$$-i_1 - i_2 + Cu' = 0$$

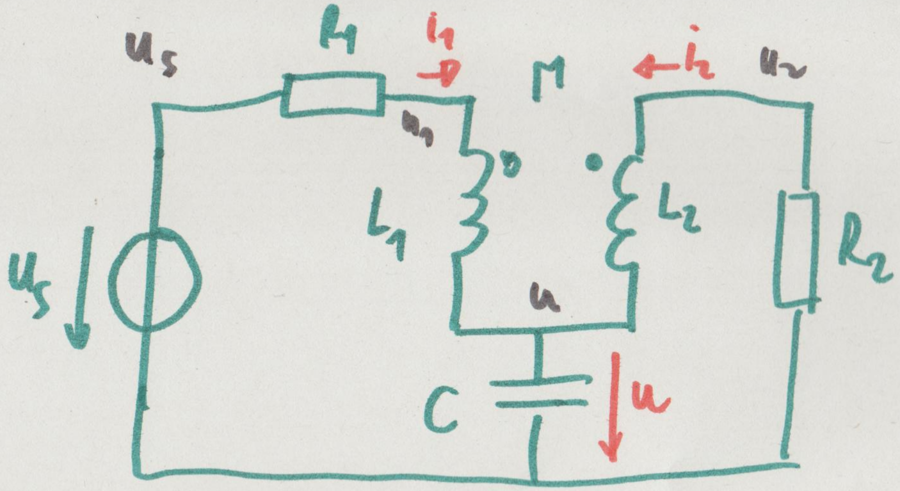
$$u_s - i_1 R_1 - (L_1 i_1' + M\cdot i_2') - u = 0$$

$$-i_2 R_2 + L_2 i_2' + M i_1' + u = 0$$

$$i_1' = \frac{R_1 L_2}{M^2 - L_1 L_2} i_1 + \frac{R_2\cdot M}{M^2 - L_1 L_2} i_2 + \frac{L_2 - M}{M^2 - L_1 L_2} u - \frac{L_2}{M^2 - L_1 L_2} u_s$$

$$i_2' = -\frac{R_1\cdot M}{M^2 - L_1 L_2} i_1 - \frac{R_2\cdot L_1}{M^2 - L_1 L_2} i_2 + \frac{L_1 - M}{M^2 - L_1 L_2}\cdot u + \frac{M}{M^2 - L_1 L_2} u_s$$

$$u' = \frac{1}{C} i_1 + \frac{1}{C} i_2$$



0

$$Cu' - i_1 - i_2 = 0$$

$$u_1 = u + L_1 i_1' + M\cdot i_2'$$

$$u_2 = u + L_2 i_2' + M\cdot i_1'$$

$$\frac{u_1 - u_s}{R_1} + i_1 = 0$$

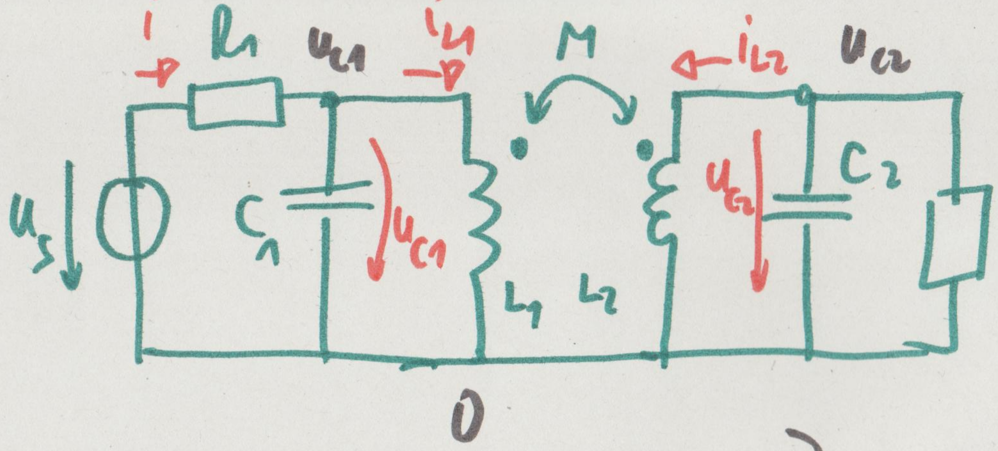
$$\frac{u_2}{R_2} + i_2 = 0$$

nem ideális
~~szoros~~ csatolás

$$L_1 L_2 > M^2$$

$$(L_1 L_2 - M^2 > 0)$$

$$p = \sqrt{\frac{L_2}{L_1}}$$



kΩ, μF, H

$R_1 = 2$

$R_2 = 4$

$C_1 = 4$

$C_2 = 2$

$L_1 = 4$

$L_2 = 8$

$M = 1$

$$\left.\begin{aligned} C_1 u_{C1}' + i_{L1} + \frac{u_{C1} - U_s}{R_1} &= 0 \\ C_2 u_{C2}' + i_{L2} + \frac{u_{C2}}{R_2} &= 0 \\ u_{C1} &= L_1 \cdot i_{L1}' + M\, i_{L2}' \\ u_{C2} &= L_2 \cdot i_{L2}' + M \cdot i_{L1}' \end{aligned}\right\}$$

$$u_{C1}' = -\frac{1}{R_1 C_1} u_{C1} - \frac{1}{C_1} i_{L1} + \frac{1}{R_1 C_1} u_s$$

$$u_{C2}' = -\frac{1}{R_2 C_2} u_{C2} - \frac{1}{C_2} i_{L2}$$

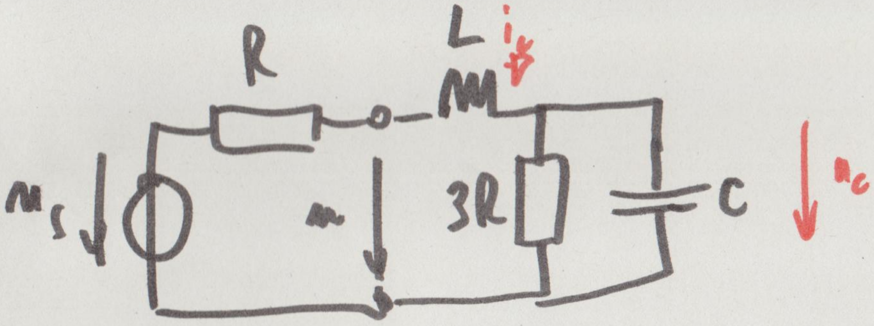
$$\frac{u_{C1}}{M} - \frac{u_{C2}}{L_2} = \underbrace{\left(\frac{L_1}{M} - \frac{M}{L_2}\right)}_{\frac{L_1 L_2 - M^2}{M L_2}} i_{L1}'$$

$$i_{L2}' = \frac{M}{M^2 - L_1 L_2} u_{C1} - \frac{L_1}{M^2 - L_1 L_2} u_{C2}$$

$$\frac{u_{C1}}{L_1} - \frac{u_{C2}}{M} = \frac{M}{L_1} i_{L2}' - \frac{L_2}{M} i_{L2}'$$

$$i_{L1}' = -\frac{L_2}{M^2 - L_1 L_2} u_{C1} + \frac{M}{M^2 - L_1 L_2} u_{C2}$$

$$i_{L2}' = \frac{M L_1}{M^2 - L_1 L_2} \cdot \left(\frac{M u_{C1} - L_1 u_{C2}}{M L_1}\right)$$



$$\left.\begin{aligned} &(1)\quad u = u_c + L i_L' \\ &(2)\quad -i_L + \frac{u_c}{3R} + C u_c' = 0 \\ &(3)\quad u_s - i_L \cdot R = u \end{aligned}\right\}$$

$$\left.\begin{matrix}(1)\\(3)\end{matrix}\right\}\ u_s - i_L \cdot R = u_c + L i_L' \longrightarrow L i_L' = -R i_L - u_c + u_s$$

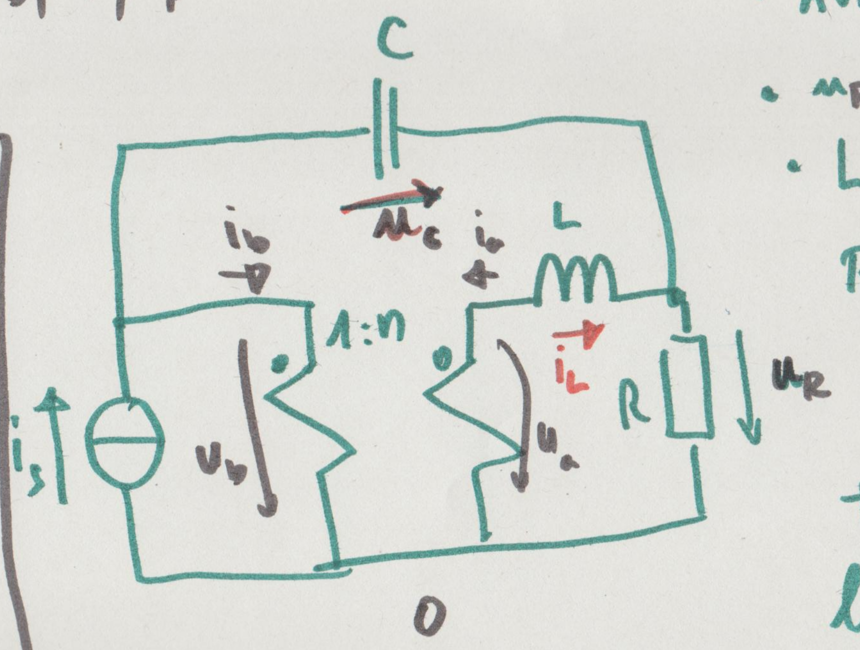
$$\boxed{i_L' = -\frac{R}{L} i_L - \frac{1}{L} u_c + \frac{1}{L} u_s}$$

$$(2) \rightarrow C u_c' = i_L - \frac{1}{3R} u_c \longrightarrow \boxed{u_c' = \frac{1}{C} i_L - \frac{1}{3RC} u_c}$$

$u_C', i_L', u_a, i_a, u_b, i_b, u_R$

- ÁVL
- u_R
- L, C, n adott

R milyen értékénél lesz a tranziens lengő jellegű



$$u_C' = -\frac{n}{C} i_L + \frac{1}{C} i_s$$

$$i_L' = \frac{n}{L} u_C - \frac{R}{L}(n^2-2n+1)\, i_L - \frac{R}{L}(1-n) i_s$$

$$u_R = -R(n-1)\, i_L + R i_s$$

$$\underline{\underline{A}} = \begin{pmatrix} 0 & -\frac{n}{C} \\ \frac{n}{L} & -\frac{R}{L}(n^2-2n+1) \end{pmatrix}$$

$$\begin{vmatrix} \lambda & n/C \\ -n/L & \lambda + \frac{R}{L}(n^2-2n+1) \end{vmatrix} = \lambda\left(\lambda + \frac{R}{L}(n^2-2n+1)\right) + \frac{n^2}{LC}$$

lengő ha $\left(\frac{R}{L}(n^2-2n+1)\right)^2 - 4 \cdot \frac{n^2}{LC} < 0$

$i_a = -i_L$ ← implicite felhasználjuk

$u_a = n \cdot u_b$

$i_b = n \cdot i_L$

$-C u_C' + \frac{u_R}{R} + -i_L = 0$

$-i_s + i_b + C u_C' = 0$

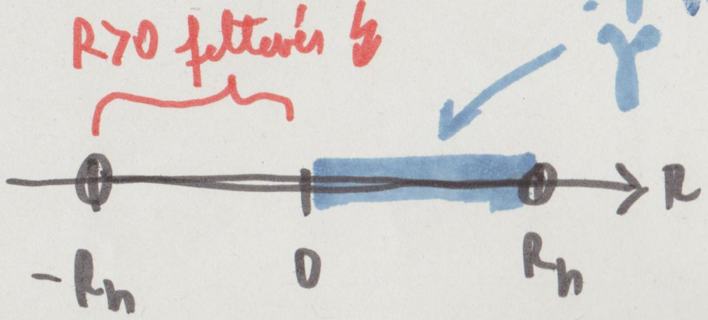
$u_a - L i_L' - u_R = 0$

$u_R + u_C - u_b = 0$

2.3-1 fgy.

$$\left(\frac{R}{L}\right)^2 (\cancel{4}n^2-2n+1)^2 < \frac{4n^2}{LC}$$

$$R^2 < \frac{4n^2\cdot L/C}{(n-1)^2} = R_n^2$$



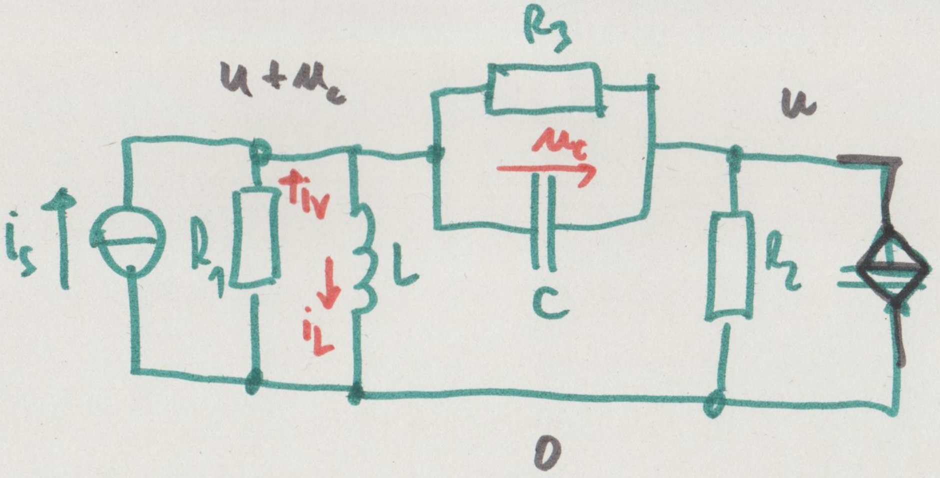
ahol $R_n = \sqrt{\frac{L}{C}}\cdot\frac{2n}{n-1}$

2.3-10

$$\textcircled{1} \quad -i_s + \frac{u+u_c}{R_1} + i_L + C u_c' + \frac{u_c}{R_3} = 0$$

$$\textcircled{2} \quad \alpha \cdot \frac{u+u_c}{R_1} + \frac{u}{R_2} - C u_c' - \frac{u_c}{R_3} = 0$$

$$\textcircled{3} \quad u + u_c = L i_L'$$



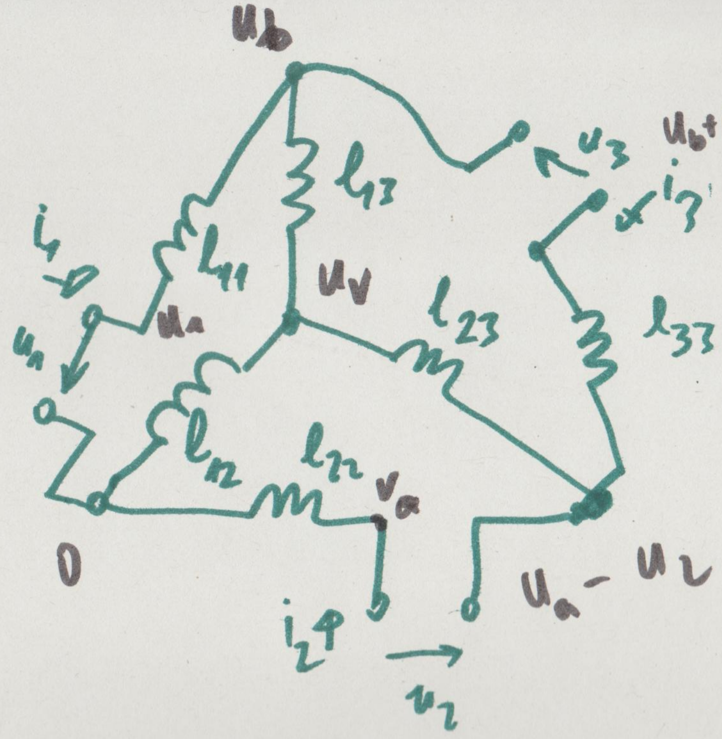
$$\textcircled{1} + \textcircled{2}: \quad -i_s + (1+\alpha)\frac{u+u_c}{R_1} + i_L + \frac{u}{R_3} = 0$$

$$u\left(\frac{1+\alpha}{R_1} + \frac{1}{R_3}\right) + i_L + \frac{1+\alpha}{R_1} u_c - i_s = 0$$

$$\boxed{u = \frac{-i_L - \frac{1+\alpha}{R_1} u_c + i_s}{\frac{1+\alpha}{R_1} + \frac{1}{R_3}}} \quad \frac{-i_L(R_1 R_3) - (1+\alpha) R_3 u_c + R_1 R_3 i_s}{(1+\alpha) R_3 + R_1}$$

$$u_c' = -\frac{R_1 + R_2(1+\alpha) + R_3}{C \cdot R_3 \cdot (R_1 + (1+\alpha) R_2)} u_c - \frac{R_3 \cdot (R_1 + \alpha R_2)}{C \cdot R(R_1 + R_2(1+\alpha))} i_L + \frac{R_1 + \alpha R_2}{C \cdot (R_1 + (1+\alpha) R_2)} i_s$$

$$i_L' = -\frac{R_1 / (R_1 + (1+\alpha) R_2)}{L} u_c - \frac{R_1 R_2}{L(R_1 + (1+\alpha) R_2)} i_L + \frac{R_1 R_2}{L(R_1 + (1+\alpha) R_2)} i_s$$



$\boxed{2.3^* - 3}$

Határozzuk meg a [illegible]

$$u_j = \sum_{k=1}^{3} L_{jk} \cdot i_k'$$

$k = 1, 2, 3$

· [illegible] az egy induktív 3-kapus illetve 3 kapu karakterisztikáját!?