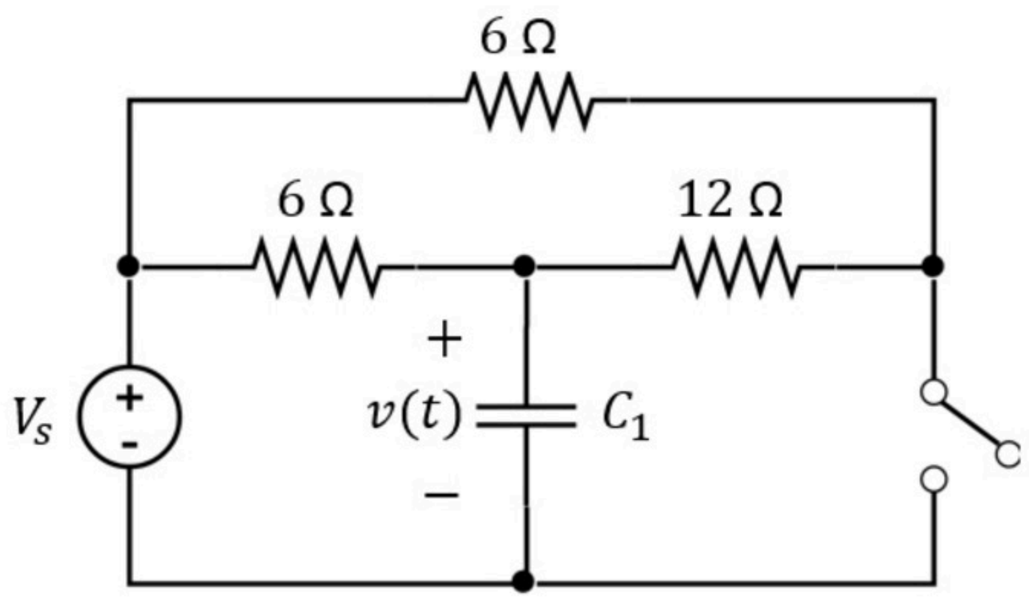
First order circuits 002

Unlimited Attempts.

a) Find the time constant τ_1 and the steady state capacitor voltage $v_1 = v(\infty)$ when the switch is open.

b) Find the time constant τ_2 and the steady state capacitor voltage $v_2 = v(\infty)$ when the switch is closed.



Given Variables:

Vs : 30 V

C1 : 8 nF

Calculate the following:

tau1 (ns) :

36 ✓

v1 (V) :

30 ✓

tau2 (ns) :

32 ✓

v2 (V) :

20 ✓

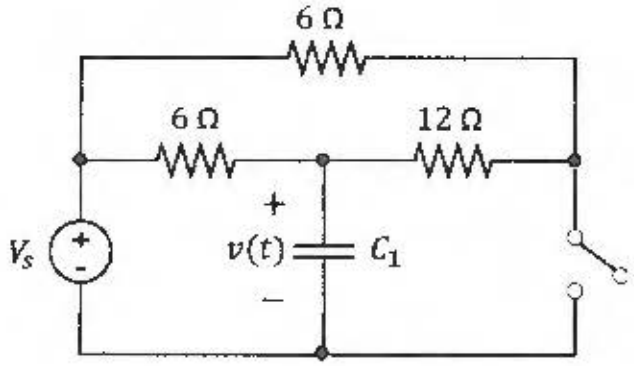
Hint: The circuit is different in the two cases

a) Find the time constant τ_1 and the steady state capacitor voltage $v_1 = v(\infty)$ when the switch is open.

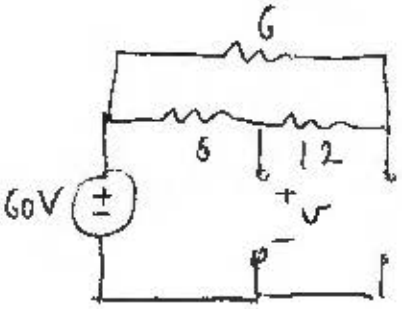
b) Find the time constant τ_2 and the steady state capacitor voltage $v_2 = v(\infty)$ when the switch is closed.

Vs : 60 V

C1 : 6 nF

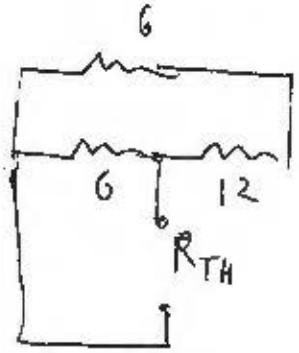


(a)



→ NO CURRENTS

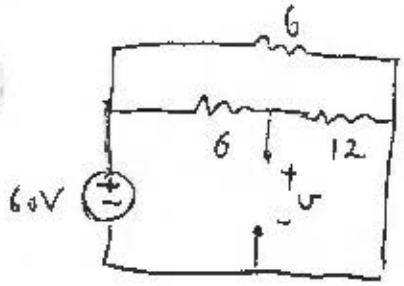
$v_1 = 60V$



$\tau_1 = R_{TH} \cdot C_1 \Rightarrow \boxed{\tau_1 = 27\,ns}$

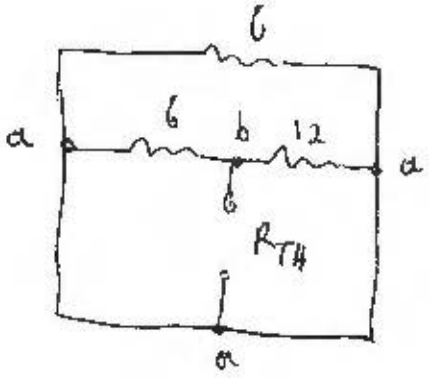
$R_{TH} = 6 // 18 = \frac{9}{2}\,\Omega$

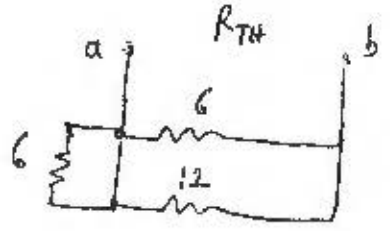
(b)



$v = 60 \cdot \frac{12}{6+12} = 40$

$\boxed{v_2 = 40V}$





$R_{TH} = 6 // 12 = 4\,\Omega$

$\tau_2 = R_{TH} \cdot C_1 \Rightarrow \boxed{\tau_2 = 24\,ns}$