

Label the diagram with currents and voltages. Write equations to solve for the voltage across and the current through each element. Do not solve.

Devices:

$$v_8 = 8i_8$$

$$v_9 = 9i_9$$

$$v_{10} = 10i_{10}$$

$$v_{11} = 11i_{11}$$

$$v_6 = .006 \frac{di_6}{dt}$$

$$i_7 = 7 \times 10^{-6} \frac{dv_7}{dt}$$

KVL:

$$-v_8 - v_{12} - v_7 - 5 \sin 6t = 0$$

$$v_7 - v_{10} = 0$$

$$-v_9 + 5 \sin 6t + v_4 - v_6 = 0$$

$$-v_4 + v_{10} + 2t + 3 - v_{11} = 0$$

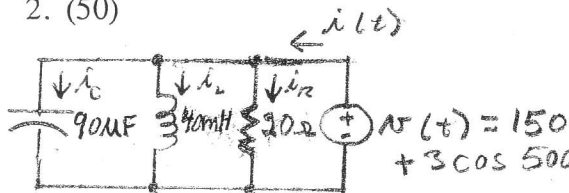
KCL: (Use any 3 nodes)

$$(A) \quad 12 + i_5 + i_6 = 0$$

$$(B) \quad -i_5 + i_7 + i_{10} - 4e^{-t} = 0$$

$$(D) \quad -i_6 + 4e^{-t} + i_{11} = 0$$

2. (50)



Find $i(t)$. At $t=0$, the current in the inductor is 8A downward.

Simplify your answer.

$$i_R = \frac{v}{R} = \frac{1}{20} [150 + 3 \cos 500t + 170 e^{-600t}] = 7.5 + .15 \cos 500t + 8.5 e^{-600t} \text{ A}$$

$$i_C = C \frac{dv}{dt} = 90 \times 10^{-6} [150 - 1500 \sin 500t - 102000 e^{-600t}]$$

$$i_C = -.135 \sin 500t - 9.18 e^{-600t} \text{ A}$$

$$i_L = \frac{1}{L} \int v(u) du + I_0 = \frac{1}{.04} \left\{ 150u + \frac{3}{500} \sin 500u - \frac{170}{600} e^{-600u} \right\}_0^t + 8$$

$$i_L = \left\{ 3750u + .15 \sin 500u - 7.0833 e^{-600u} \right\}_0^t + 8$$

$$i_L = 3750t + .15 \sin 500t - 7.0833 e^{-600t} + 7.0833 + 8 \text{ A}$$

$$i = i_R + i_C + i_L = (7.5 + 7.0833 + 8) + 3750t + .15 \cos 500t + (.15 - .135) \sin 500t + (8.5 - 9.18 - 7.08) e^{-600t}$$

$$i = 22.58 + 3750t + .15 \cos 500t + .015 \sin 500t - 7.76 e^{-600t} \text{ A}$$