14.36 Find $v_o(t)$, for $t > 0$, in the network in Fig. P14.36.

PSV

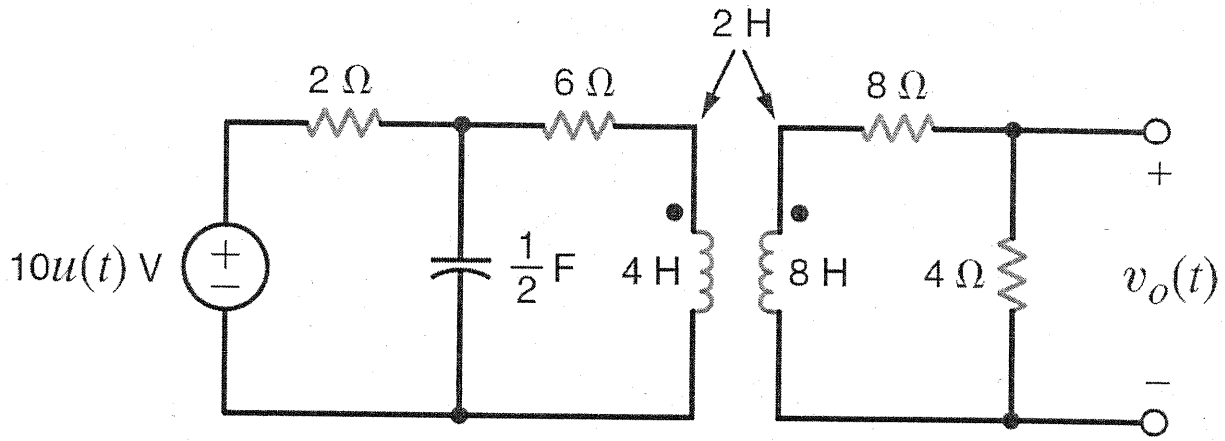
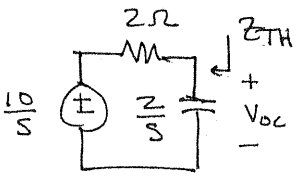


Figure P14.36

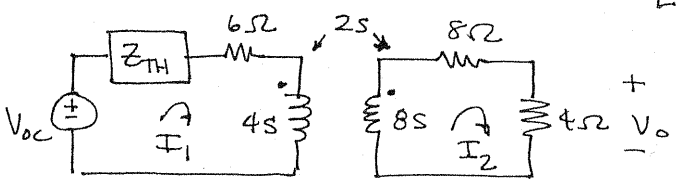
SOLUTION: $t=0^-$: no excitation ⇒ ∅ initial conditions

$t=0^+$ (use Thevenin 1st)



$$V_{oc} = \frac{10}{s}\left[\frac{2/s}{2/s+2}\right] = \frac{10}{s(s+1)}\ \text{V}$$

$$Z_{TH} = 2(2/s)\,/\,\left[2+2/s\right] = \frac{2}{s+1}\ \Omega$$



$$V_{oc} = I_1(4s+6+Z_{TH}) - 2sI_2$$

$$0 = -2sI_1 + I_2(8s+12)$$

yields, $I_1 = I_2(4s+6)/s \Rightarrow V_{oc} = I_2\left[(4s+6+Z_{TH})(4s+6) - 2s\right]$

solve for I_2 and use $V_o = 4I_2$

$$V_o = \frac{20/7}{s^3 + \left(\frac{31}{7}\right)s^2 + \left(\frac{46}{7}\right)s + \frac{24}{7}}$$

Using the ROOTS function in MATLAB yields

$$V_o = \frac{20/7}{(s+2)(s+1.21-j0.5)(s+1.21+j0.5)} = \frac{A}{s+2} + \frac{K}{s+1.21-j/2} + \frac{K^*}{s+1.21+j/2}$$

$A = 3.33$ $\quad K = 3.15\angle -122$

$$v_o(t) = \left[3.33e^{-2t} + 6.30\, e^{-1.21t} \cos\left(t/2 - 122^\circ\right)\right] u(t)\ V$$ ✓