Date: 25.02.2024

Übung

Tutorial: Übungen

1.)

$\frac{1}{C_1} + \frac{1}{C_2} = \frac{1}{C_{ges}}$ seien

parallel

$\frac{1}{1\mu F} + \frac{1}{1\mu F} = \frac{1}{C}$ $\quad C = 5 \cdot 10^{-4}$ $500\mu F$

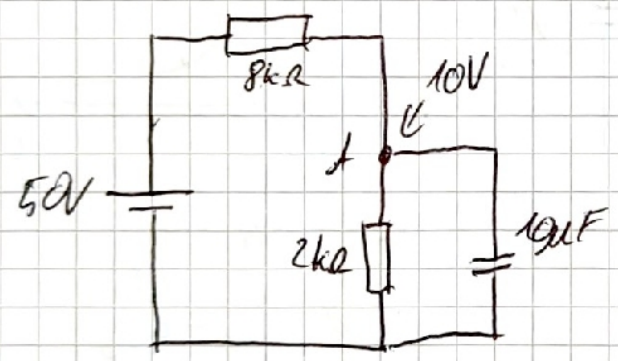
$2\mu F +$ $\quad \frac{1}{2\mu F} + \frac{1}{1\mu F} = \frac{1}{C}$ $\quad 666\mu F$

2.)

$W = \frac{1}{2} C V^2$ $\quad V = I R$

Voltage divider

$\frac{R_2}{R_1 + R_2} V_{in}$



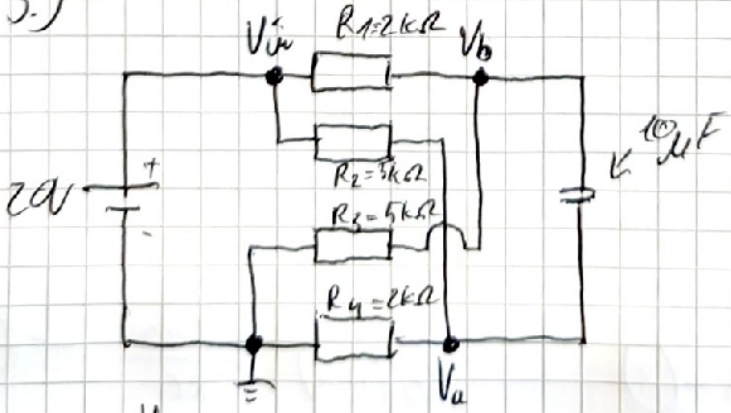
$\frac{2k\Omega}{8k\Omega + 2k\Omega} \cdot 50V$

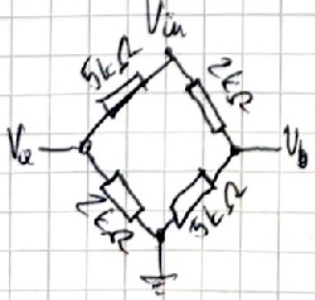
$\frac{1}{2} \cdot 10\mu F \cdot 10^2 V = \frac{1}{2} CV$

$= 0.0005\ J$

$= 5mJ$

3.)





$\frac{R_1}{R_2} = \frac{R_3}{R_4}$

$P_d = \frac{40}{7} V - \frac{100}{7} V = -\frac{60}{7}$

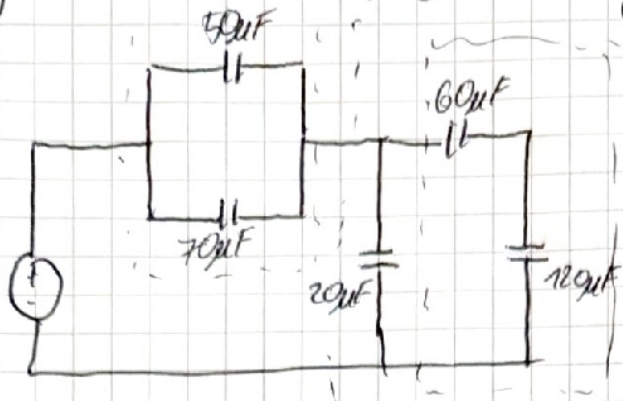
$W = \frac{1}{2} C V^2$

$\frac{1}{2} \cdot 10\mu F \left(\frac{60}{7} V\right)^2 = 367\mu J$

$\frac{5k\Omega}{7k\Omega} \cdot 20V = V_b = \frac{100}{7} V$

$\frac{2k\Omega}{7k\Omega} \cdot 20V = V_a = \frac{40}{7} V$

Q4)



$\frac{1}{60\mu F} + \frac{1}{120\mu F} = C$

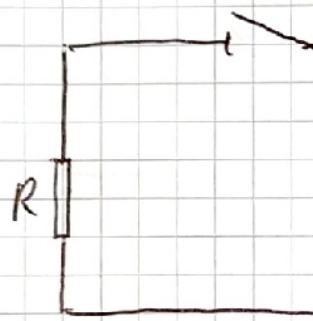
$= 40\mu F$

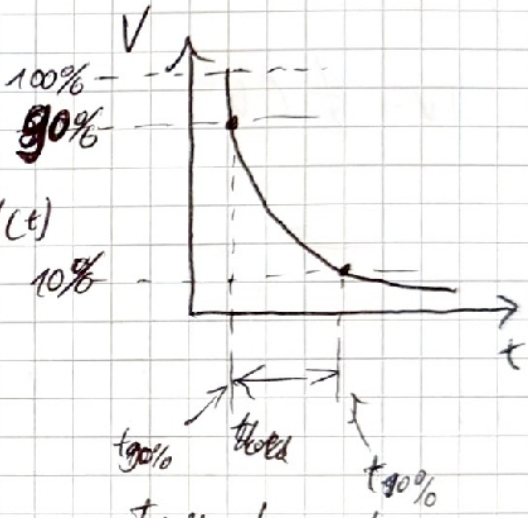
$\Leftarrow 40\mu F$

$\Leftarrow 60\mu F$

$$\Rightarrow \frac{1}{\frac{1}{120\mu F} + \frac{1}{60\mu F}} = C \Rightarrow 40\mu F$$

Q5)





$t_{fall} = t_{10\%} - t_{90\%}$

$$V(t) = V_0 e^{-\frac{t}{RC}}$$

initial value

$90 = 100e^{-\frac{t_{90\%}}{RC}}$

$0.9 = e^{-\frac{t_{90\%}}{RC}}$

$10 = 100e^{-\frac{t_{10\%}}{RC}}$

$0.1 = e^{-\frac{t}{RC}}$

Taking $\ln$

$\ln(0.9) = -\frac{t_{90\%}}{RC}$ — (3)

$\ln(0.1) = -\frac{t_{10\%}}{RC}$ — (4)

$\ln(0.9)RC = -t_{90\%}$

$-\ln(0.9)RC = t_{90\%}$

$-\ln(0.1)RC = t_{10\%}$

$-\ln(0.1)RC - (-\ln(0.9)RC)$

$-\ln(0.1)RC + \ln(0.9)RC$

$RC(\ln(0.9) - \ln(0.1))$