

**14.28** Find  $i_o(t)$ ,  $t > 0$ , in the network shown in Fig. P14.28.

CS

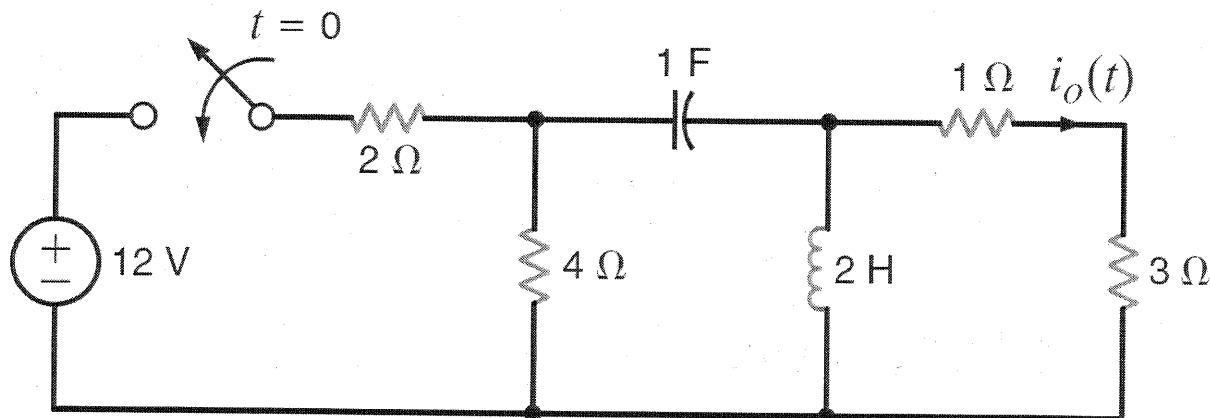
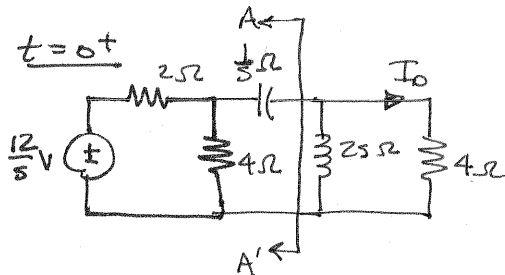
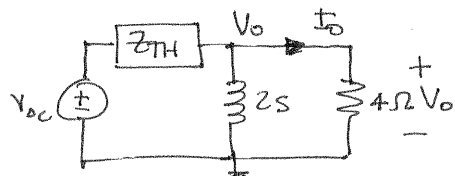
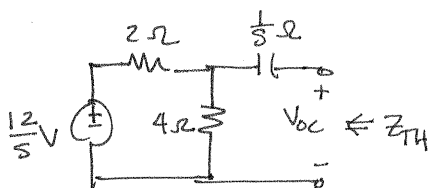


Figure P14.28

SOLUTION:

$$t=0^-, i_L(0^-) = 0 \\ v_C(0^-) = 0$$

Theremin at A-A'



$$V_{OC} = \frac{12}{s} \left( \frac{4}{6} \right) = \frac{8}{s}$$

$$Z_{TH} = \frac{1}{s} + \frac{2(4)}{6} = \frac{1}{s} + \frac{4}{3} = \frac{4s+3}{3s}$$

$$\frac{V_0 - V_{OC}}{Z_{TH}} + \frac{V_0}{4} + \frac{V_0}{2s} = 0 \quad I_0 = \frac{V_0}{4}$$

$$\text{Let } Z_1 = 2s(4)/(2s+4) = 4s/(s+2)$$

$$V_0 = V_{OC} Z_1 / (Z_1 + Z_{TH}) \Rightarrow I_0 = V_0/4 = \frac{1.5s}{s^2 + \left(\frac{11}{16}\right)s + \frac{6}{16}}$$

$$I_0 = \frac{K}{s + \frac{11}{32} - j\sqrt{\frac{263}{32}}} + \frac{K^*}{s + \frac{11}{32} + j\sqrt{\frac{263}{32}}} \quad K = 0.906 \angle 34.2^\circ$$

$$i_o(t) = 1.81 e^{-0.344t} \cos(0.507t + 34.2^\circ) u(t) \text{ A}$$