14.33 Find $v_o(t)$, for $t > 0$, in the network in Fig. P14.33.

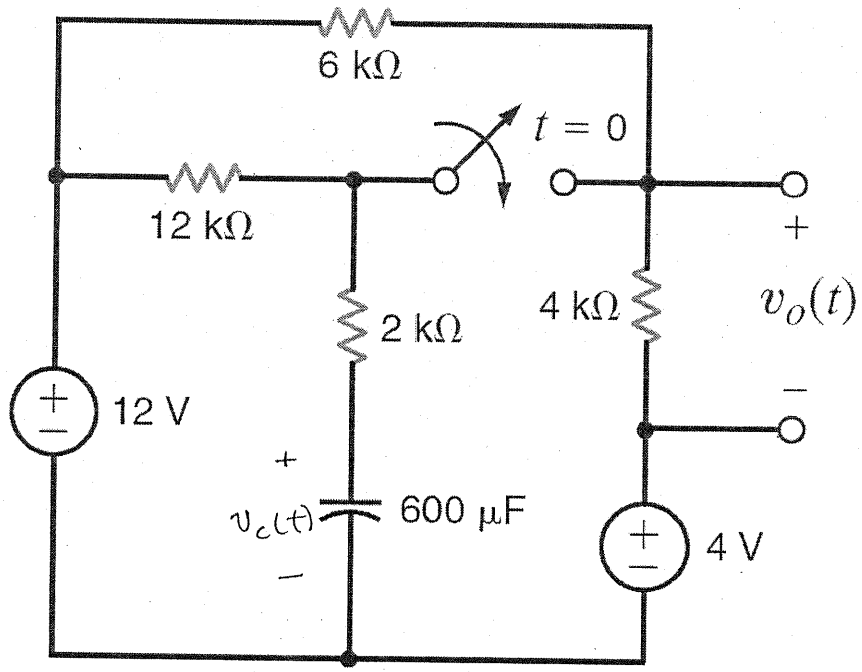
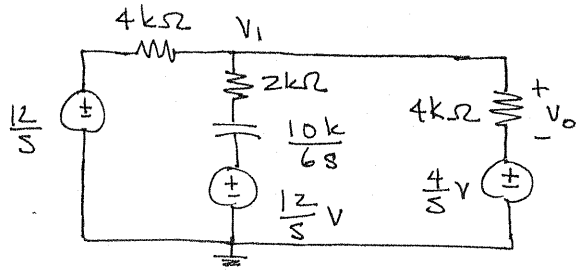


Figure P14.33

SOLUTION: $v_c(0^-) = 12\text{V}$

$t = 0^+$ (12k & 6k in parallel!)



$$\frac{V_1 - 12/s}{4\times10^3} + \frac{V_1 - 12/s}{\left(2 + \frac{10}{6s}\right)\times10^3} + \frac{V_1 - 4/s}{4\times10^3} = 0$$

$$\text{or, } \frac{V_1}{4} + \frac{V_1}{2+\frac{10}{6s}} + \frac{V_1}{4} = \frac{3}{s} + \frac{1}{s} + \frac{12}{s\left(2+\frac{10}{6s}\right)}$$

$$V_1\left[\frac{12s+5}{12s+10}\right] = \frac{120s+40}{s(12s+10)}$$

$$V_1 = \frac{120s+40}{s(12s+5)}$$

$$V_o = V_1 - \frac{4}{s} = \frac{72s+20}{s(12s+5)}$$

$$V_o = \frac{(72s+20)/12}{s(s+5/12)} = \frac{4}{s} + \frac{2}{s+5/12}$$

$$\boxed{v_o(t) = \left[4 + 2e^{-(5/12)t}\right]u(t)\ \text{V}}$$