14.11 For the network shown in Fig. P14.11, find $v_o(t)$, $t > 0$, using loop equations.

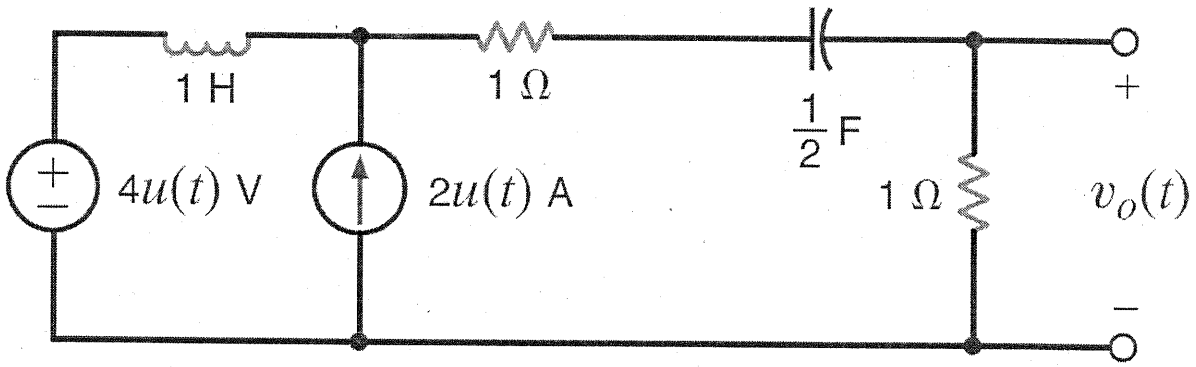
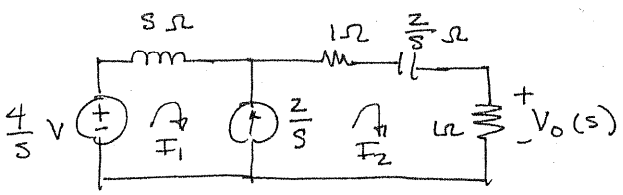


Figure P14.11

SOLUTION:



$$\frac{4}{s} = sI_1 + \left(2 + \frac{2}{s}\right) I_2$$

$$\text{or,} \quad 4 = s^2 I_1 + (2s+2) I_2$$

$$\text{and,} \quad I_2 - I_1 = 2/s \Rightarrow I_1 = I_2 - \frac{2}{s}$$

$$4 = s^2 I_2 - 2s + (2s+2) I_2 = I_2 (s^2 + 2s + 2) - 2s$$

$$I_2 = \frac{2s+4}{s^2+2s+2} \qquad V_o = (1) I_2 = \frac{2(s+2)}{(s+1-j1)(s+1+j1)} = \frac{K_1}{s+1-j1} + \frac{K_1^*}{s+1+j1}$$

$$K_1 = \frac{2(-1+j1+2)}{j2} = \sqrt{2}\,\angle -45^\circ$$

$$\boxed{v_o(t) = [2\sqrt{2}\, e^{-t} \cos(t - 45^\circ)]\, u(t) \text{ V}}$$