14.12 For the network shown in Fig. P14.12, find $v_o(t)$, $t > 0$, using mesh equations.

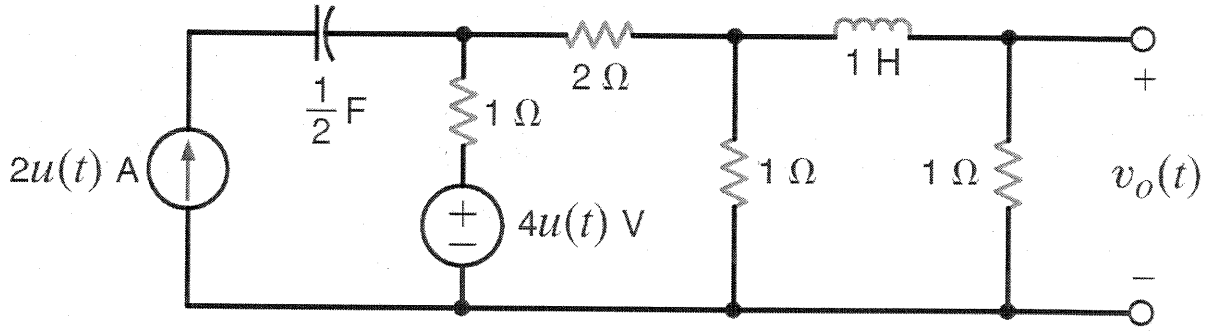
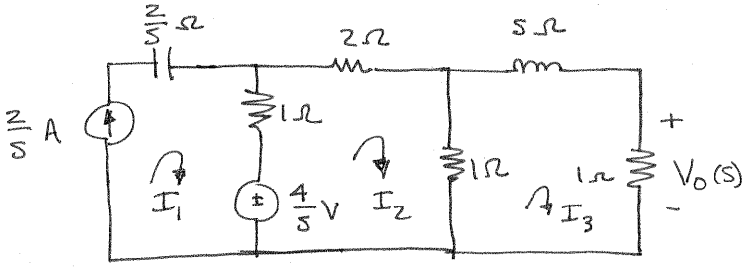


Figure P14.12

SOLUTION:



$I_1 = \frac{2}{s}$ A

$\frac{4}{s} = -I_1 + I_2(4) - I_3$

$0 = -I_2 + I_3(s+2)$

$\frac{4}{s} = -\frac{2}{s} + 4I_2 - I_3 \Rightarrow \frac{6}{s} = 4I_2 - I_3$

and $0 = -I_2 + I_3(s+2)$

$I_3(s)\left[4(s+2)-1\right] = 6/s$

$I_3(s) = \frac{6}{s(4s+7)}$ $\quad V_o = (1)I_3 = \frac{3/2}{s(s+7/4)}$

$V_o(s) = \frac{K_1}{s} + \frac{K_2}{s+7/4}$ $\quad K_1 = \left(\frac{3}{2}\right)\left(\frac{4}{7}\right) = \frac{6}{7}$ $\quad K_2 = \frac{3}{2}\left(-\frac{4}{7}\right) = -\frac{6}{7}$

$V_o(s) = \frac{6}{7}\left[\frac{1}{s} - \frac{1}{s+7/4}\right]$

$$v_o(t) = \left[\frac{6}{7}\left(1 - e^{-1.75t}\right)\right]u(t)$$