14.61 Find the steady-state response $i_o(t)$ for the network shown in Fig. P14.61. CS

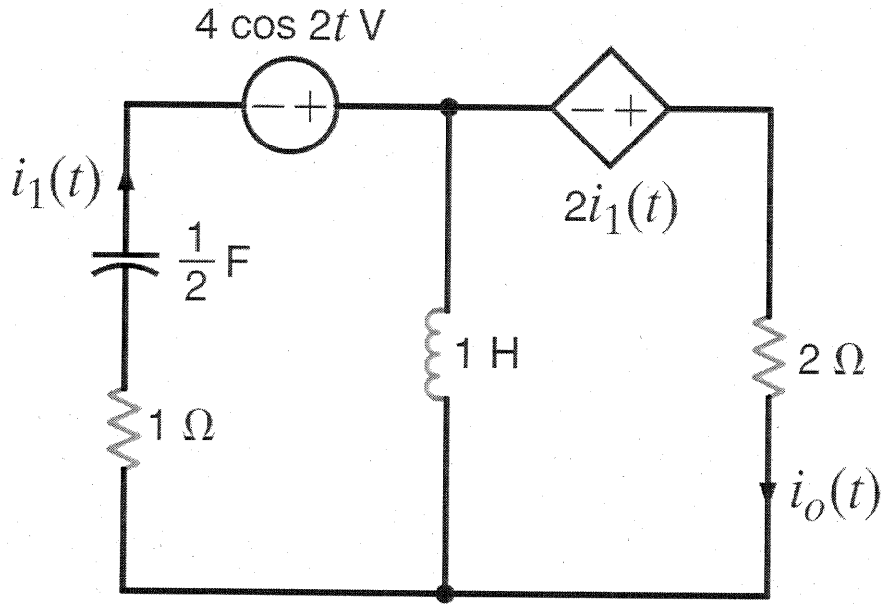
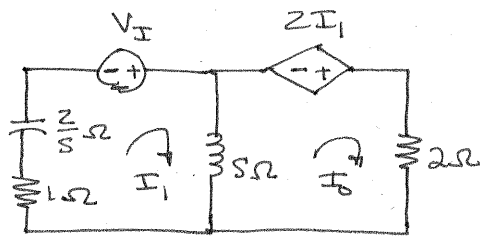


Figure P14.61

SOLUTION:



$$V_I = I_1\left(s+1+\tfrac{2}{s}\right) - sI_o$$

$$= I_1\left(\frac{s^2+s+2}{s}\right) - sI_o$$

and, $2I_1 = -sI_1 + (s+2)I_o$

or, $0 = -I_1(s+2) + I_o(s+2)$

$\Leftarrow$ yields $I_1 = I_o$

$$V_I = I_o\left[\frac{s^2+s+2-s^2}{s}\right]$$

$$I_o = \frac{V_I(s)}{s+2}$$

In steady state, $V_I = 4\angle 0°\ V$ $\quad s \to j2$

$$I_o = \frac{4\angle 0°\ (j2)}{2+j2} = 2\sqrt{2}\angle 45°\ A$$

$$i_o(t) = 2\sqrt{2}\cos(2t+45°)\ A$$