14.34 Find $v_o(t)$, for $t > 0$, in the network in Fig. P14.34.

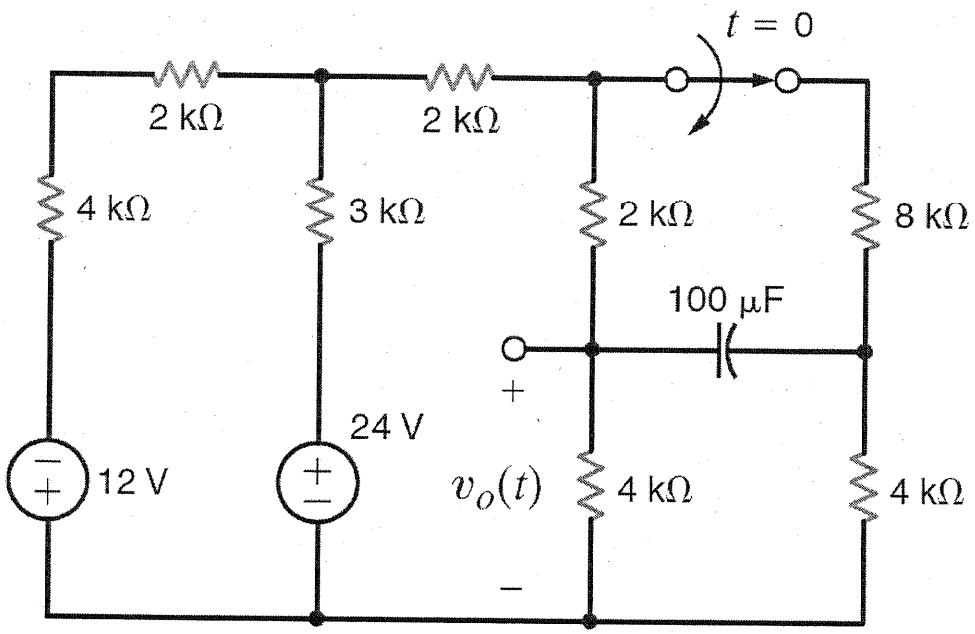
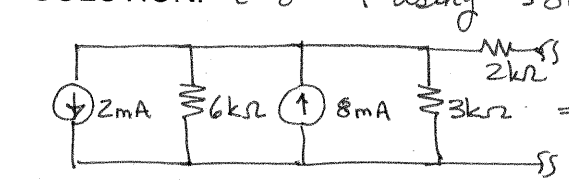
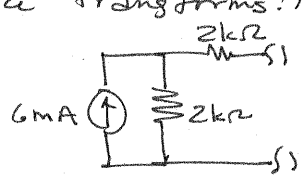
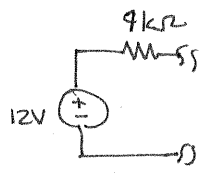


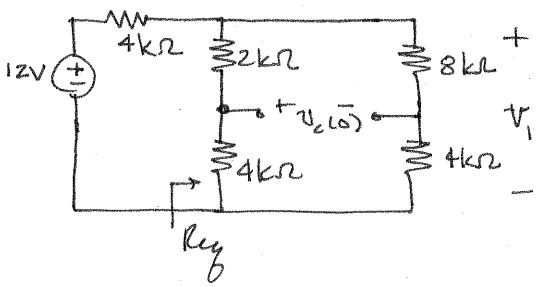
Figure P14.34

SOLUTION: $t=0^-$ (using source transforms!)







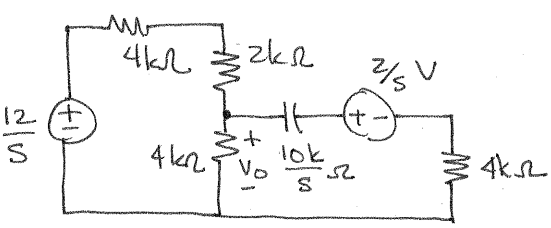


$R_{eq} = (6000)(12{,}000)/18{,}000 = 4\text{k}\Omega$

$V_1 = 12\,R_{eq}/(4000 + R_{eq}) = 6\text{ V}$

$v_c(0) = v_1\left[\frac{4000}{6000} - \frac{4000}{12{,}000}\right] = 2\text{ V}$

$t=0^+$



$$\frac{V_o - 12/s}{6000} + \frac{V_o}{4000} + \frac{V_o - 2/s}{4000 + \frac{10{,}000}{s}} = 0$$

$$\frac{V_o}{6} + \frac{V_o}{4} + \frac{V_o s}{4s+10} = \frac{2}{s} + \frac{2}{4s+10}$$

$$V_o\left[\frac{5}{12}+\frac{s}{4s+10}\right]=\frac{10s+20}{5(4s+10)}=V_o\left[\frac{32s+50}{12(4s+10)}\right]$$

$$V_o=\frac{\frac{15}{4}(s+2)}{s\left(s+\frac{25}{16}\right)}=\frac{24/5}{s}-\frac{21/20}{s+25/16}$$

$$\boxed{v_o(t)=\left[\frac{24}{5}-\frac{21}{20}e^{-(25/16)t}\right]u(t)\ V}$$