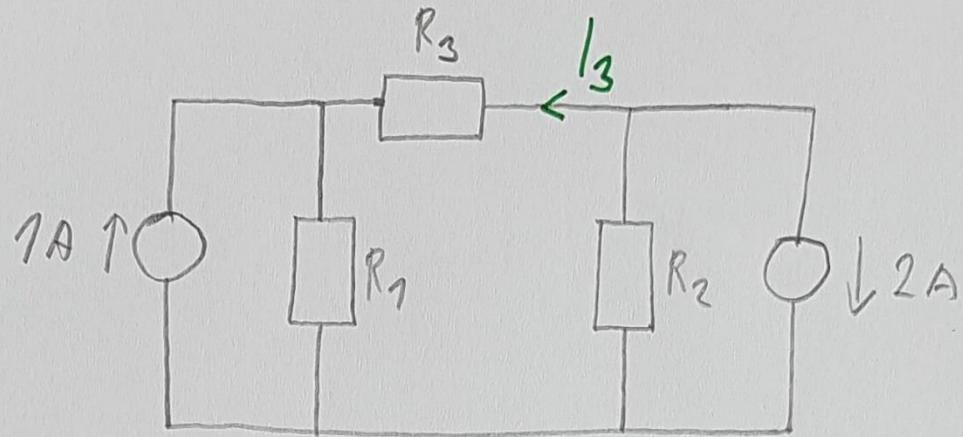
④ DR-2019-A

$$R_1 = 2 \Omega$$

$$R_2 = 2 \Omega$$

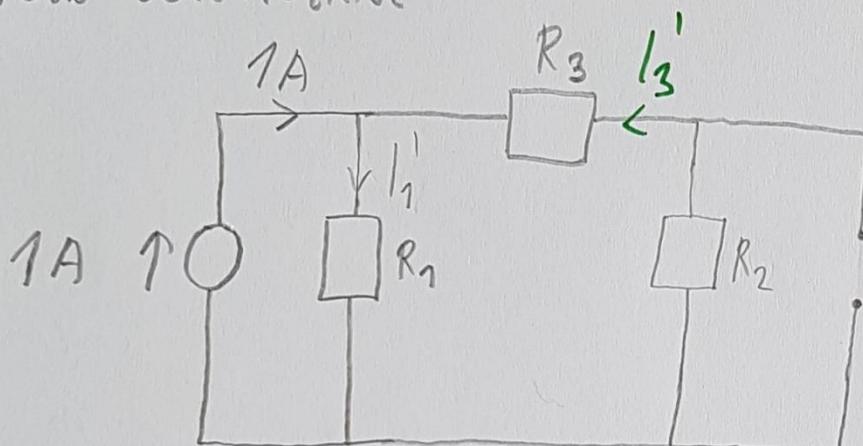
$$R_3 = 2 \Omega$$

$$I_3 = ?$$



METODO SUPERPOSICIONE

①

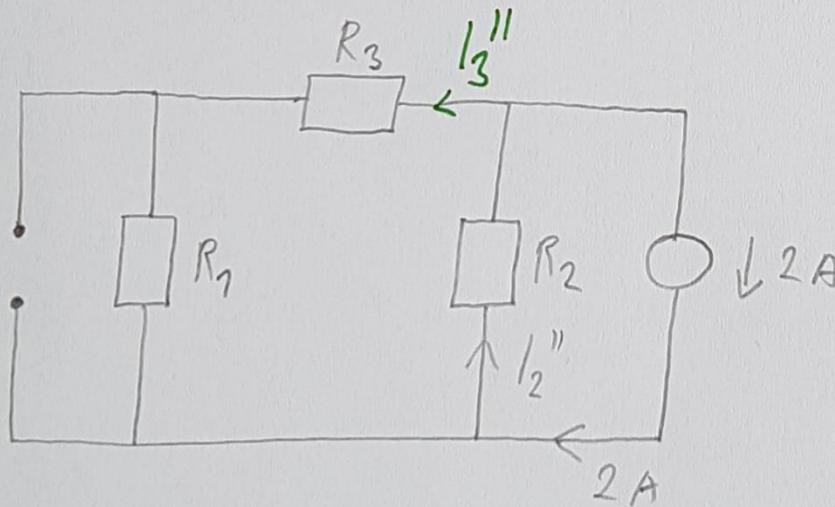


$$-I_3' = 1A \cdot \frac{R_1}{R_1 + R_2 + R_3}$$

$$-I_3' = 1A \cdot \frac{2}{6} = \frac{1}{3} A$$

$$I_3' = -\frac{1}{3} A$$

②



$$-I_3'' = 2A \cdot \frac{R_2}{R_1 + R_2 + R_3}$$

$$-I_3'' = 2A \cdot \frac{1}{3} = \frac{2}{3} A$$

$$I_3'' = -\frac{2}{3} A$$

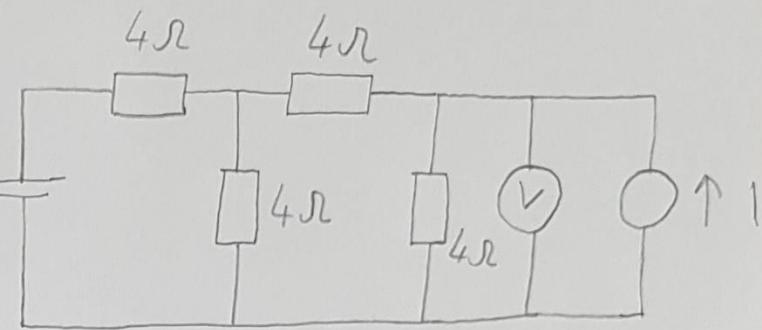
$$I_3 = I_3' + I_3'' = -\frac{1}{3} A + \left(-\frac{2}{3} A\right) = -1A$$

(5)

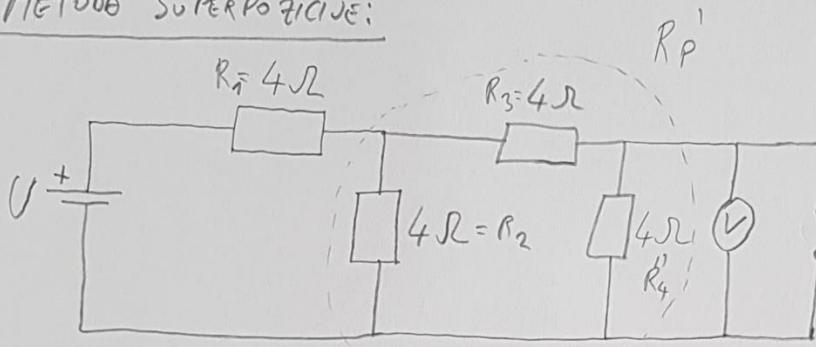
$$U_{V_1} = 10V$$

$$U_{V_2} = 8V \quad (\text{Aho je } U_2 = \frac{U_1}{2})$$

$$I = ?$$

METODO SUPERPOZICIONE:

(1°)



$$R_p' = (4\Omega + 4\Omega) // 4\Omega$$

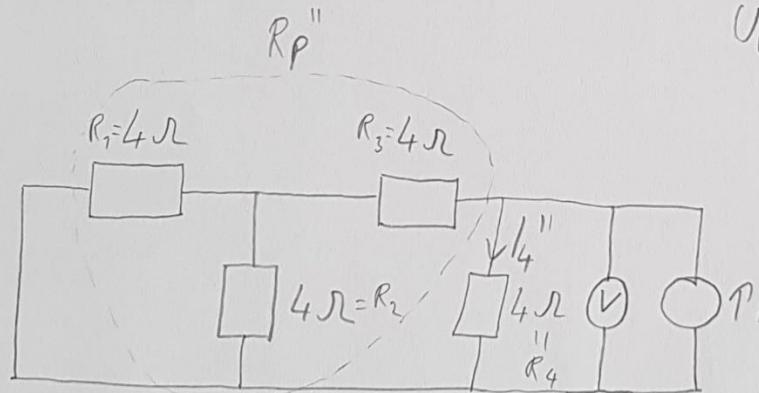
$$R_p' = 8\Omega // 4\Omega = 2,67\Omega$$

$$U_{R_1}' = U \cdot \frac{R}{R+R_p'} = 0,6V$$

$$U_{R_p'} = 0,4V = U_{R_2}$$

$$U_V' = U_{R_3} = U_{R_4} = \frac{U_{R_2}}{2} = 0,2V$$

(2°)



$$R_p'' = 4\Omega + 4\Omega // 4\Omega = 6\Omega$$

$$I_4'' = I \cdot \frac{R_p''}{R_4 + R_p''} = I \cdot \frac{6}{10} = 0,6I$$

$$U_V'' = 4\Omega \cdot 0,6I = 2,4I$$

$$U = U_1$$

$$U_V = U_V' + U_V'' = 0,2V + 2,4I = 10V$$

$$U = U_2$$

$$U_V = 8V = \frac{U_V'}{2} + U_V'' = 0,1V + 2,4I$$

$$0,2V + 2,4I = 10$$

$$0,1V + 2,4I = 8$$

$$0,1V = 2 \Rightarrow U = 20V$$

$$2,4I = 8 - 0,1V$$

$$I = \frac{8 - 0,1V}{2,4} = \frac{6}{2,4} = 2,5A$$

⑥

DR-2019-A

$$i(t) = I_m \sin \omega t$$

$$f = 50 \text{ Hz}$$

$$t = ? \quad (I_{EF} = i(t))$$

$$\omega = 2\pi f = 100\pi \frac{1}{s}$$

$$I_{EF} = \frac{I_m}{\sqrt{2}}$$

$$\frac{I_m}{\sqrt{2}} = I_m \sin \left(100\pi \frac{1}{s} t \right)$$

$$\sin \left(100\pi \frac{1}{s} t \right) = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$100\pi \frac{1}{s} t = \frac{\pi}{4} \Rightarrow t = \frac{1s}{400} = \boxed{2,5 \text{ ms}}$$

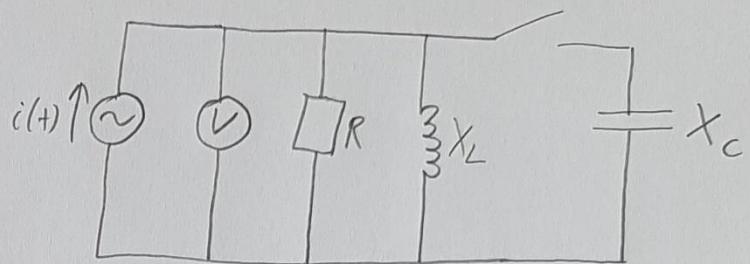
7. DR-2019-A

$$i(+)= 4 \sin(\omega t) A$$

$$R = 3 \Omega$$

$$U_V = 6V \begin{pmatrix} 1 \text{ PRI OTVORENO} \\ 1 \text{ PRI ZATVORENO} \\ \text{SKLOPČI} \end{pmatrix}$$

$$|X_C| = ?$$



1° - SKLOPČI OTVORENA

$$Y = \frac{1}{|R|} + \frac{1}{j|X_L|} \Rightarrow |Y| = \sqrt{\left(\frac{1}{|R|}\right)^2 + \left(\frac{1}{|X_L|}\right)^2}$$

$$|U_V| = \frac{|i|}{|Y|}$$

$$|U_V| = \frac{|i|}{\sqrt{\left(\frac{1}{|R|}\right)^2 + \left(\frac{1}{|X_L|}\right)^2}} = \frac{\frac{4}{\sqrt{2}}}{\sqrt{\frac{1}{9} + \frac{1}{|X_L|^2}}} = 6V / \sqrt{\frac{1}{9} + \frac{1}{|X_L|^2}}$$

$$36 \left(\frac{1}{9} + \frac{1}{|X_L|^2} \right) = \frac{16}{2}$$

$$\frac{1}{9} + \frac{1}{|X_L|^2} = \frac{2}{9} \Rightarrow \frac{1}{|X_L|^2} = \frac{1}{9}$$

$$|X_L|^2 = 9 \Rightarrow |X_L| = 3 \Omega$$

$$\frac{1}{3} - \frac{1}{|X_C|} = \frac{1}{3} \Rightarrow |X_C| = \infty$$

$$-\left(\frac{1}{3} - \frac{1}{|X_C|}\right) = \frac{1}{3} \Rightarrow \frac{1}{|X_C|} = \frac{2}{3} \Rightarrow 2|X_C| = 3 \Rightarrow |X_C| = \frac{3}{2} = 1,5 \Omega$$

2° - SKLOPČI ZATVORENA

$$Y = \frac{1}{|R|} + \frac{1}{j|X_L|} + \frac{1}{j|X_C|}$$

$$|Y| = \sqrt{\left(\frac{1}{|R|}\right)^2 + \left(\frac{1}{|X_L|} - \frac{1}{|X_C|}\right)^2}$$

$$|U_V| = 6V = \frac{|i|}{|Y|} = \frac{|i|}{\sqrt{\left(\frac{1}{|R|}\right)^2 + \left(\frac{1}{|X_L|} - \frac{1}{|X_C|}\right)^2}}$$

$$6V = \frac{\frac{4}{\sqrt{2}}}{\sqrt{\frac{1}{9} + \left(\frac{1}{3} - \frac{1}{|X_C|}\right)^2}} / \sqrt{\frac{1}{9} + \left(\frac{1}{3} - \frac{1}{|X_C|}\right)^2}$$

$$36 \left(\frac{1}{9} + \left(\frac{1}{3} - \frac{1}{|X_C|}\right)^2 \right) = 8$$

$$\frac{1}{9} + \left(\frac{1}{3} - \frac{1}{|X_C|}\right)^2 = \frac{2}{9} / \sqrt{\frac{1}{9} + \left(\frac{1}{3} - \frac{1}{|X_C|}\right)^2}$$

$$\left| \frac{1}{3} - \frac{1}{|X_C|} \right| = \frac{1}{3}$$

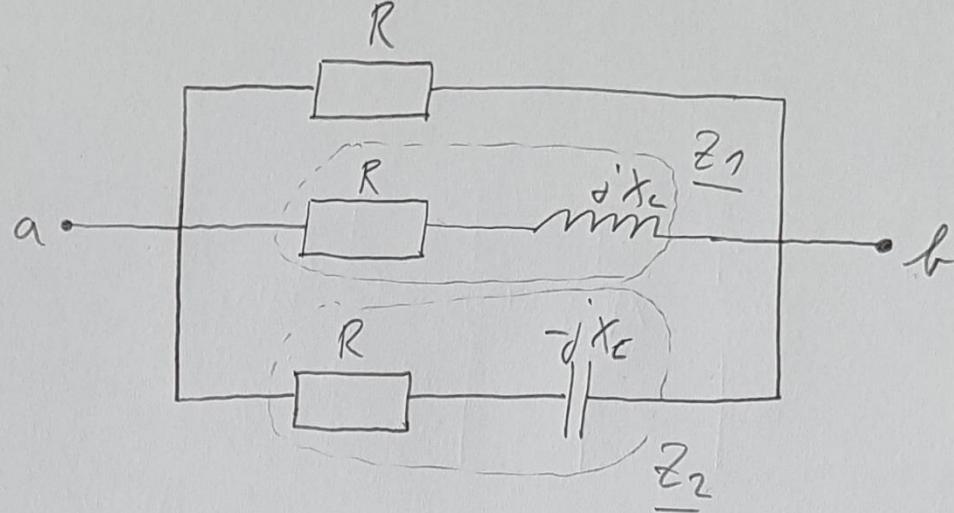
$$-\left(\frac{1}{3} - \frac{1}{|X_C|}\right) = \frac{1}{3} \Rightarrow \frac{1}{|X_C|} = \frac{2}{3} \Rightarrow 2|X_C| = 3 \Rightarrow |X_C| = \frac{3}{2} = 1,5 \Omega$$

8.

DR-2019-A

$$R = X_L = X_C = 60 \Omega$$

$$\underline{Z}_{ab} = ?$$



$$\underline{Z}_1 = R + jX_L = 60 + j60$$

$$\underline{Z}_2 = R + jX_C = 60 - j60$$

$$\frac{1}{\underline{Z}_{ab}} = \frac{1}{R} + \frac{1}{\underline{Z}_1} + \frac{1}{\underline{Z}_2} = \frac{1}{60} + \frac{1}{60+j60} + \frac{1}{60-j60} = \frac{1}{30}$$

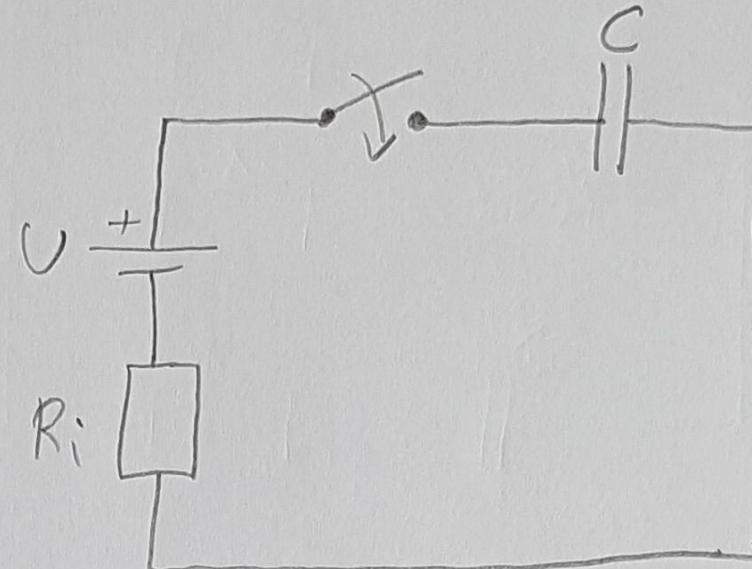
$$\underline{Z}_{ab} = \frac{1}{\frac{1}{30}} = \boxed{30 \Omega}$$

⑨.

$$U = 10V$$

$$R_i = 1k\Omega = 10^3 \Omega$$

$$C = 20 \mu F = 20 \cdot 10^{-6} F$$



$$M_C(t=20ms)$$

$\frac{1}{20 \cdot 10^{-3} s}$

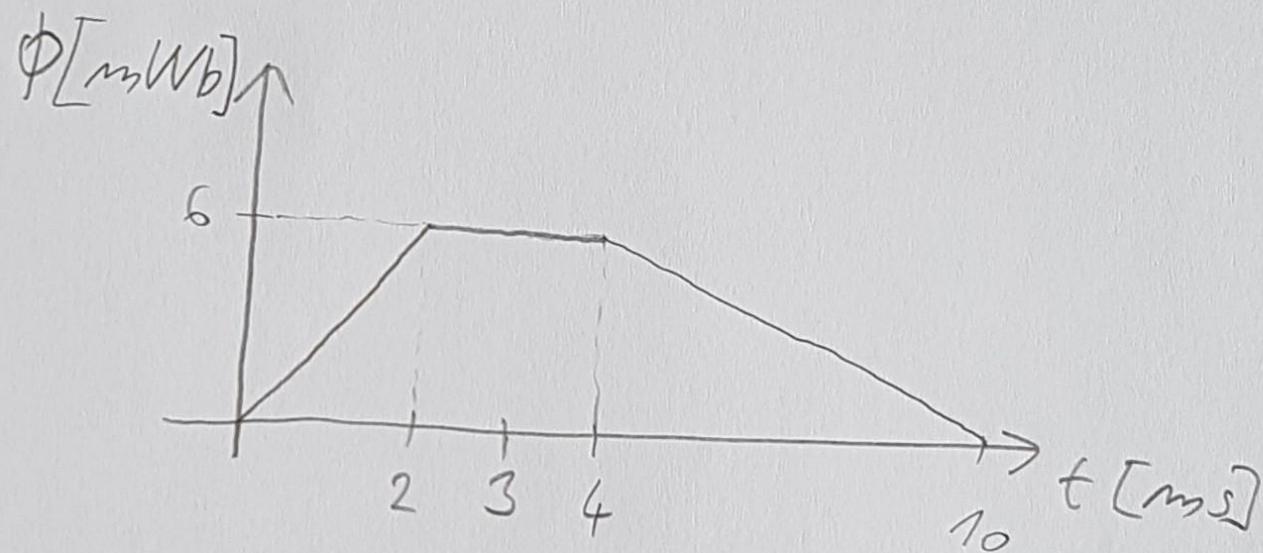
$$M_C(t=20ms) = U \left(1 - e^{-\frac{t}{\tau}} \right) = \left| \tau = R \cdot C \right| = 10 \left(1 - e^{-\frac{-20 \cdot 10^{-3} s}{10^3 \Omega \cdot 20 \cdot 10^{-6} F}} \right)$$

$$M_C(t=20ms) = 10 \left(1 - e^{-1} \right) = \boxed{6,32 V}$$

10.

DR-2019-A

$$M_{ino}(t=3ms) = ?$$



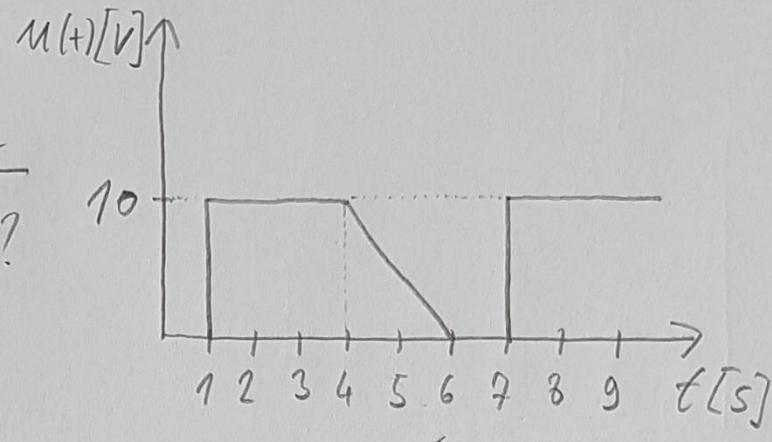
$$M_{ino}(t) = -\frac{d\phi}{dt}$$

$$M_{ino}(t=3ms) = \left. -\frac{d\phi}{dt} \right|_{t=3ms} = \boxed{0V}$$

11.

$$R = 47 \lambda \Omega = 47 \cdot 10^3 \Omega$$

U_m zu sinuso. напом = ?



$$M(t) = M_1(t) + M_2(t)$$

$$U_{EF} = \sqrt{U_{1EF}^2 + U_{2EF}^2}$$

$$U_{1EF} = 10V \cdot \sqrt{\frac{T_1}{T}}$$

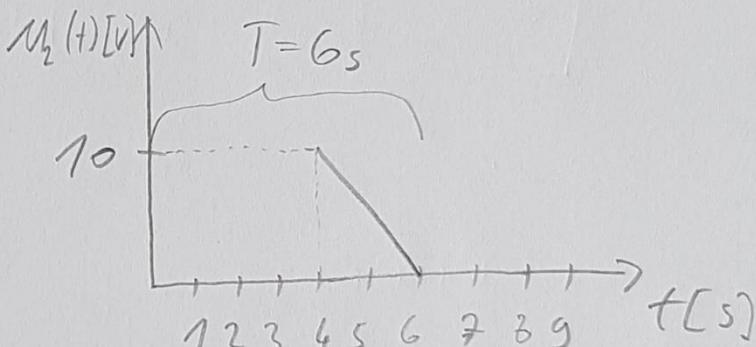
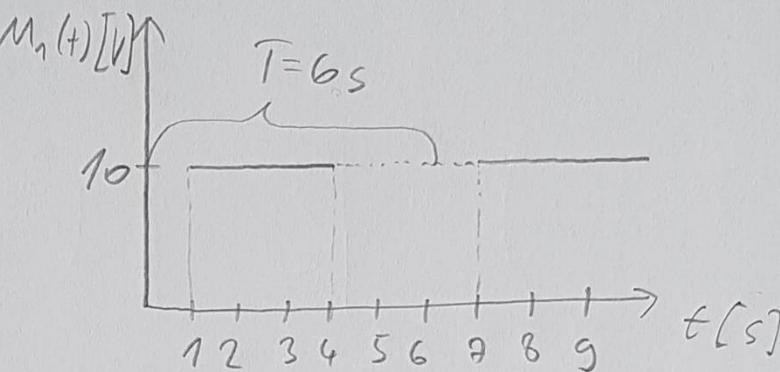
$$U_{1EF} = 10V \cdot \sqrt{\frac{3}{6}} = \frac{10}{\sqrt{2}} V$$

$$U_{1EF} = \boxed{5\sqrt{2} V}$$

$$U_{2EF} = \frac{10V}{\sqrt{3}} \cdot \sqrt{\frac{T_2}{T}}$$

$$U_{2EF} = \frac{10V}{\sqrt{3}} \cdot \sqrt{\frac{2}{6}} = \frac{10}{\sqrt{3}} \cdot \frac{1}{\sqrt{3}} V$$

$$U_{2EF} = \boxed{\frac{10}{3} V}$$



$$U_{EF} = \sqrt{U_{1EF}^2 + U_{2EF}^2} = \sqrt{(5\sqrt{2})^2 + \left(\frac{10}{3}\right)^2} = \sqrt{50 + \frac{100}{9}} = \frac{5\sqrt{22}}{3} V$$

$$U_m = U_{EF} \cdot \sqrt{2} = \frac{5\sqrt{22}}{3} \cdot \sqrt{2} = \frac{10\sqrt{11}}{3} = \boxed{11,06 V}$$

$$12. \quad U_L = 400V \quad R = 10\Omega$$

↓

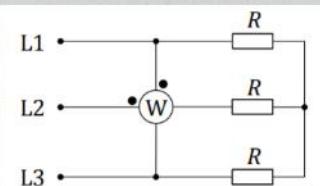
$(R = L = R) \Rightarrow$ SIMETRIČNO TRGOŠICO U ZVIJEZDI, NA SVAKOJ FAZI TRGOŠICA JE

$$U_f = U_L / \sqrt{3} = \frac{400}{\sqrt{3}} V$$

GDJE JE
+ NAPONA

VATMETAK MJEOM

GDJE STVJA
ULAZI



$$P_W = U_W \cdot I_W \cdot \cos(\alpha_{U_W} - \alpha_{I_W})$$

OVDJE:

$$I_W \rightarrow I_2 = \frac{U_f \angle -120^\circ}{R} = \frac{400 \angle -120^\circ}{\sqrt{3} \cdot 10} = \frac{40}{\sqrt{3}} \angle -120^\circ A$$

NAPON NA
DUGOJ FAZI TRGOŠICA JEOMAK
NAPONU DRUGE FAZE POKROVA

KROZ VATMETAK PROLAZI LINIJSKA STRUJA 2. LINIJE
(= STRUJI KROZ DUGU FAZU TRGOŠICA)

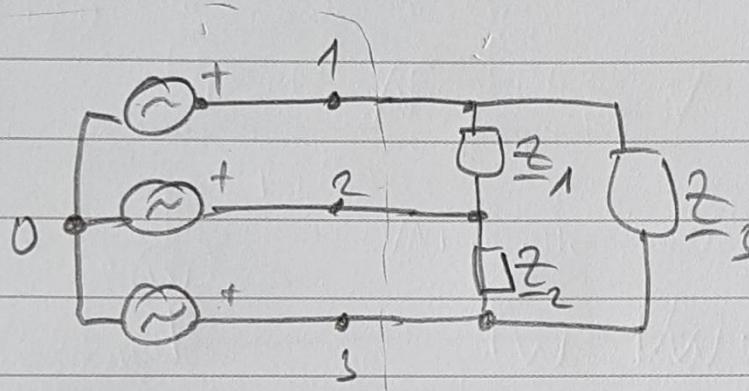
$$\begin{aligned} U_W \rightarrow U_{13} &= U_{10} - U_{30} = U_f - U_f \angle -240^\circ = U_f - U_f \left(-\frac{1}{2} + j \frac{\sqrt{3}}{2} \right) = \\ &= U_f \left(1 + \frac{1}{2} - j \frac{\sqrt{3}}{2} \right) = U_f \left(\frac{3}{2} - j \frac{\sqrt{3}}{2} \right) = \frac{U_f \cdot \sqrt{3}}{2} (\sqrt{3} - j) = \\ &= \frac{U_f \sqrt{3}}{2} \cdot \sqrt{3+1} \angle -30^\circ = U_f \cdot \sqrt{3} \angle -30^\circ = 400 \angle -30^\circ V \end{aligned}$$

NA VATMETU JE LINIJSKI NAPON U_{13}
(IZMEĐU 1. I 3. LINIJE)

100%:

$$\begin{aligned} P_W &= U_W \cdot I_W \cdot \cos(\alpha_{U_W} - \alpha_{I_W}) = 400 \cdot \frac{40}{\sqrt{3}} \cdot \cos(-30 - (-120)) = \\ &= \frac{16000}{\sqrt{3}} \cos 90^\circ = \frac{16000}{\sqrt{3}} \cdot 0 = 0 W \end{aligned}$$

$$13. \underline{Z}_1 = \underline{Z}_2 = \underline{Z}_3 = 100 \angle 45^\circ \Omega$$



IZVJEŠTAJNO UZNEŠI

NA SVAKOJ Fazi TREBALA JE UNIJKI NAPON:

$$I_1 = \frac{U_L}{|Z_1|}$$

$$I_2 = \frac{U_L}{|Z_2|}$$

$$I_3 = \frac{U_L}{|Z_3|}$$

$$\text{ODDE: } I_1 = I_2 = I_3 = \frac{400}{100} = 4A$$

$$P_1 = I_1^2 \cdot \operatorname{Re}\{\underline{Z}_1\} = 16 \cdot 100 \cdot \cos 45^\circ = 1600 \cdot \frac{\sqrt{2}}{2} = 800\sqrt{2} W$$

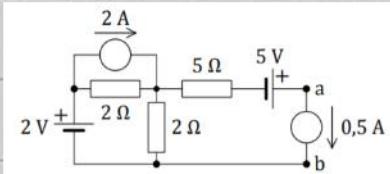
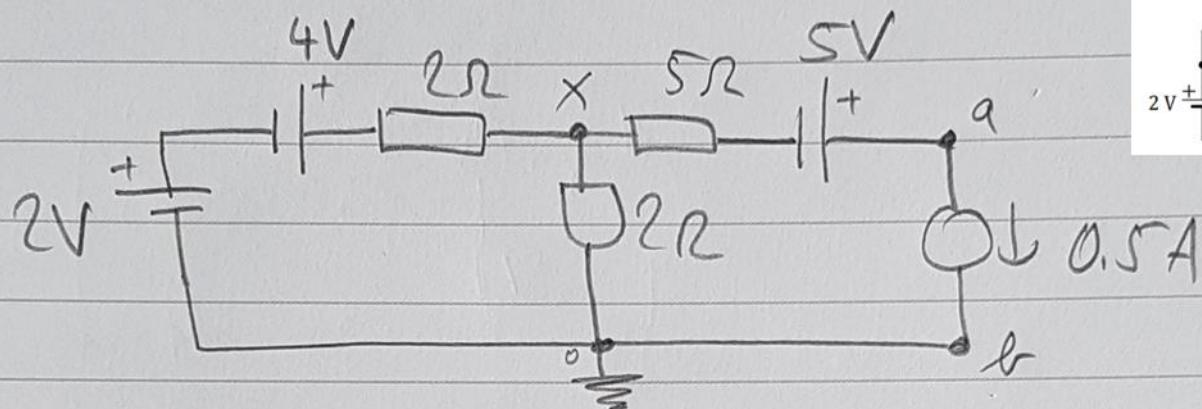
$$\text{OMDA JE } \therefore P_2 = P_3 = P_1 = 800\sqrt{2} W$$

NA KRALJU:

$$P_{uk} = P_1 + P_2 + P_3 = 3 \cdot 800\sqrt{2} = 2400\sqrt{2} = 3.39 kW$$

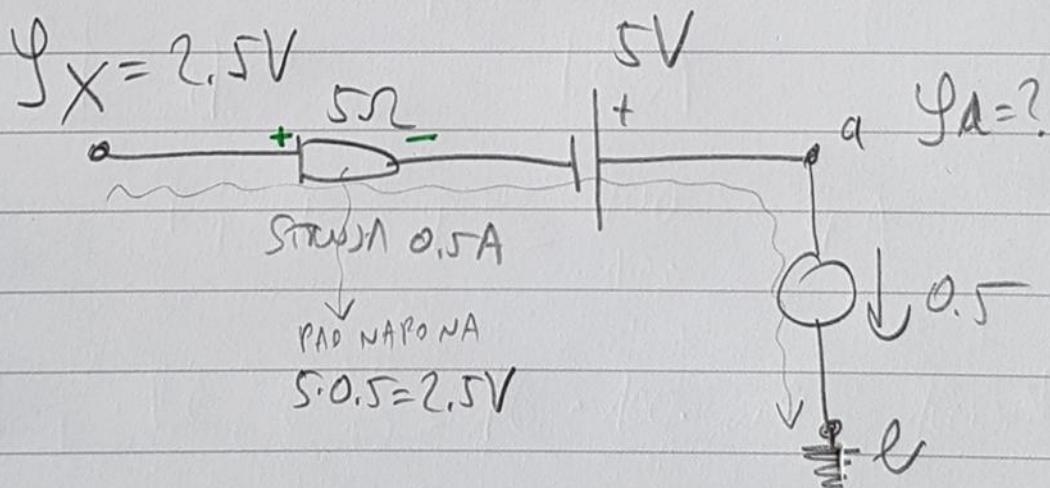
14.

PPR,
REALNI STROJNI (A, 2Ω → REALNI NAPONSKI 2.2=4V, 2Ω



HILLMAN DA SE DOBE DO φ_x :

$$U_{x_0} = \varphi_x = \frac{\frac{2+4}{2} + \frac{0}{2} - 0.5}{\frac{1}{2} + \frac{1}{2} + \frac{1}{5+0}} = \frac{3 - 0.5}{1} = 2.5 \text{ V}$$



SETNJA OD X DO a:
(φ_a U ODNOSU NA POZNATI φ_x)

$$\varphi_b = \varphi_a = 0 \text{ V}$$

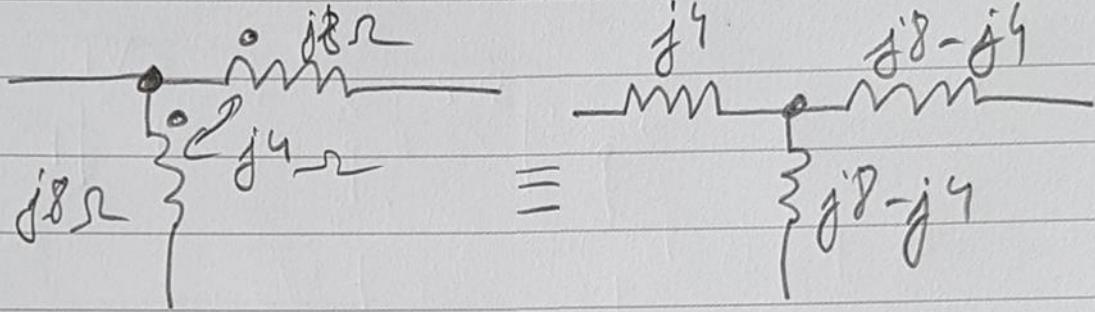
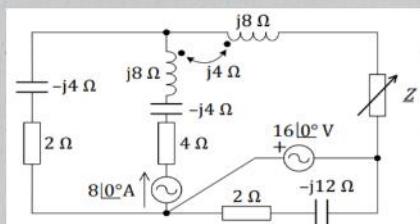
$$\varphi_a = \varphi_x - 2.5 \text{ V} + 5 \text{ V}$$

$(0.5 \cdot 5)$ \downarrow ULATNO NA \ominus IZVOKA
PAZNJANJE NA \oplus ULATNO
OBILATNO U SMJERU DJELOVANJA INORA

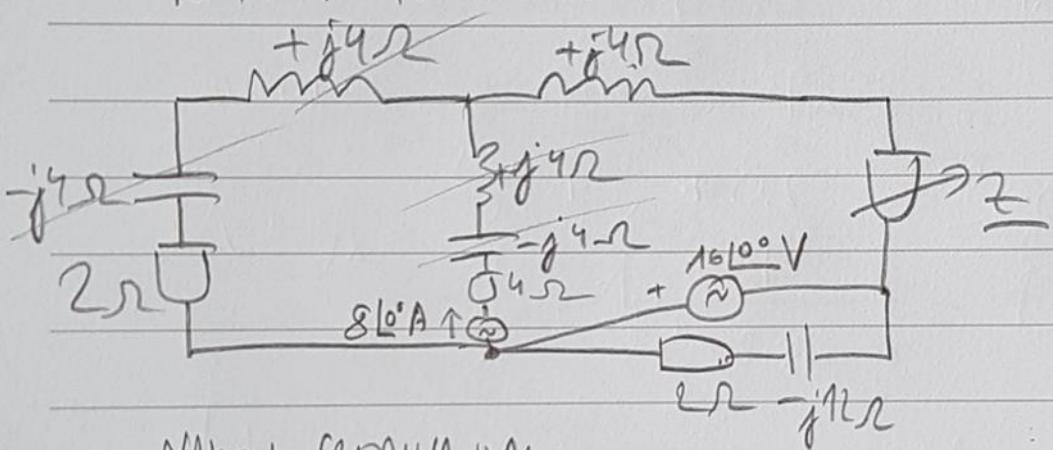
$$\varphi_a = 2.5 - 2.5 + 5 = 5 \text{ V}$$

$$U_{ab} = \varphi_a - \varphi_b = 5 - 0 = 5 \text{ V}$$

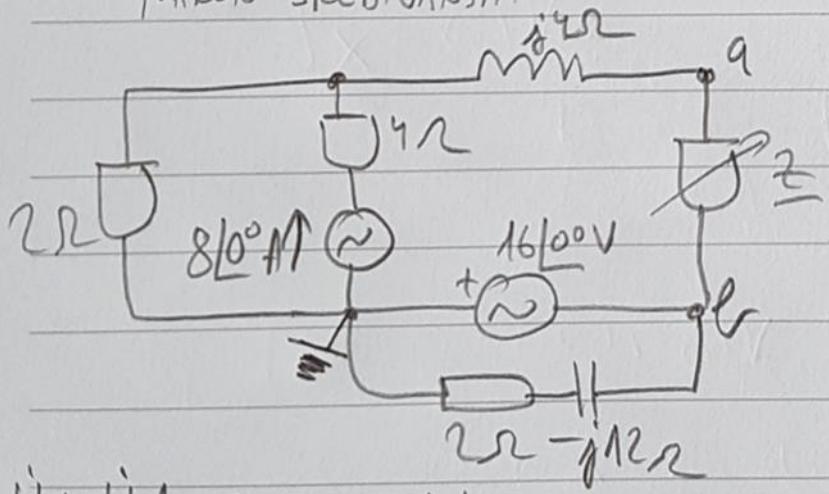
15. TOČAKA JEDNAKO ORIENTIRANA PREMA ZAJEDNIČKOM ČVORU:



NAKON TRANSFORMACIJE:

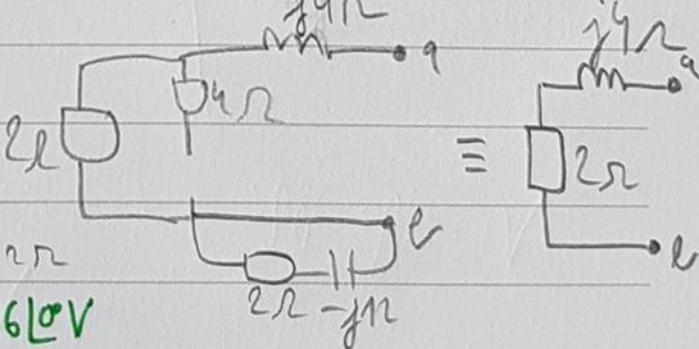


NAKON SREDJIVANJA:

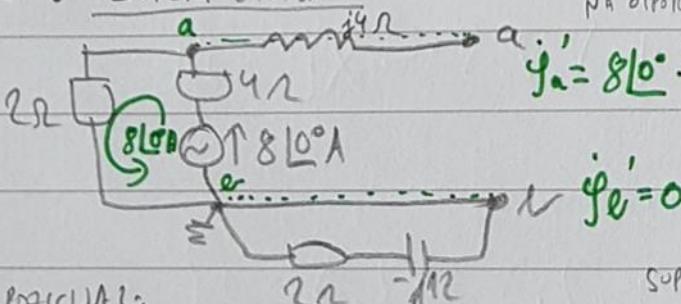


THEVENIN'S TOČAKA aile

$$Z_{Th} = 2 + j4 \Omega$$

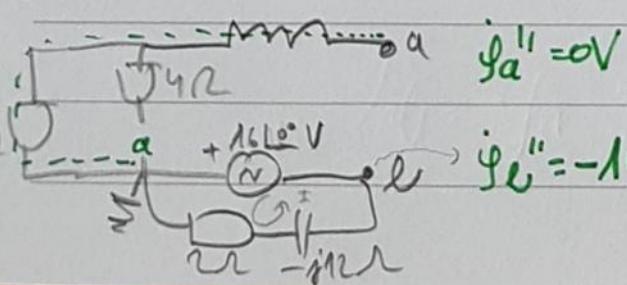


$V_{Th} = V_{ab}$ SUPERPOZICIJA 1:



$$\varphi_a' = 8\angle 0^\circ \cdot 2 = 16\angle 0^\circ V$$

SUPERPOZICIJA 2:



SUPERPOZICIJA 1+2:

$$\varphi_a = \varphi_a' + \varphi_a'' = 16\angle 0^\circ V$$

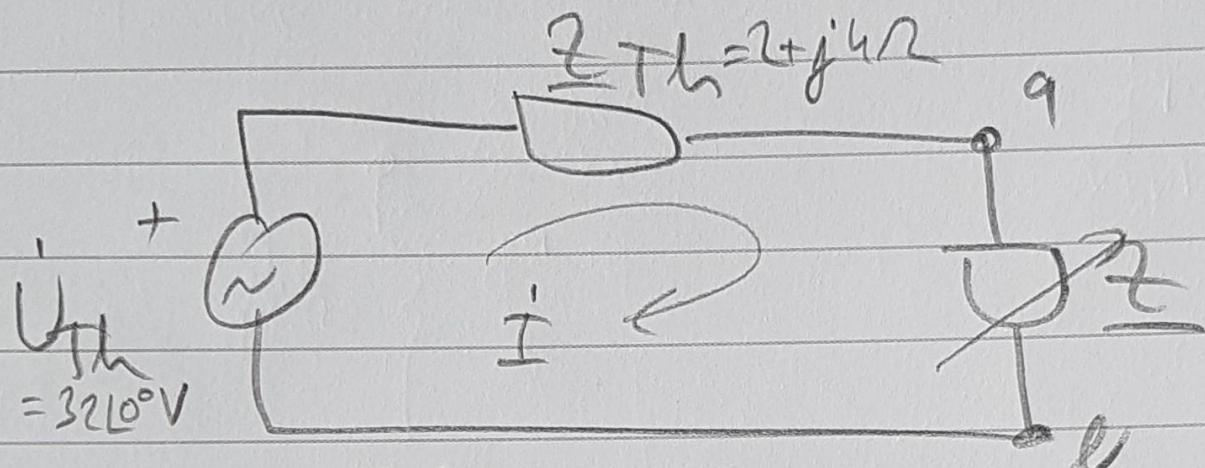
$$\varphi_b = \varphi_b' + \varphi_b'' = -16\angle 0^\circ V$$

$$V_{ab} = \varphi_a - \varphi_b = 32\angle 0^\circ V$$

$$Z_{Th} = Z_{ab} = 2 + j4 \Omega$$

$$V_{Th} = 32\angle 0^\circ V$$

NADOMJESNÍ TÝDEN V NOU ANO K



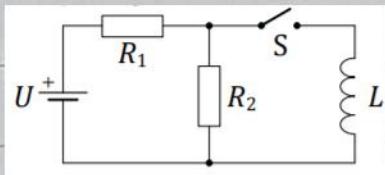
2A MAX. SNAHU NA TRNOVU:

$$\underline{Z} = \underline{Z}_{Th}^* = \underline{2 - j4 \Omega}$$

$$I = \frac{\dot{U}_{Th}}{\underline{Z}_{Th} + \underline{Z}} = \frac{32 L^0^\circ}{2 + j4 + 2 - j4} = \frac{32}{4} = 8 A$$

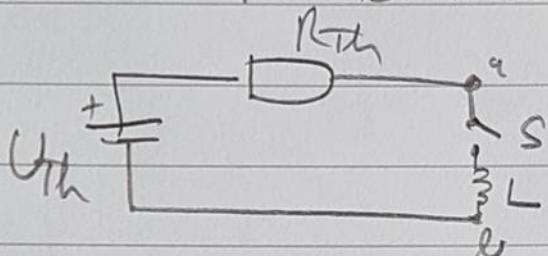
$$P_{Z_{MAX}} = I^2 \cdot \text{Re}\{\underline{Z}\} = 8^2 \cdot 2 = 128 W$$

16.

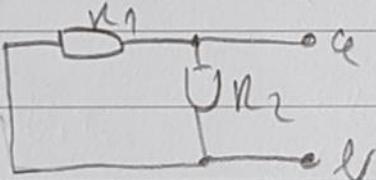


IZVADITI DLENU GANU SA SKLOPICONOM I L

NAPOMESTITI PO THEVENINU DA SE DOBRIE

U_{Th}:

$$U_{Th} = U_{n2} = U \frac{R_2}{R_1 + R_2} = 12 \cdot \frac{12}{4+12} = 12 \cdot \frac{3}{4} = 9 \text{ V}$$

R_{Th}:

$$R_{Th} = R_{ab} = R_1 || R_2 = \frac{R_1 R_2}{R_1 + R_2} = 3 \Omega$$

ODDA:

3Ω

$$9 \text{ V} \quad \frac{1}{3} L = 3 \text{ mH} \quad \tau = \frac{L}{R} = \frac{3 \text{ mH}}{3} = 1 \text{ ms}$$

$$u_L(t=1 \text{ ms}) = U e^{-\frac{t}{\tau}} = 9 \cdot e^{-\frac{1 \text{ ms}}{1 \text{ ms}}} = 9 \cdot e^{-1} =$$

$$= 3,310914971 \text{ V}$$

AKO JE TO NAPON NA L 100 t=1ms ODOA JE
TO 1 NAPON NA R₂ U POCETNOM SPOJU
(R₂ i L U PARALEL)

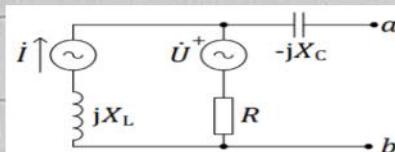
$$u_{R_2}(t=1 \text{ ms}) = u_L(t=1 \text{ ms}) = 3,310914971 \text{ V}$$

ODDA:

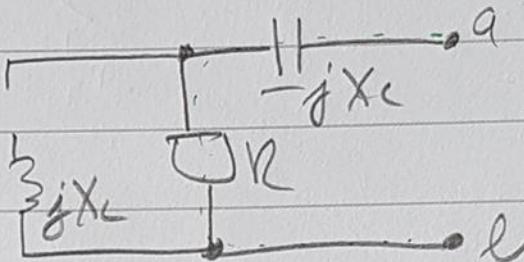
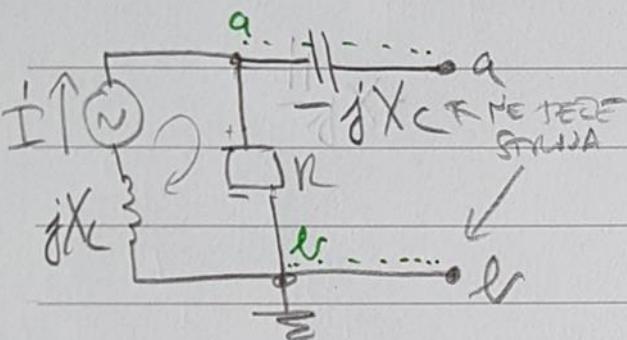
$$i_{R_2}(t=1 \text{ ms}) = \frac{u_{R_2}(t=1 \text{ ms})}{R_2} \approx 0.28 \text{ A}$$

$$17. \quad U_{Th} = U_{ab}$$

SUPERPOZICJA 1:



$$Z_{Th} = Z_{ab}$$

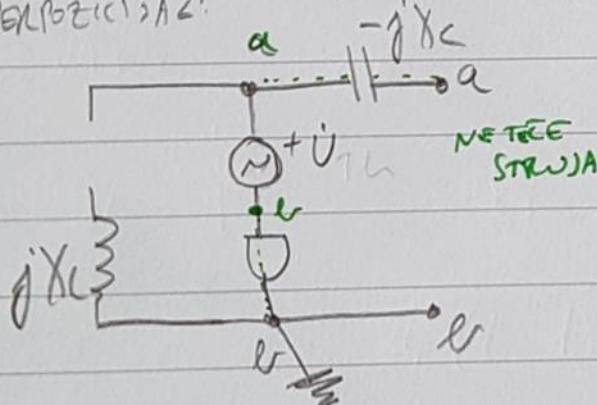


$$\dot{\varphi}_a = I \cdot R \quad \dot{\varphi}_v = 0V$$

$$\dot{\varphi}_a' = 1 \angle 45^\circ \cdot 10 = 10 \angle 45^\circ V$$

$$Z_{Th} = 10 - j10 \Omega$$

SUPERPOZICJA 2:



$$Z_{Th} = 10 - j10 \Omega$$

$$U_{Th} \approx 15.73 + j12.07 V$$

$$\dot{\varphi}_a'' = \dot{U} = 10 \angle 30^\circ V \quad \dot{\varphi}_v'' = 0V$$

SUPERPOZICJA 1+2:

$$\dot{\varphi}_a = \dot{\varphi}_a' + \dot{\varphi}_a'' = 10 \angle 45^\circ + 10 \angle 30^\circ = 10 \cdot \frac{\sqrt{2}}{2} + j10 \frac{\sqrt{2}}{2} \\ + 10 \frac{\sqrt{3}}{2} + j10 \frac{1}{2} =$$

$$\dot{\varphi}_v = \dot{\varphi}_v' + \dot{\varphi}_v'' = 0V$$

$$5(\sqrt{2} + \sqrt{3}) + j5(\sqrt{2} + 1) V$$

$$U_{Th} = U_{ab} = \dot{\varphi}_a - \dot{\varphi}_v = 5(\sqrt{2} + \sqrt{3}) + j5(\sqrt{2} + 1) V$$

18.

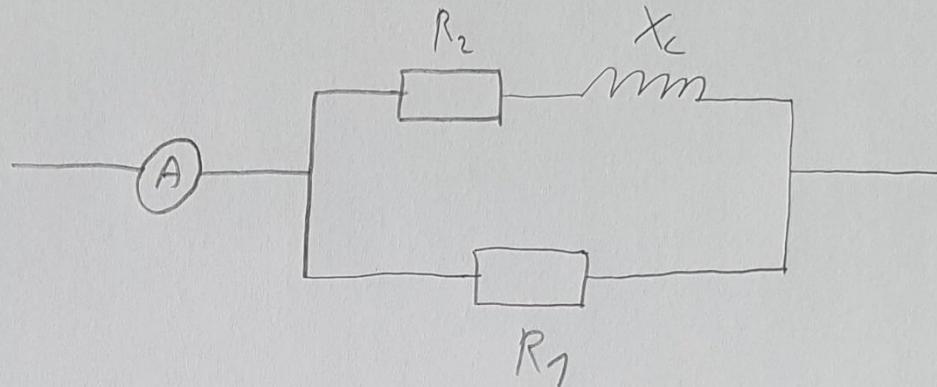
$$P_{\text{VH}} = 1600 \text{ W}$$

$$R_1 = 8 \Omega$$

$$R_2 = 8 \Omega$$

$$X_L = 8 \Omega$$

$$I_A = ?$$



$$Z = R_1 \parallel (R_2 + jX_L)$$

$$Z = 8 \Omega \parallel (8 \Omega + j8 \Omega) = \boxed{\frac{24}{5} + \frac{8}{5}j \Omega}$$



$$P_{\text{VH}} = I_A^2 \cdot R \Rightarrow I_A = \sqrt{\frac{P_{\text{VH}}}{R}}$$

$$I_A = \sqrt{\frac{1600 \text{ W}}{\frac{24}{5} \Omega}} = \frac{10\sqrt{30}}{3} = \boxed{18,26 \text{ A}}$$

(19.)

$$U(t) = 5 + U_1 \sin(\omega t) [V]$$

$$U_{EF} = 15V$$

$$U_1 = ?$$

$$U_{EF} = \sqrt{5^2 + \left(\frac{U_1}{\sqrt{2}}\right)^2} = 15V$$

$$5^2 + \left(\frac{U_1}{\sqrt{2}}\right)^2 = 225$$

$$\left(\frac{U_1}{\sqrt{2}}\right)^2 = 200 \Rightarrow U_1^2 = 400 \Rightarrow U_1 = 20V$$

(20.)

$$U = 4\sqrt{I}$$

$$\frac{R_s}{r_d} = ?, \text{ PR1 } U=8V$$

$$U = 4\sqrt{I} \Rightarrow I = \left(\frac{U}{4}\right)^2$$

$$U = 8V \Rightarrow I = 4A$$

$$R_s = \frac{U}{I} = \frac{8V}{4A} = 2\Omega \rightarrow \text{PR1 } U = 8V$$

$$r_d = \frac{dU}{dI} = \left(4 \cdot I^{\frac{1}{2}}\right)' = 4 \cdot \frac{1}{2} \cdot I^{-\frac{1}{2}}$$

$$r_d = 2 \cdot \frac{1}{\sqrt{I}} = \frac{2}{\sqrt{4}}$$

$$r_d (U=8V; I=4A) = \frac{2}{\sqrt{4}} = 1\Omega$$

$$\frac{R_s}{r_d} = \frac{2\Omega}{1\Omega} = 2$$