14.15 Use loop analysis to find $v_o(t)$ for $t > 0$ in the network in Fig. P14.15.

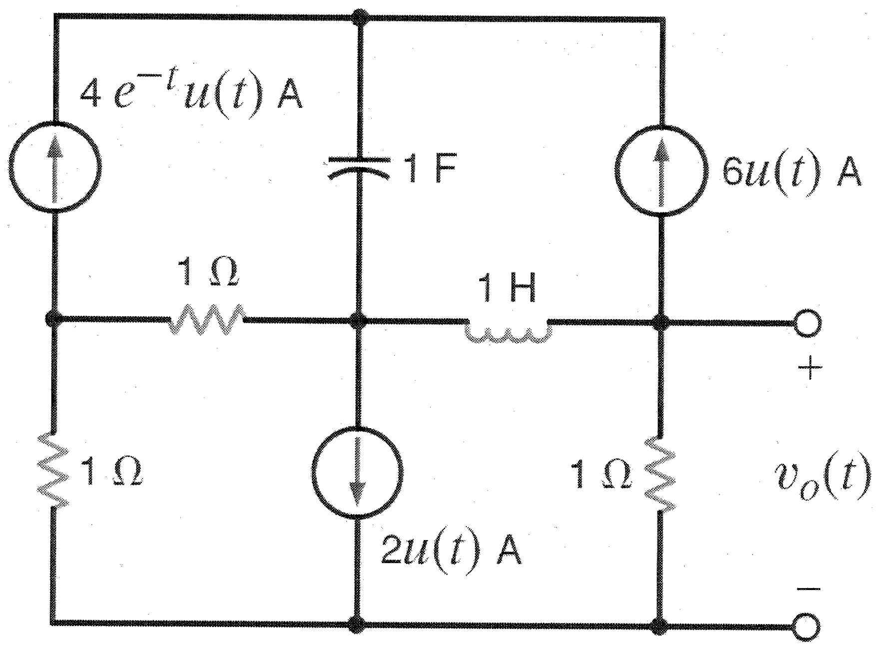
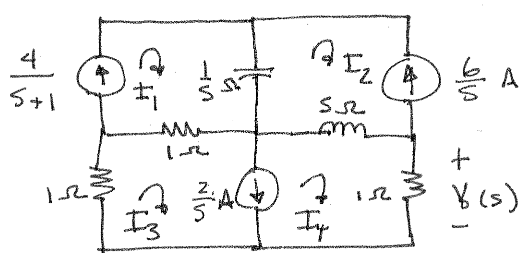


Figure P14.15

SOLUTION:



$I_1 = \frac{4}{s+1} \qquad I_2 = -\frac{6}{s} \qquad I_3 - I_4 = \frac{2}{s}$

$I_3(2) - I_1 + I_4(s+1) - sI_2 = 0$

$V_o = (1)\,I_4 \qquad I_3 = \frac{2}{s} + I_4$

$$2\left[\frac{2}{s} + I_4\right] - \frac{4}{s+1} + I_4(s+1) + 6 = 0 \;\Rightarrow\; I_4(s+3) = \frac{4}{s+1} - \frac{4}{s} - 6$$

$$I_4(s+3) = \frac{4s - 4s - 4 - 6s^2 - 6s}{s(s+1)} = \frac{-(6s^2+6s+4)}{s(s+1)}$$

$$V_o = \frac{-(6s^2+6s+4)}{s(s+1)(s+3)} = \frac{-4/3}{s} + \frac{2}{s+1} - \frac{20/3}{s+3}$$

$$v_o(t) = \left[2e^{-t} - 4/3 - \frac{20}{3}e^{-3t}\right]u(t)$$