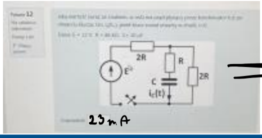
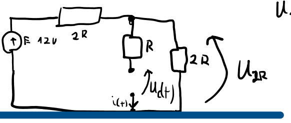
Egzamin 2

środa, 28 czerwca 2023 14:16



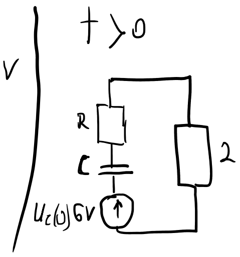
$t<0$



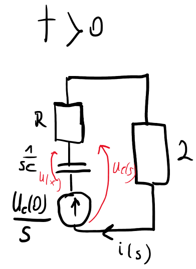
$U_{2R} = E \cdot \frac{2R}{2R+2R} = 12 \cdot \frac{172}{344} = 6V$

$U_C(t) = U_{2R}$

$t>0$



$t>0$



Przejście w Laplace

$t=0$

$U_C(0) = 6V$

$$i(s) = \frac{\frac{U_C(0)}{s}}{3R + \frac{1}{sC}} = \frac{U_C(0)}{s} \cdot \frac{1}{3R + \frac{1}{sC}}$$

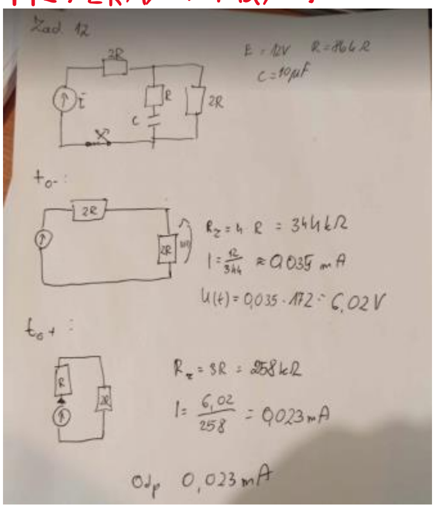
$U_C(0) \cdot \mathbb{1}(t)$

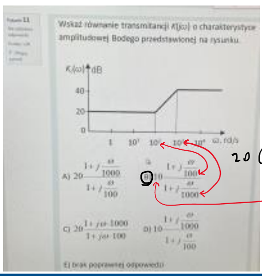
$$i(s) = \frac{U_C(0) \cdot C \cdot \frac{1}{3RC}}{3RsC + 1 \cdot \frac{1}{3RC}} = \frac{U_C(0) \cdot \frac{1}{3R}}{s + \frac{1}{3RC}}$$

0

$$i(t) = \lim_{s \to -\frac{1}{3RC}} U_C(0) \cdot \frac{1}{3R} \cdot e^{st} = U_C(0) \cdot \frac{1}{3R} \cdot e^{-\frac{1}{3RC} \cdot t} = 6 \cdot \frac{1}{258} = \frac{6}{258} = 0{,}023mA$$

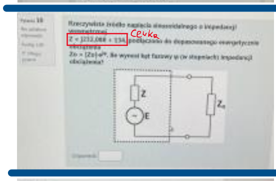
ALTERNATYWA:





10 bo jest skala w decybelach

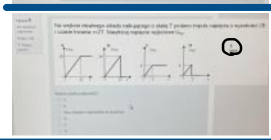
$20 \log_{10}(10) = 20 \cdot 1 = 20 dB$

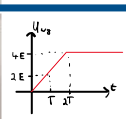


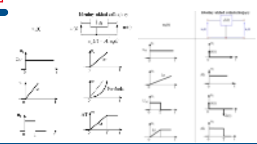
$Z = 134 + j232{,}088$

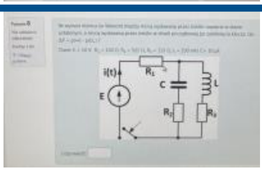
$\varphi = \text{arctan} \frac{232{,}088}{134} = 60°$

$\varphi = -\text{arctan} \frac{Im}{Re}$



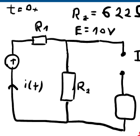






$t = 0_+$ $R_z = 622\Omega$

$E = 10V$

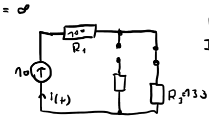


$I = \frac{10}{622} = 0{,}016$

$P(0_+) = (0{,}016)^2 \cdot 622 = 0{,}16W$

$\Delta P = 0{,}43 - 0{,}16W = 0{,}27W$

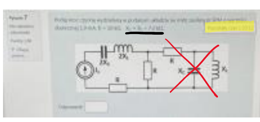
$t = \infty$



$R_z = 233$

$I = \frac{10}{233} = 0{,}043$

$P = (0{,}043)^2 \cdot 233 = 0{,}43W$

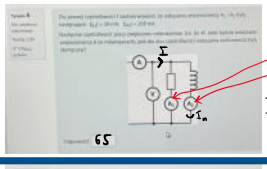


$X_C = X_L = \frac{1}{...}$ – jest przerwa

$P = I^2 \cdot R$

$R_z = 2 \cdot j7{,}3k\Omega + 2 \cdot (-j7{,}3k\Omega) + 2 \cdot 10k\Omega = 20k\Omega$

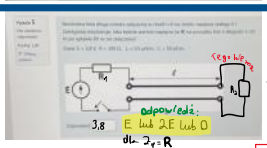
$P = (1{,}9)^2 \cdot 20k\Omega = 72{,}2W$



$I^2 = I_1^2 + I_2^2$ $\quad I = \frac{U}{j\omega L}$ $\quad U = I \cdot j\omega L$ $\quad X_L = j\omega L$ $\quad I_s = I_{A_2} = 20A$ $\quad I_s \cdot j\omega L = I_w \cdot j\omega L$ $\quad I_n = \frac{I_s \cdot j\omega L}{j\omega L}$ $\quad I_n = \frac{I_s}{4}$

$I_n = 5A$

$I = \sqrt{39^2 + 52^2} = \sqrt{2704 + 1521} = 65mA$

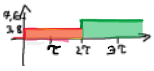


$Z_f = \sqrt{\frac{L}{C}}$ $\quad \sqrt{\frac{5}{500 \cdot 10^{-12}}} = \sqrt{10000} = 100\Omega$ $\quad \frac{5\mu H}{500pF} = Z_f$ $\quad N = \frac{Z_f - R_1}{Z_f + R_2}$ $\quad M = \frac{Z_f - R_1}{Z_f + R_1}$

U_0 $\quad -N \cdot U_0$ $\quad M \cdot N \cdot U_0$ $\quad -M \cdot N^2 \cdot U_0$ $\quad \circ$

$N = 1$ – 2 wewnątrz

$N = -1$ – rozwarcie



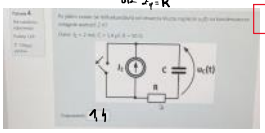
gdzie: $v = \frac{1}{\sqrt{L_1 C_1}}$ to prędkość propagacji fali w linii, a

$V = \frac{1}{\sqrt{5 \cdot 10^{-6} \cdot 500 \cdot 10^{-12}}} = \frac{1}{5\sqrt{10^{-6} \cdot 10^{-12}}} = \frac{1}{5 \cdot 10^{-9}} =$

$= \frac{10^9}{5} = \frac{1000000000}{5} = 200000000$

$\tau = \frac{L}{R}$ $\quad 2\tau > 80ms$ $\quad 80ms > 0$

3,8V



$U = \frac{I \cdot t}{C}$ – wzór na V na C od t

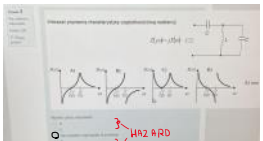
$2 = \frac{2 \cdot 10^{-3} \cdot t}{1,1 \cdot 10^{-6}}$

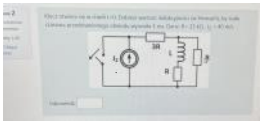
$2 = \frac{2t}{1,1 \cdot 10^{-3}} \quad / \cdot 1,1$

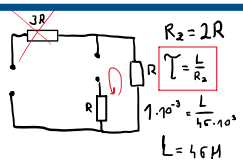
$2,8 = 2t \cdot 1000$

$t = \frac{2,8}{2000}$

$t = \frac{1,1}{1000} = 1,1 \cdot 10^{-3} s$





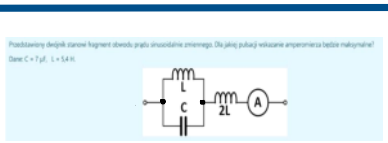


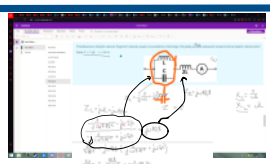
$R_2 = 2R$

$\tau = \frac{L}{R_2}$

$1 \cdot 10^{-3} = \frac{L}{4 \cdot 10^3}$

$L = 4H$

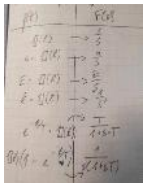


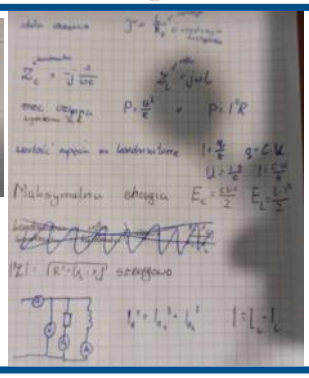


STAŁE CZASOWE:

$RC = t$

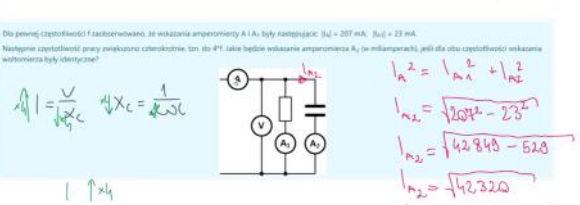
$\frac{L}{R} = t$

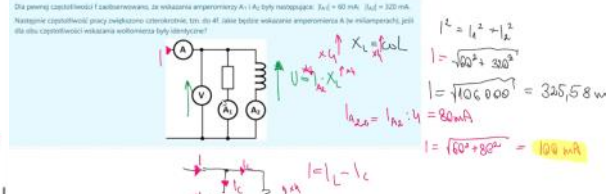


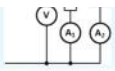


$i(s) = \frac{u_C(0) \cdot \frac{1}{3R}}{\left(s + \frac{1}{3RC}\right)s}$ $\quad M = 0$ $\quad s_1 = -\frac{1}{3RC}$ $\quad , \quad s_2 = 0$

$\lim_{s \to -\frac{1}{3RC}} \frac{u_C(0) \cdot \frac{1}{3R} \cdot e^{st}}{1 \cdot s} + \lim_{s \to 0} \frac{u_C(0) \cdot \frac{1}{3R} \cdot e^{st}}{\left(s + \frac{1}{3RC}\right) 1} = \underbrace{\frac{u_C(0) \cdot \frac{1}{3R} \cdot e^{-\frac{t}{3RC}}}{-\frac{1}{3RC}}} + \frac{u_C(0) \cdot \frac{1}{3R} \cdot e^{0}}{\frac{1}{3RC}} = i(t)$







$I_{R2} = \sqrt{42849 - 528}$

$I_{R2} = \sqrt{42320}$

$I_{R2} = 205{,}72\ \text{mA}$

$I_{R2} = 4 \cdot 205{,}72\ \text{mA} = 822{,}88\ \text{mA}$