Physics 116A Fall 2006 Assignment 3 Solutions
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3.15

(a) \( V(t) = i_{L}(t) \frac{dL}{dt} = 2 \frac{di}{dt} \) when \( t \leq 15 \), \( 2 \frac{di}{dt} \) when \( t > 15 \)

(b) \( V(t) = \frac{1}{2} L \frac{d^{2}i}{dt^{2}} = \frac{1}{2} \frac{d^{2}i}{dt^{2}} \) when \( t \leq 15 \), \( 0 \) when \( t > 15 \)

(c) \( P_L(t) = R \frac{d^{2}i}{dt^{2}} = \frac{1}{2} \frac{d^{2}i}{dt^{2}} \) when \( t \leq 15 \), \( 0 \) when \( t > 15 \)

(d) \( V_L(t) = \frac{d}{dt} \int_{0}^{t} V(t) dt = \frac{d}{dt} \int_{0}^{t} i_{L}(t) \frac{dL}{dt} dt = \frac{d}{dt} \int_{0}^{t} 2 \frac{di}{dt} dt \) when \( t \leq 15 \), \( 0 \) when \( t > 15 \)

(e) \( V_L(t) = V_F(t) + V_H(t) = 0 \) when \( t \leq 15 \), \( 2t \) when \( t > 15 \)

4.7

\[ i(t) = \frac{V}{R} \]

where \( R = 2 \) ohms/s

By voltage division,

\[ V_0 = \frac{\bar{V}}{5+2} \nonumber \]

where \( \bar{V} = 4.67/22.7^\circ \)

Thus,

\[ V_0(t) = 6.37 \cos(2t - 10.8^\circ) \]

Since \( \angle V_0 = -10.8^\circ > \angle V_0 \), \( V_0(t) \) leads \( V_0(t) \)

Hence, the circuit is a lead network.
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\[ \mathbf{1.42} \]

\[ \mathbf{1.45} \]

\[ \mathbf{1.46} \]

\[ \mathbf{1.25} \]

\[ \mathbf{1.26} \]