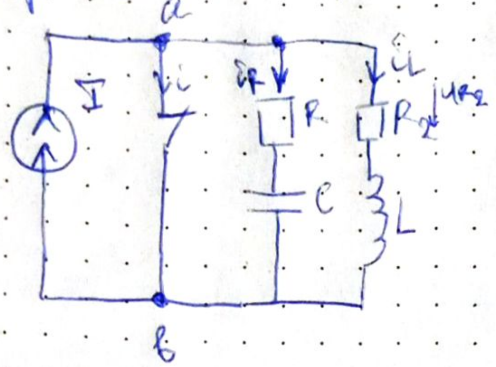
Харламова В.А., СМ5-41, вариант П РК6 по ОТЦ

1.



$J = 1\,A,\ R = 4\,Ом,\ R_2 = 3\,Ом,\ L = 17\,мГн,\ C = 350\,мкФ$

$i_R(0_+),\ u_{R_2}(0_+)$ - ?

$i_{Rпр}(t)$ - ? $u_{R_2пр}(t)$ - ?

$i_L(0-) = I$

$u_C(0-) = i_L(0-) R_2 = i_R(0-) \cdot R$

$u_C(0-) = I R_2$

$u_C(0+) = u_C(0-) = I R_2$

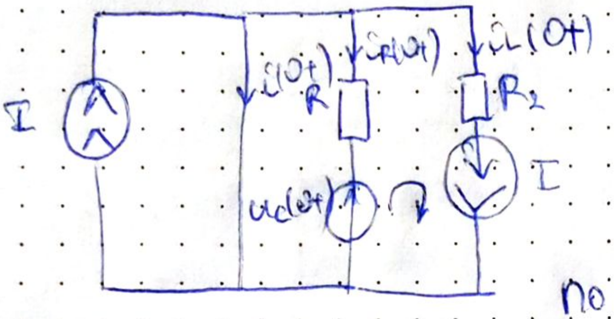
$i_L(0+) = i_L(0-) = I$

$u_{R_2}(0+) = i_L(0+) R_2 = I R_2 = 1A \cdot 3\,Ом$

$u_{R_2}(0+) = 3\,В$

$i_{Rпр}(t) = i_{Rпр}(\infty) = 0$

$u_{R_2пр}(t) = u_{R_2пр}(\infty) = 0$



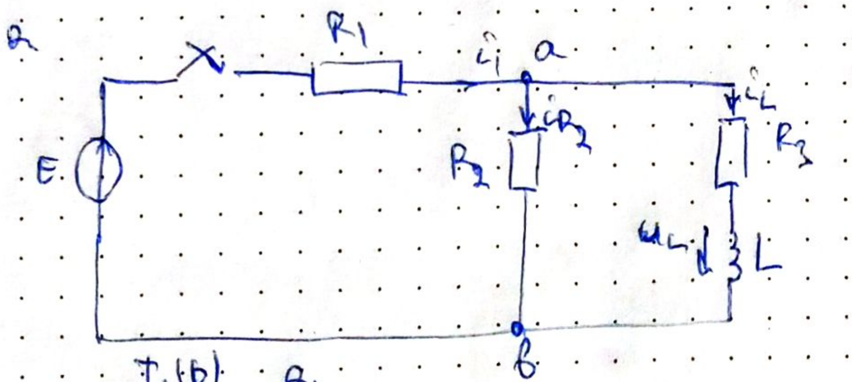
По 2 закону Кирхгофа:

$-u_C(0+) - i_R(0+) \cdot R + i_L(0+) \cdot R_2 = 0$

т.к. $I R_2 = u_C(0+) = i_L(0+) \cdot R_2 \Rightarrow i_R(0+) = 0$

Ответ: $i_R(0+) = 0$, $u_{R_2}(0+) = 3\,В$, $i_{Rпр}(t) = 0$, $u_{Rпр}(t) = 0$.

2.

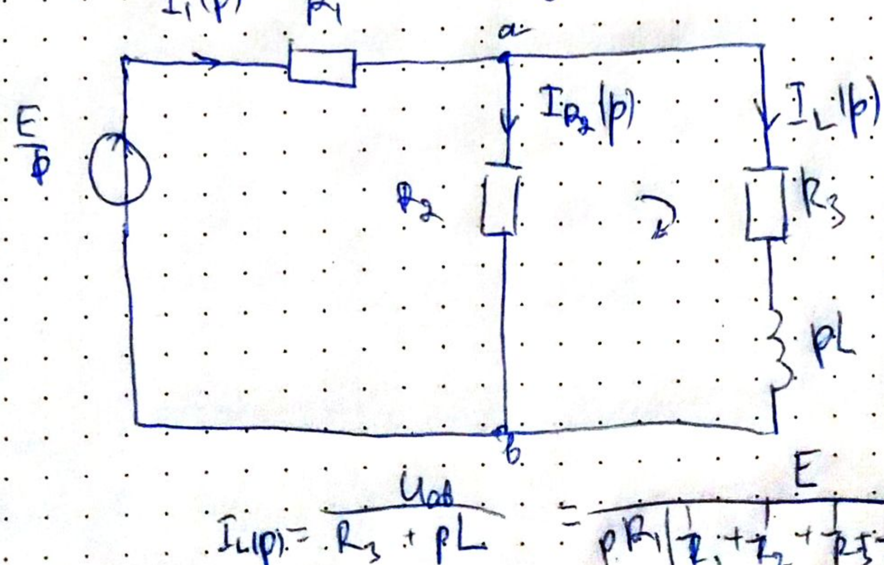


$E = 15\,В,\ R_1 = R_2 = R_3 = 5\,Ом,\ L = 10\,мГн$

$I_L(p)$ - ?

$i_L(0-) = 0 \Rightarrow i_L(0) = 0$

ЭДС при L отсутствует



$$\begin{cases} I_1(p) = I_{R_2}(p) + I_L(p) \\ I_L(p)[R_3 + pL] - I_{R_2}(p) \cdot R_2 = 0 \\ I_L(p) \cdot [R_3 + pL] + I_1(p) R_1 = \frac{E}{p} \end{cases}$$

$$U_{ab} = \frac{\frac{E}{pR_1}}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{pL}} = \frac{E}{pR_1\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3 + pL}\right)}$$

$$I_L(p) = \frac{U_{ab}}{R_3 + pL} = \frac{E}{pR_1\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3 + pL}\right)(R_3 + pL)}$$

$$I_L(p) = \frac{15}{p5\left(\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{p16}\right)(5+p10)} = \frac{15\cdot 3}{\left(3p+\frac{1}{10}\right)5\cdot(1+8p)} =$$

$$= \frac{3}{3p+\frac{1}{10}+6p^2+\frac{p}{5}}$$

Отже: $I_L(p) = \frac{3}{3p+\frac{1}{10}+6p^2+\frac{p}{5}}$