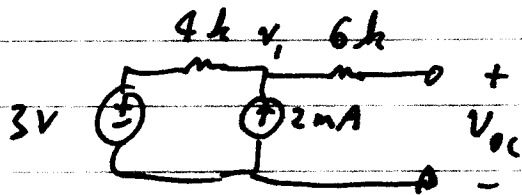


Quiz Solution

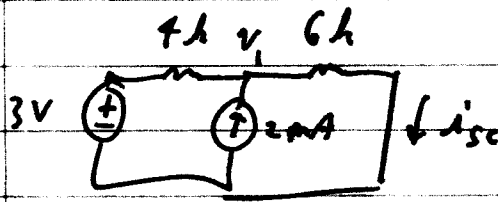
Thevenin equiv:



$$V_{oc} = V_1$$

$$\frac{V_1 - 3}{4k} = 2mA$$

$$V_1 = 11V$$

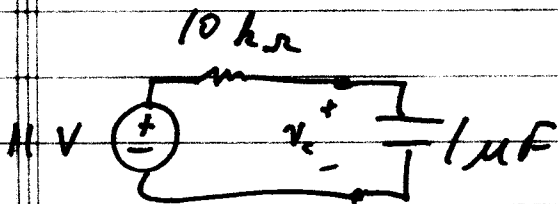


$$\frac{V_1 - 3}{4k} - 2mA + \frac{V_1}{6k} = 0$$

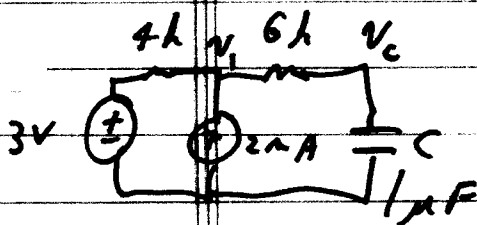
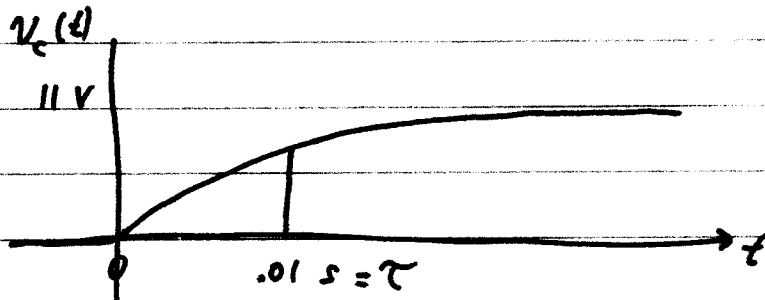
$$3V_1 - 9 + 2V_1 = 24$$

$$V_1 = \frac{33}{5} V \Rightarrow i_{sc} = \frac{V_1}{6k} = \frac{33}{30} mA$$

$$R_o = \frac{V_{oc}}{i_{sc}} = \frac{11}{33/30} = 10k\Omega$$



$$\tau = RC = .01s$$



$$\frac{V_1 - 3}{4k} - .002 + \frac{V_1 - V_c}{6k} = 0 \quad (1)$$

$$\frac{V_c - V_1}{6k} + C \frac{dV_c}{dt} = 0 \quad (2)$$

$$\textcircled{1} \Rightarrow 3v_1 - 9 + 2v_1 - 2v_c = 24$$

$$5v_1 - 2v_c = 33$$

$$v_1 = \frac{33}{5} + \frac{2}{5}v_c$$

put in $\textcircled{2}$:

$$v_c - \left(\frac{33}{5} + \frac{2}{5}v_c \right) + (6k)C \frac{dv_c}{dt} = 0$$

$$\frac{3}{5}v_c + \underbrace{(6k)C}_{(6 \times 10^{-3})} \frac{dv_c}{dt} = \frac{33}{5}$$

$$(6 \times 10^{-3})$$

$$\frac{dv_c}{dt} + 100 v_c(t) = 1100$$

$$v_c(0) = 0$$

$$\Rightarrow v_c(t) = 11 \left(1 - e^{-100t} \right) \text{ V, } t \geq 0$$