11.

(1) $U_0(s) - U_1(s) = sL \cdot I_1(s)$

(2) $U_1(s) - \frac{u_c(0)}{s} = I_2(s)\left(R + \frac{1}{sC}\right)$

$I_1 - I_2(s) = \alpha \cdot I_1(s) \quad \Rightarrow I_2 = (1-\alpha) I_1$

$U_1(s) - \frac{u_c(0)}{s} = (1-\alpha) I_2(s)\left(R + \frac{1}{sC}\right)$ — alfa α

$U_0 = U_1 + sL \cdot I_1(s) = \frac{u_c(0)}{s} + (1-\alpha) I_1(s)\left(R + \frac{1}{sC}\right) + sL \cdot I_1(s)$

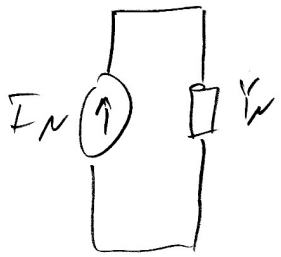
$U_0 - \frac{u_c(0)}{s} = (1-\alpha) I_1(s)\left(R + \frac{1}{sC}\right) + sL \cdot I_2(s)$

$I_1(s) = \frac{U_0 - \frac{u_c(0)}{s}}{(1-\alpha)\left(R + \frac{1}{sC}\right) + sL} = \frac{1}{2} \frac{1}{s^2 + s + \frac{1}{2}} = \frac{1}{2} \frac{1}{\left(s + \frac{1}{2}\right)^2 + \frac{1}{4}}$

$i_1(t) = e^{-\frac{t}{2}} \sin\left(\frac{t}{2}\right) s(t)$

(10.) $u_0(t) = \delta(t)$

$R = 0{,}5$
$L = 1$
$C = 1$
$n = 1$
$i_L(0) = 1$
$u_C(0) = 0{,}5$



$U_2 = -n \cdot I_{g1} \Rightarrow I_{g1} = \frac{-U_2}{n}$

$U_1 = -n \cdot I_{g2} \Rightarrow I_{g2} = \frac{-U_2}{n}$

admit. koja je između ① i ②

(1) $U_1\left(sC + \frac{1}{R}\right) - U_2 \cdot \frac{1}{R} = U_0 \cdot sC + C \cdot u_C(0) - I_{g1}$

struje koje ulaze i izlaze

(2) $-U_1 \frac{1}{R} + U_2\left(\frac{1}{R} + \frac{1}{sL}\right) = I_{g2} + \frac{i_L(0)}{s} - I_N(s)$

$U_1\left(sC + \frac{1}{R}\right) - U_2 \cdot \left(\frac{1}{R} + \frac{1}{n}\right) = U_0 sC + C u_C(0)$

$-U_1\left(\frac{1}{R} + \frac{1}{n}\right) + U_2\left(\frac{1}{R} + \frac{1}{sC}\right) = \frac{i_L(0)}{s} - I_N(s)$

Uvrstimo $U_2 = 0$

$(1) \Rightarrow U_1 = \frac{U_0 sC + C \cdot u_C(0)}{sC + \frac{1}{R}}$

$(2) \Rightarrow I_N = U_1\left(\frac{1}{R} - \frac{1}{n}\right) + \frac{i_L(0)}{s}$

$I_N(s) = \frac{U_0 sC + C u_C(0)}{sC + \frac{1}{R}} \cdot \left(\frac{1}{R} - \frac{1}{n}\right) + \frac{i_L(0)}{s} = \frac{s^2 + 1{,}5s + 2}{s(s+2)}$

$Y_N(s) = ?$

isključit poč. uvjete i neovisne izvore

$Y_N = \frac{I}{U}$

(1) $U_1\left(sC + \frac{1}{R}\right) - U_2 \frac{1}{R} = -I_{g1}$

(2) $-U_1 \frac{1}{R} + U_2\left(\frac{1}{R} + \frac{1}{sL}\right) = I_{g2} + I$

(1) $U_1\left(sC + \frac{1}{R}\right) - U_2\left(\frac{1}{R} + \frac{1}{r}\right) = 0$

(2) $-U_1\left(\frac{1}{R} - \frac{1}{r}\right) + U_2\left(\frac{1}{R} + \frac{1}{sC}\right) = I$

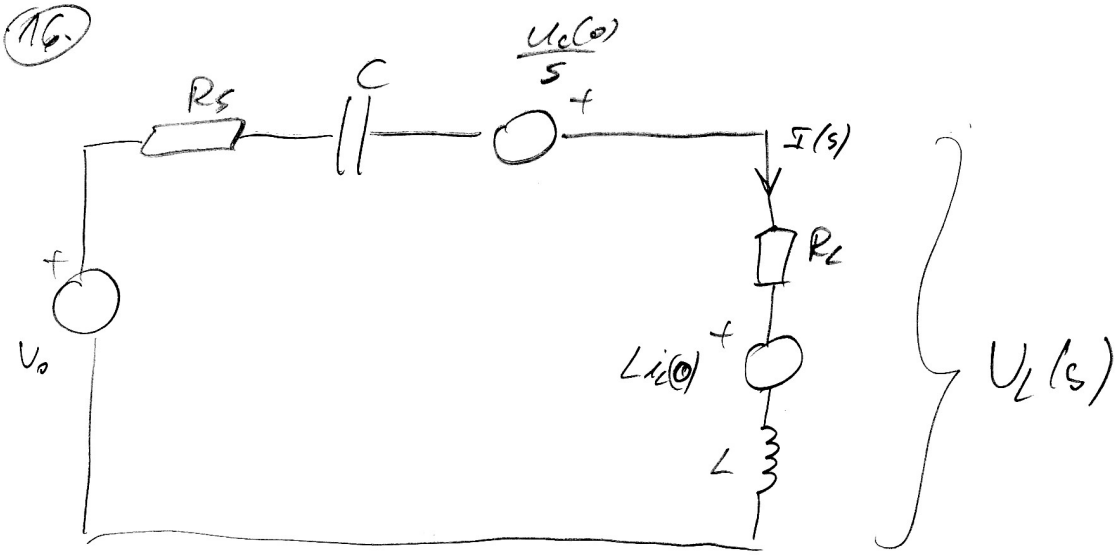
(1) $\Rightarrow U_1 = \frac{\frac{1}{R} + \frac{1}{r}}{sC + \frac{1}{R}} U_2$

→ (2)

$I = -\frac{\frac{1}{R} + \frac{1}{r}}{sC + \frac{1}{R}}\left(\frac{1}{R} - \frac{1}{r}\right)U_2 + \left(\frac{1}{R} + \frac{1}{sC}\right)U_2 \quad (U_2 = U) \quad / : U$

$Y_N(s) = \frac{I}{U} = \frac{R + sr^2C}{r^2(sCR + 1)} + \frac{1}{sL} = \frac{s^2 + s + 1}{s(0{,}5s + 1)}$

(16.)



$$I(s)\left(R_S+R_L+\frac{1}{sC}+sL\right)=V_0(s)+\frac{U_c(0)}{s}-Li_L(0)$$

$$I(s)=\frac{V_0(s)+\frac{U_c(0)}{s}-Li_L(0)}{R_S+R_L+\frac{1}{sC}+sL}$$

$$U_L(s)=I(s)\left(R_L+sL\right)+Li_L(0)$$

$$\vdots$$

$$U_L(s)=\frac{3}{s+1}-\frac{1}{(s+1)^2}$$

$$u_L(t)=\left(3e^{-t}-te^{-t}\right)S(t)$$

(17.)

$$I(s)\left(R+\frac{1}{sC}+sL\right)=U_g(s)-Li_L(0)+\frac{u_c(0)}{s}$$

$$U_c(s)=I(s)\cdot\frac{1}{sC}-\frac{u_c(0)}{s}$$

$$U_c(s)=\frac{1,8-1,2s}{s^2+2s+1}\cdot\frac{2}{s}-\frac{2,6}{s}$$

$$U_c(s)=\frac{-3,6}{s+1}\cdot\frac{6}{(s+1)^2}+\frac{1}{s}$$

$$\frac{-2,4+3,6}{(s+1)^2}\cdot\frac{1}{s}=\frac{A}{s+1}+\frac{B}{(s+1)^2}+\frac{C}{s}$$

$$A=-3,6=-C$$

$$B=-6$$

$$u_c(t)=(1-3,6e^{-t}-6te^{-t})\,s(t)$$

18.

$U_{g1} = -rI_{g2} \Rightarrow I_{g2} = \frac{-U_1}{r}$

$U_{g2} = -rI_{g1}$

(1) $U_{g1} \cdot \frac{1}{sL} - U_{g2} - \frac{1}{sL} = I - I_{g1}$

(2) $-U_{g1}\frac{1}{sL} + U_{g2}\left(\frac{1}{sL} + \frac{1}{sL}\right) = I_{g2}$

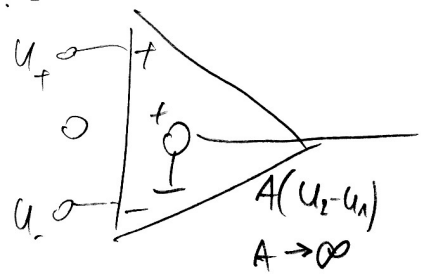
$U \cdot \frac{1}{sL} - rI_{g1}\frac{1}{sL} = I - I_{g1}$

$-U\frac{1}{sL} - rI_{g1}\left(\frac{I}{sL}\right) = \frac{-U}{r}$

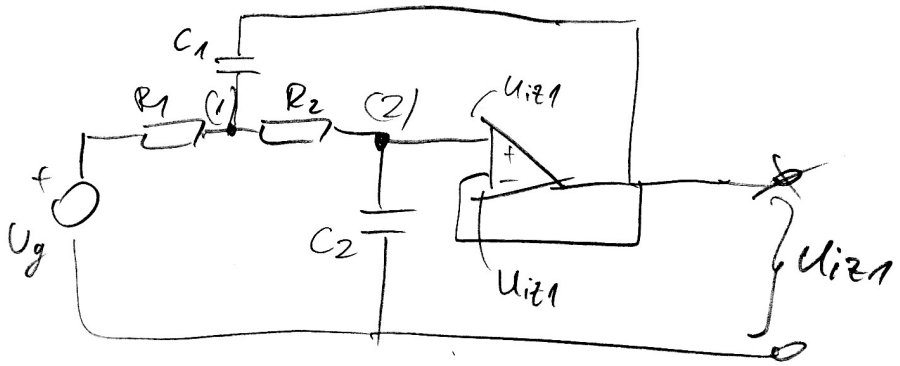
$Y_{ue} = \frac{I}{L} = \frac{1}{sL} + \left(\frac{sL}{2r^2} - \frac{1}{2r}\right)\left(\frac{r}{sL} + 1\right) = \frac{r^2 + s^2L^2}{2r^2sL}$

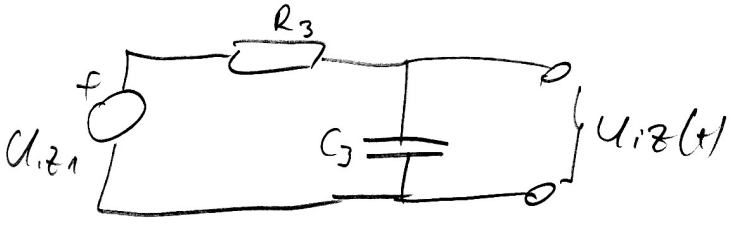
$Y_{II} = sC + Y_{ue} = sC + \frac{r^2 + s^2L^2}{2r^2sL} = s + \frac{1+s^2}{2s} = \frac{3}{2s} + \frac{1}{2s}$

(19)



Za čvorove lagr nisu naponski izvori





(1) $U_1\left(\frac{1}{R_1}+\frac{1}{R_2}+sC_1\right)-U_2\frac{1}{R_2} = u_{iz1}\cdot sC_1 + U_g\cdot\frac{1}{R_1}$

(2) $-U_1\left(\frac{1}{R_2}\right)+U_2\left(\frac{1}{R_2}+sC_2\right)=0$

(3) $U_2 = u_{iz1}$

$A(U_2-u_{iz1})=u_{iz1}$, $A\to\infty$

$\Rightarrow U_2 = u_{iz1}$

(2) $\Rightarrow U_1 = u_{iz1}(1+sR_2C_2)$

↓

(1) $u_{iz1}\left[(1+sR_2C_2)\left(\frac{1}{R_1}+\frac{1}{R_2}+sC_1\right)-\frac{1}{R_2}-sC_1\right]=\frac{U_g}{R_1}$

$u_{iz1} = \frac{1}{s^2R_1R_2C_1C_2+s(R_1C_2+R_2C_2)+1}\cdot U_g = \frac{1}{s^2+s+1}U_g$

$U_g = u_{iz1} = 1$

$$U_{1z}(s) = \frac{\frac{1}{sC_3}}{R_3 + \frac{1}{sC_3}} \cdot U_{1z1}$$

$$U_{1z}(s) = \frac{1}{1 + sR_3C_3} \cdot U_{1z1} = \frac{1}{s+1} U_{1z1}$$

$$U_{1z}(s) = \frac{1}{(s+1)(s^2+s+1)}$$