14.62 Find the steady-state response $v_o(t)$, for $t > 0$, in the network in Fig. P14.62.

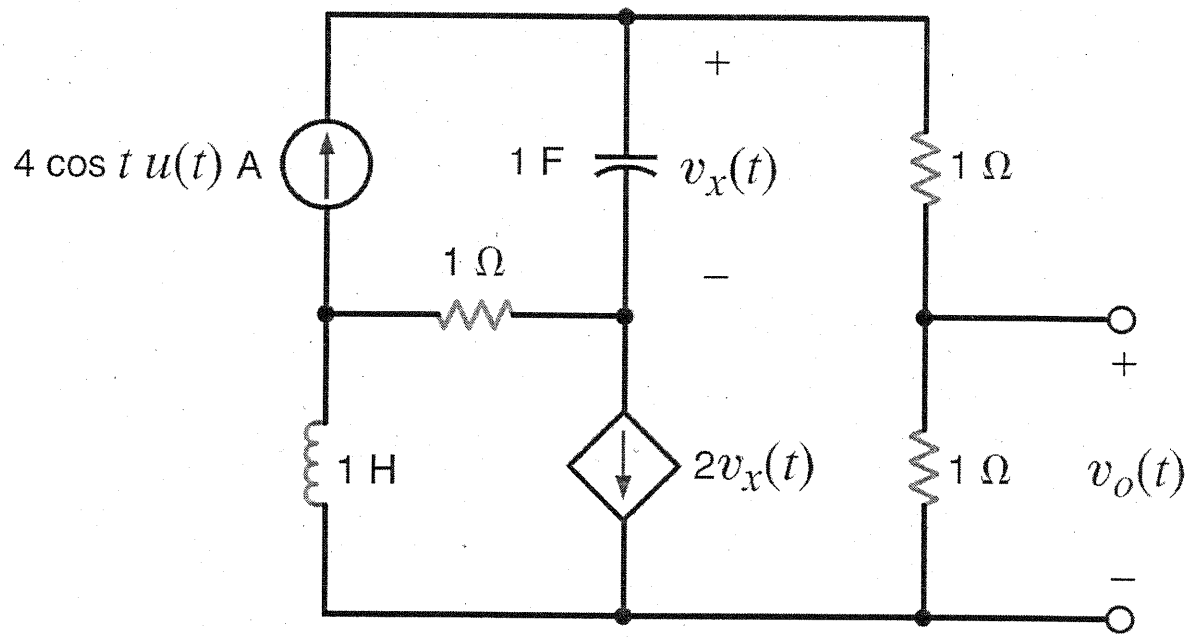
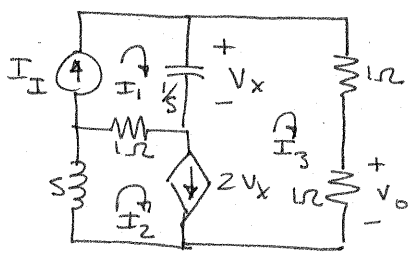


Figure P14.62

SOLUTION:



$I_1 = I_I$ $\quad I_2 - I_3 = 2V_x = 2(I_1 - I_3)/s$

yields $\quad I_2 = \frac{2I_1}{s} + I_3\left(1 - \frac{2}{s}\right)$

and

$$I_2(s+1) + I_3\left(2 + \tfrac{1}{s}\right) - I_1\left(1 + \tfrac{1}{s}\right) = 0$$

$$\Downarrow$$

$$I_1\left[\frac{2}{s}(s+1) - \frac{s+1}{s}\right] + I_3\left[\frac{s-2}{s}(s+1) + \frac{2s+1}{s}\right] = 0 \qquad V_o = (1)\,I_3$$

$$I_I\left[2s+2-s-1\right] + V_o\left[s^2 - s - 2 + 2s + 1\right] = 0$$

$$V_o = -I_I(s+1)/(s^2+s-1)$$

In steady state, $I_I = 4\angle 0°$ A & $s = j1 \Rightarrow V_o = 2.53\angle 71.6°$ V

$$v_o(t) = 2.53\cos(t + 71.6°)\ \text{V}$$