14.22 Find $v_o(t)$, for $t > 0$, in the network in Fig. P14.22 using Thévenin's theorem.

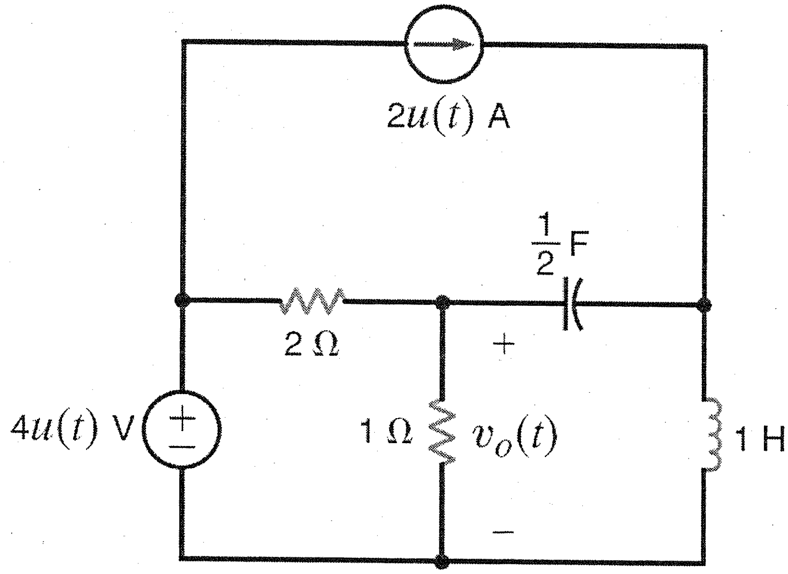
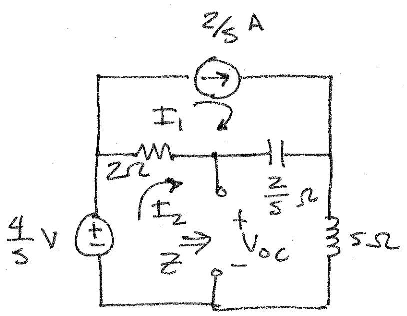


Figure P14.22

SOLUTION:



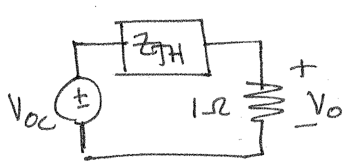
$$Z = \frac{2\left(s+\frac{2}{s}\right)}{2+s+2/s} = \frac{2s^2+4}{s^2+2s+2}$$

$I_1 = \frac{2}{s}$; $\frac{4}{s} = I_2\left[2+\frac{2}{s}+s\right] - I_1\left[2+\frac{2}{s}\right]$

or, $\frac{4}{s} = I_2\left(\frac{s^2+2s+2}{s}\right) - \frac{2}{s}\left(\frac{2s+2}{s}\right)$

$$I_2 = \frac{8s+4}{s(s^2+2s+2)}$$

$$V_{oc} = \frac{4}{s} - 2(I_2 - I_1) = \frac{8s^2+8}{s(s^2+2s+2)}$$



$$V_o = \frac{V_{oc}\,(1)}{1+Z_{TH}} = \frac{(8/3)(s^2+1)}{s(s^2+\frac{2}{3}s+2)}$$

$$V_o = \frac{4/3}{s} + \frac{K_1}{s+\frac{1}{3}-j\frac{\sqrt{17}}{3}} + \frac{K_1^*}{s+\frac{1}{3}+j\sqrt{17}/3}$$

$K_1 = 0.825 \angle 36.0°$

$$v_o(t) = \left[\frac{4}{3} + 1.65\,e^{-t/3}\cos\left(\frac{\sqrt{17}}{3}t + 36°\right)\right]u(t)\ \text{V}$$