A csop $-I_1 + \frac{U_1-U_2}{R} - n\left(\frac{U_2-nU_1}{R}\right)=\emptyset$ 1p $-I_2+\frac{U_2-U_1}{R}+\frac{U_2-nU_1}{R}=\emptyset$ 1p

a) $I_1=\left(\frac{1}{R}+\frac{n^2}{R}\right)U_1+\frac{-1-n}{R}U_2$ 1p $I_2=\frac{-1-n}{R}U_1+\frac{2}{R}U_2$ 1p.

b.) Reciprok minden n-re. 0,5p szimmetrikus, ha $n^2=1 \Rightarrow n=\pm 1$ 1p

Passzív: csak passzív elemeket tartalmaz minden n-re. 0,5p

c.) $U_1=10$ $U_2=-5I_2$ 0,5 $I_2=-6+0{,}4(-5)I_2$ 0,5 $I_2=-3$ mA $P=I_2^2R_L=$ 1p. $=45$ mW

d.) $I_2=-6+0{,}4U_2 \Rightarrow U_2=15+2{,}5I_2$ $U_T=15$ V $R_b=2{,}5\,k\Omega = R_{T\max}$ 1p.

$P_{max}=\frac{U_T^2}{4R_b}=22{,}5$ mW 1p.

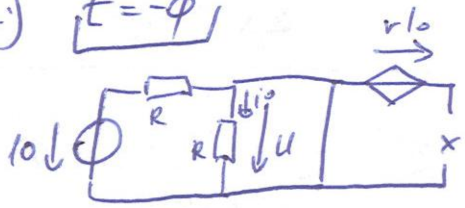
2.) a) ↓i_L ↓u_c 2x0,5p. | c.) kΩ; mA 2x0,5p.

b.) $u=L\dot{i}_L$ $i_0=\frac{L\dot{i}_L}{R}$ $L\dot{i}_L=ri_0+u_c$ $i_L+C\dot{u}_c+\frac{L\dot{i}_L}{R}+\frac{L\dot{i}_L-u_s}{R}=\emptyset$ 4x0,5p

d.) $\dot{u}_C=\frac{-2}{C(R-r)}u_c-\frac{1}{C}i_L+\frac{1}{RC}u_s$ $\dot{i}_L=\frac{Ru_c}{L(R-r)}$ $u=\frac{Ru_c}{R-r}$

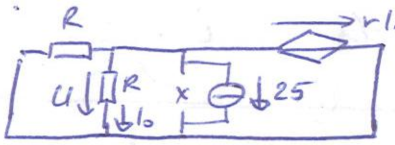
$\dot{u}_c=-2{,}5u_c-0{,}25i_L+0{,}625u_s$ $\dot{i}_L=4u_c$ $u=2u_c$ 3x1p.

e.) $t=-\emptyset$



$u=0$ V
$i_0=0$ mA
$u_c=0$ V
$i_L=25$ mA

$t=+0$ $u_c=\emptyset$ V $u=0$ V
$i_L=25$ mA $i_0=0$ mA



6x0,5p

1.) $I=I_0\cdot\frac{2R}{2R+R+2R\times 2R}\cdot\frac{1}{2}=I_0\cdot\frac{1}{4}$

2.) $P_1=-5\cdot(25+5)=-150$ mW

3.) $U=30$ V

4.) Nem, nem reciprok

5.) $\frac{U_2}{U_1}=\frac{2}{5}$ $U_1=2U_2+5\cdot\frac{U_2}{10}=2{,}5U_2$

B csop.

$$-I_1 + \frac{U_1 - U_2}{R} + \frac{U_{g2}}{r} = \phi \qquad U_2 = rI_1 \quad U_1 = -rI_2$$

a.) $$-I_2 + \frac{U_2 - U_1}{R} - \frac{U_1}{r} = \phi \qquad \frac{-U_1}{r} = \frac{U_2 - U_{g2}}{R}$$ 3x0,5p.

$$U_{g2} = U_2 + \frac{R}{r}U_1$$ 0,5p.

$$I_1 = \frac{U_1}{R} - \frac{U_2}{R} + \frac{U_2}{r} + \frac{RU_1}{r^2}$$

$$I_2 = -\left(\frac{1}{R} + \frac{1}{r}\right)U_1 + \frac{1}{R}U_2$$

$$\begin{bmatrix} \frac{1}{R} + \frac{R}{r^2} & \frac{1}{r} - \frac{1}{R} \\ -\left(\frac{1}{R} + \frac{1}{r}\right) & \frac{1}{R} \end{bmatrix}$$ 2p.

b.) Nem reciprok (csak ha $r = \infty$) $G_{12} \neq G_{21}$

Nem szimmetrikus (csak ha $r = \infty$) nem rec, $G_{11} \neq G_{22}$

Passzív, csak passzív elemekből áll. v. $G_{11} \geq 0$; $G_{22} \geq 0$; $G_{11}G_{22} \geq \frac{G_{12}}{2}$

2p.

c.) $U_1 = 10$ $\quad U_2 = -5I_2$ $\quad I_1 = 52 + 20U_2$ $\quad I_2 = -60 - 25I_2$

$$I_2 = \frac{-60}{24} = \frac{-10}{4} = \underline{-2{,}5\,mA}$$ 1p. $$P_2 = I_2^2 \cdot R_L = \underline{31{,}25\,mW}$$ 1p.

d.) $I_2 = -60 + 5U_2 \Rightarrow U_2 = 12 + 0{,}2I_2 \Rightarrow \underline{U_T = 12V}$ 0,5p $\quad \underline{R_b = 0{,}2\,k\Omega}$ 0,5p

$$P_{max} = \frac{U_T^2}{4R_b} = \frac{144}{0{,}8} = \underline{180\,mW}$$ 1p.

2) a) $\downarrow u_c$ $\downarrow i_L$ 2x0,5p | c) $k\Omega$, mA, 2x0,5p

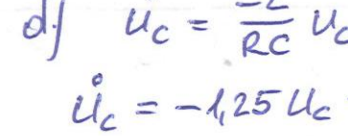
b) $u_0 = u_s - u_c$ $\quad i = \frac{u_c}{R}$ $\quad L\dot{i}_L + \mu u_0 = u_c$ $\quad \frac{u_c - u_s}{R} + \frac{u_c}{R} + C\dot{u}_c + i_L = \phi$

4x0,5p.

d) $\dot{u}_c = \frac{-2}{RC}u_c - \frac{1}{C}i_L + \frac{1}{RC}u_s$ $\quad \dot{i}_L = \frac{1+\mu}{L}u_c - \frac{\mu}{L}u_s$ $\quad i = \frac{u_c}{R}$

$\dot{u}_c = -1{,}25u_c - 0{,}25u_c + 0{,}625u_s$ $\quad \dot{i}_L = 10u_c - 8u_s$ $\quad i = 2{,}5u_c$ 3x1p.

e) $t = -0$



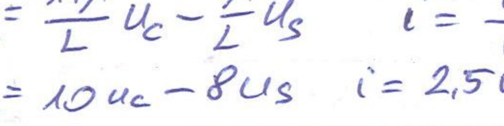
$u_0 = 1V$

$\underline{u_c = 4V}$

$\underline{i = 10\,mA}$

$\underline{i_L = -7{,}5\,mA}$

$t = +\phi$



$\underline{u_c = 4V}$

$\underline{i_L = -7{,}5\,mA}$

$\underline{i = 10\,mA}$

$u_0 = -4V$

6x0,5p.

1.) $P_4 = -10(0{,}5 - 2{,}5) = \underline{20\,mW}$

2.) Nem, nem reciprok.

3.) $U = 2 \cdot 12 = \underline{24V}$

4.) $I = I_0 \cdot \frac{R}{R + 2{,}5R} \cdot \frac{1}{2} = \underline{I_0 \cdot \frac{1}{7}}$

5.) $\frac{U_2}{U_1} = \underline{\frac{1}{5} = 0{,}2}$