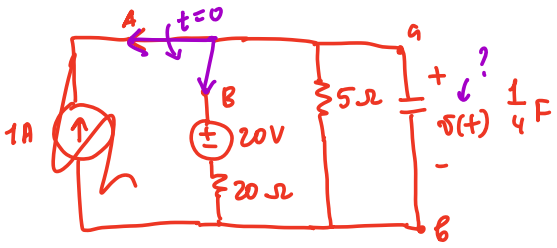
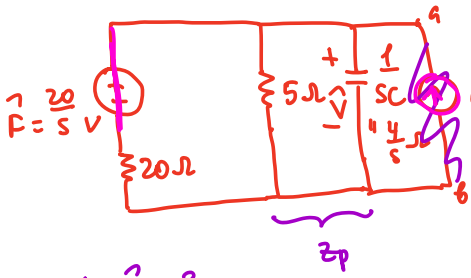
Extra example:

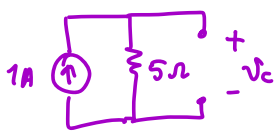
05/03/2022



a) Draw eq. circuit in s-domain for t>0



t<0



$i = C\frac{dv}{dt}$

$v_c(0^-) = 1 \cdot 5 = 5V$

b) $\hat{V}$ - ?

Superposition:

only $\hat{F} = \frac{20}{s}V \Rightarrow \hat{V}_{Zs} = \hat{F}\left(\frac{Z_p}{Z_p+20}\right) = \frac{4}{s(1+s)}$

only $\frac{5}{4}A$: $\Rightarrow \hat{V}_{ZI} = \frac{5}{4}A \cdot Z_p = \frac{5}{1+s}$

$$\frac{1}{Z_p} = \frac{1}{20} + \frac{s}{4} + \frac{1}{5}$$

$$\hat{V} = \frac{4}{s(1+s)} + \frac{5}{1+s} = \frac{4+5s}{s(1+s)}$$

c) $v(t)$, $t>0$

$$\hat{V} = \frac{4+5s}{s(1+s)} = \frac{A_1}{s} + \frac{A_2}{1+s} = \frac{4}{s} + \frac{1}{1+s}$$

$$\downarrow \mathcal{L}^{-1}$$

$$v(t) = 4u(t) + e^{-t}u(t) \quad V$$

d) Plot $v(t)$ for $t>-1s$