14.9 Find $v_o(t)$, $t > 0$, in the network shown in Fig. P14.9 using nodal analysis. CS

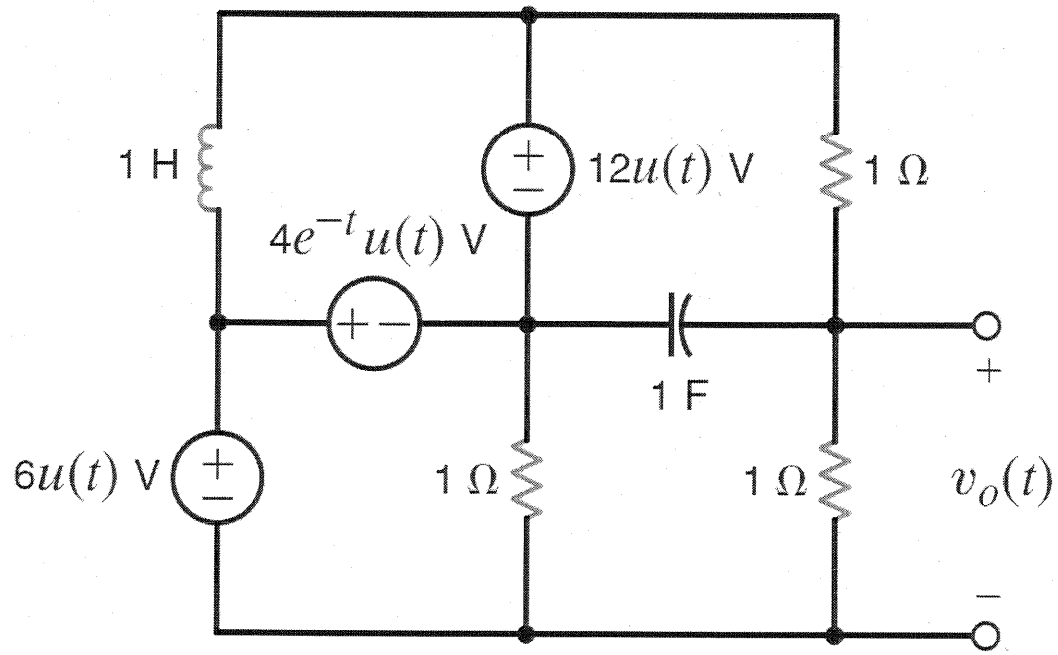
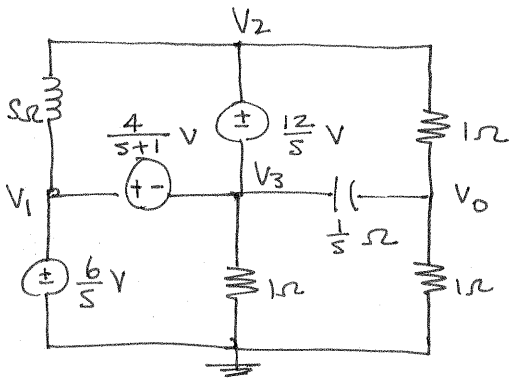


Figure P14.9

SOLUTION:



$V_1 = \frac{6}{s}$ $\quad V_1 - V_3 = \frac{4}{s+1} \Rightarrow V_3 = \frac{6}{s} - \frac{4}{s+1}$

$V_2 - V_3 = \frac{12}{s} \Rightarrow \quad V_2 = \frac{12}{s} + V_3 = \frac{18}{s} - \frac{4}{s+1}$

$\frac{V_o - V_2}{1} + s(V_o - V_3) + \frac{V_o}{1} = 0$

$V_o(s+2) = V_2 + sV_3$

$V_o(s+2) = \frac{2(s+9)}{s} \Rightarrow V_o(s) = \frac{2(s+9)}{s(s+2)} = \frac{K_1}{s} + \frac{K_2}{s+2}$

$K_1 = 9 \qquad K_2 = -7$

$$\boxed{v_o(t) = [9 - 7e^{-2t}]u(t)}$$