

14.41 Determine the output voltage $v_o(t)$ in the network in Fig. P14.41a if the input is given by the source in Fig. P14.41b. **PSV**

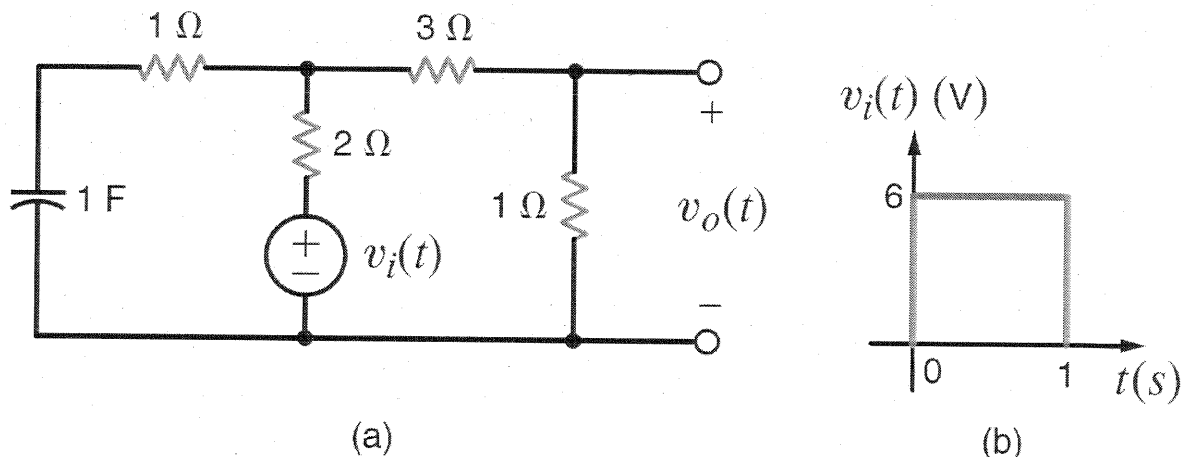
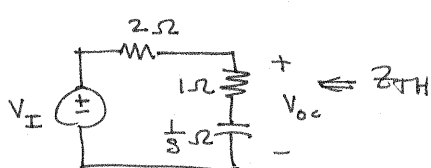


Figure P14.41

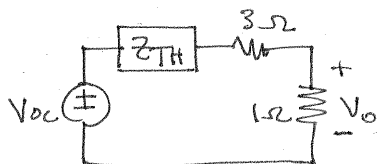
SOLUTION: $v_i(t) = 6u(t) - 6u(t-1)$ $V_I(s) = \frac{6}{s} (1 - e^{-s})$

Use Thevenin eq.



$$V_{oc} = V_I \left[\frac{1 + 1/s}{3 + 1/s} \right] = V_I \left(\frac{s+1}{3s+1} \right)$$

$$Z_{TH} = \frac{(1 + 1/s)(2)}{3 + 1/s} = \frac{2(s+1)}{3s+1}$$



$$V_o = V_{oc} \left[\frac{1}{4 + Z_{TH}} \right] = V_I \left(\frac{s+1}{3s+1} \right) \left(\frac{3s+1}{4(3s+1) + 2s+2} \right)$$

$$V_o = \frac{(6/14)(s+1)(1-e^{-s})}{s(s+6/14)} = \left[\frac{1}{s} - \frac{4/7}{s+6/14} \right] (1-e^{-s})$$

$$v_o(t) = \left[1 - \frac{4}{7} e^{-(6/14)t} \right] u(t) - \left[1 - \frac{4}{7} e^{-(6/14)(t-1)} \right] u(t-1) \text{ V} \quad \checkmark$$