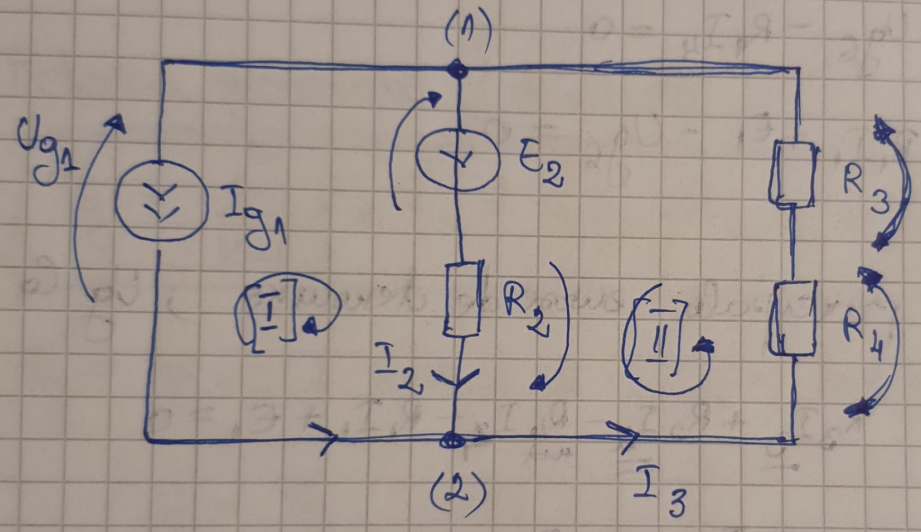
TEMĂ SEMINAR 1

①

$R_2 = 2\,\Omega$, $R_3 = 1\,\Omega$, $R_4 = 3\,\Omega$, $E_2 = 32\,V$, $I_{g_1} = 2\,A$

a) Calc. mec. circ.

b) U_3, U_4



$N = 2$

$L = 3$

a)

T_1K: $N - 1 = 1$ ec

T_2K: $L - N + 1 = 2$ ec

(1): $I_{g_1} + I_2 = I_3$

[I]: $-E_2 + I_2 R_2 + U_{g_1} = 0$

[II]: $I_3(R_3 + R_4) - E_2 + I_2 R_2 = 0$

$$\begin{cases} 2 + I_2 = I_3 \\ 4I_3 - 32 + 2I_2 = 0 \end{cases} \Rightarrow \begin{cases} I_3 - I_2 = 2 \\ 2I_3 + I_2 = 16 \end{cases} \Rightarrow 3I_3 = 18 \Rightarrow I_3 = 6A$$

$I_2 = 4A$

$U_{g_1} = E_2 - I_2 R_2 = 32 - 8 = 24$ V

$P_E = R_2 I_2^2 + I_3^2 (R_3 + R_4) =$

$= 32 + 144 = 176$ W

$P_g = U_{g_1} I_{g_1} + I_2 E_2 = 48 + 128 =$

$= 176$ W

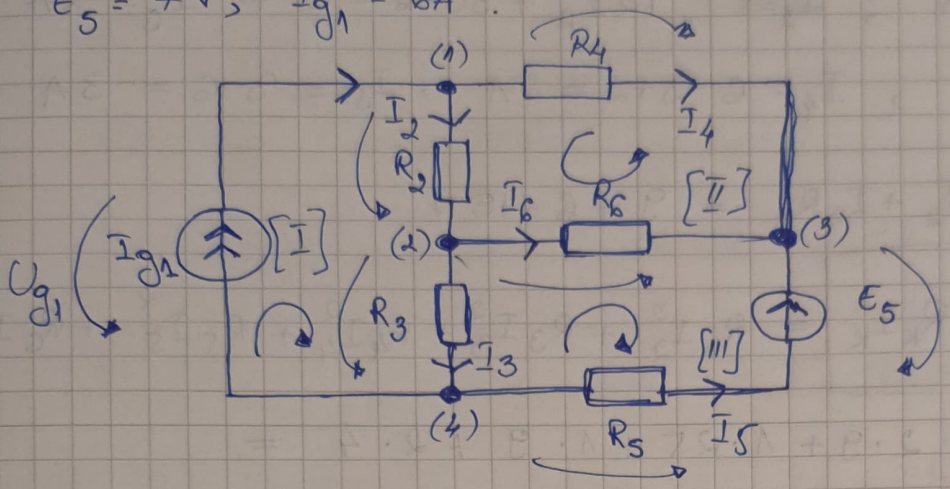
b) $U_3 = I_3 \cdot R_3 = 6 \cdot 1 = 6$ V

$U_4 = I_3 \cdot R_4 = 6 \cdot 3 = 18$ V

$P_c = P_g$ (A)

(2.) $R_2 = 9\,\Omega$, $R_3 = 2\,\Omega$, $R_4 = 1\,\Omega$, $R_5 = 1\,\Omega$, $R_6 = 2\,\Omega$

$E_5 = 7$ V, $I_{g_1} = 6$ A.



$N = 4$

$L = 6$

TK1 : $N-1 = 3$ ec.

TK2 : $L-N+1 = 6-4+1 = 3$ ec.

(1) : $I_{g_1} = I_2 + I_4 \Rightarrow I_2 = 6 - 6 + I_3 + I_6 \Rightarrow \underline{I_2 = I_3 + I_6}$

(2) : $I_2 = \underline{I_6} + I_3$

(3) : $I_4 + \underline{I_6} + I_5 = 0 \Rightarrow \underline{I_4 = 6 - I_3 - I_6}$

(4) : $I_3 = I_{g_1} + I_5 \Rightarrow \underline{I_5 = I_3 - 6}$

[I] : $I_2 R_2 + I_3 R_3 - U_{g_1} = 0$

[II] : $I_6 R_6 - I_4 R_4 + I_2 R_2 = 0 \Rightarrow 2\underline{I_6} - I_4 + 9 I_2 = 0$

[III] : $I_6 R_6 + E_5 - I_5 R_5 - I_3 R_3 = 0 \Rightarrow 2\underline{I_6} + 7 - I_5 - 2 I_3 = 0$

~~$2\underline{I_6} - 6 + I_3 + \underline{I_6} + 9\underline{I_6} + 9 I_3 = 0 \Rightarrow 12\underline{I_6} + 10 I_3 = 6$~~

~~$2\underline{I_6} + 7 - I_3 + 6 - 2\underline{I_6} - 2 I_3 = 0 \Rightarrow -3 I_3 - 1 = 0$~~

$2I_6 + 7 - I_3 + 6 - 2I_3 = 0 \Rightarrow (2I_6 - 3I_3 + 13 = 0 \mid \cdot(-6)$

$2I_6 - 6 + I_3 + I_6 + 9I_3 + 9I_6 = 0 \Rightarrow 12I_6 + 10I_3 - 6 = 0$

$$\Rightarrow \begin{cases} -12I_6 + 18I_3 - 78 = 0 \\ 12I_6 + 10I_3 - 6 = 0 \end{cases} \Rightarrow 28I_3 - 84 = 0 \Rightarrow$$

$\Rightarrow I_3 = 3A$; $12I_6 + 30 - 6 = 0 \Rightarrow I_6 = -2A$

$I_2 = 1A$, $I_4 = 6 - 3 + 2 = 5A$, $I_5 = 3 - 6 = -3A$

$U_{g_1} = I_2 R_2 + I_3 R_3 = 9 + 6 = 15V$

$$P_C = \sum_{k=1}^{L} R_k I_k^2 = R_2 I_2^2 + R_3 I_3^2 + R_4 I_4^2 + R_5 I_5^2 + R_6 I_6^2 =$$

$= 9 \cdot 1 + 2 \cdot 9 + 1 \cdot 25 + 1 \cdot 9 + 2 \cdot 4 =$

$= 9 + 18 + 25 + 9 + 8 = 33 + 36 = 69 W$

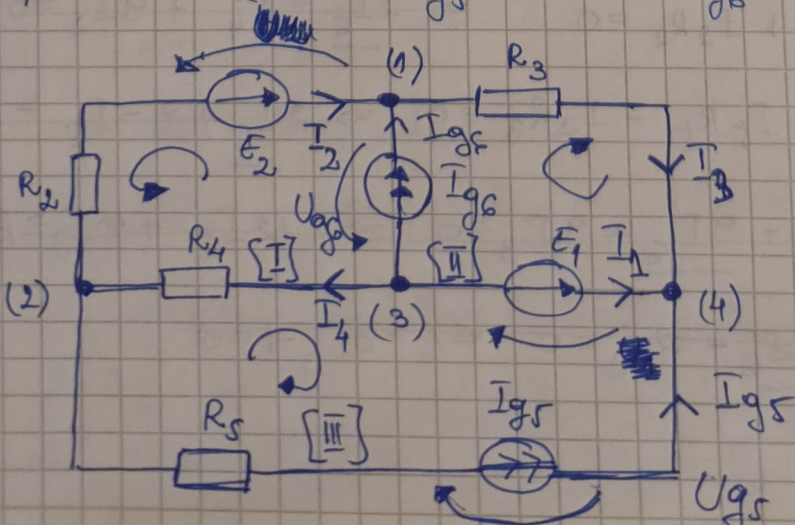
$$P_g = \sum_{k=1}^{L} E_k I_k = U_{g_1} I_{g_1} + E_5 I_5 =$$

$= 15 \cdot 6 + 7 \cdot (-3) = 90 - 21 = 69 W$

$P_C = P_g$ (A)

(3.) $R_2 = 2\Omega$, $R_3 = 4\Omega$, $R_4 = 2\Omega$, $R_5 = 2\Omega$,

$E_1 = 12V$, $E_2 = 8V$, $I_{g_5} = 2A$, $I_{g_6} = 6A$.



$N = 4$

$L = 6$

TR1 : $N - 1 = 3$ ec

TR2 : $L - N + 1 = 3$ ec.

(1): $I_2 + I_{g6} = I_3 \Rightarrow I_2 = I_3 - I_{g6}$

(2): $I_2 + I_{g5} = I_4 \Rightarrow I_4 = I_3 - I_{g6} + I_{g5}$

(3): $I_4 + I_{g6} + I_1 = 0$

(4) $I_1 + I_3 + I_{g5} = 0 \Rightarrow I_1 = -I_3 - I_{g5}$

[I]: $\mathcal{E}_2 - I_2 R_2 - I_4 R_4 + U_{g6} = 0$

[II] $R_3 I_3 + \mathcal{E}_1 - U_{g6} = 0$

[III] $U_{g5} - I_4 R_4 + \mathcal{E}_1 - I_{g5} R_5 = 0$

$I_2 = I_3 - 6$, $I_4 = I_3 - 6 + 2 = I_3 - 4$, $I_1 = -I_3 - 2$

[I] - [II]: $\mathcal{E}_2 - I_2 R_2 - I_4 R_4 - R_3 I_3 - \mathcal{E}_1 = 0 \Rightarrow$

$\Rightarrow 8 - 2(I_3 - 6) - 2(I_3 - 4) - 4I_3 - 12 = 0 \Rightarrow$

$\Rightarrow 8 - 2I_3 + 12 - 2I_3 + 8 - 4I_3 - 12 \Rightarrow -8I_3 + 16 = 0 \Rightarrow$

$\Rightarrow I_3 = 2\ A$

$I_2 = 2 - 6 = -4\ A$, $I_4 = 2 - 4 = -2\ A$, $I_1 = -2 - 2 = -4\ A$.

$U_{g6} = \mathcal{E}_2 - I_2 R_2 - I_4 R_4 = 8 - (-4) \cdot 2 - (-2) \cdot 2 =$

$= 8 + 8 + 4 = 20\ V$.

$U_{g5} = I_{g5} R_5 + \mathcal{E}_1 + I_4 R_4 = 4 + 12 - 4 = 12\ V$.

$P_C = \sum_{R=1}^{L} R_K I_K^2$: $P_C = R_2 I_2^2 + R_3 I_3^2 + R_4 I_4^2 + R_5 I_5^2 =$

$= 32 + 16 + 8 + 8 = 64\ W$

$P_g = \sum_{R=1}^{L} \mathcal{E}_K I_K$: $P_g = \mathcal{E}_2 I_2 + \mathcal{E}_1 I_1 + U_{g6} I_{g6} + U_{g5} I_{g5} =$

$= -32 - 48 + 120 + 24 = 144 - 80 = 64\ W$

$P_C = P_g$ (A)