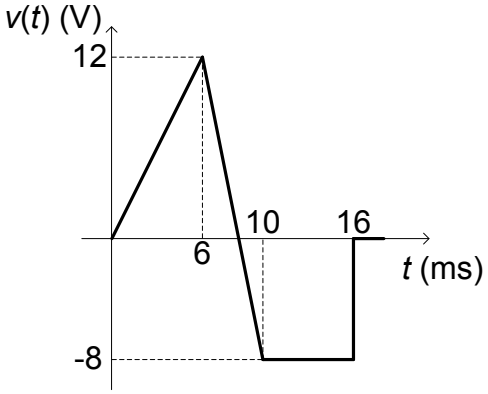
Problem Set 6 (Fall 2008)

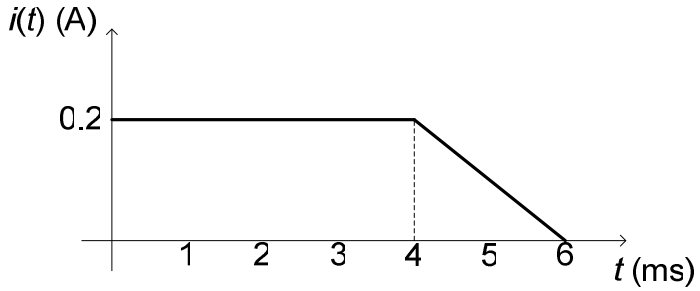
6.1 An uncharged 10μF capacitor is charged by the current $i(t) = 10\cos(10^3 t)$ mA; take $i(t<0)=0$ and $v(t<0)=0$.
a) Find the expression for the voltage across the capacitor.
b) Sketch the voltage across the capacitor.
c) Find the expression for power.
Hint: $\sin\theta\cos\theta = 1/2 \sin(2\theta)$

6.2 A capacitor is charged by a constant current of 2mA and results in a voltage increase of 5V in a 10s interval. What is the value of the capacitance?

6.3 The voltage across a 2μF capacitor is given by the waveform as shown. Find the equations for current, and sketch the current waveform.

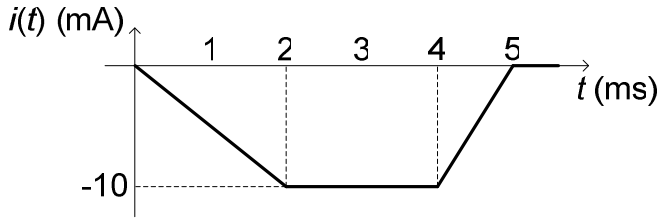


6.4 The waveform for the current in a 10μF capacitor is shown. Find the equations for the voltage across the capacitor and sketch the voltage waveform. Assume $v(t<0)=-0.1$ V.

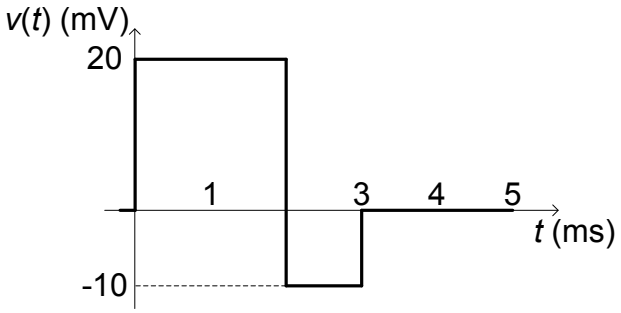


6.5 The current in an inductor changes linearly from 0 to 100mA in 2ms, and induces a voltage of 100mV. What is the value of the inductor?

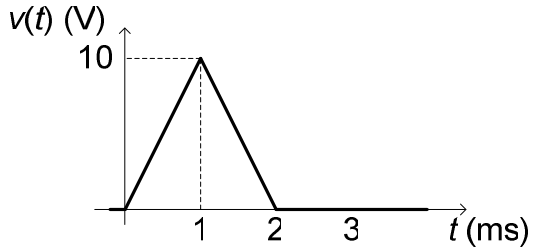
6.6 The current in a 10mH inductor is shown below. Find the voltage across the inductor.



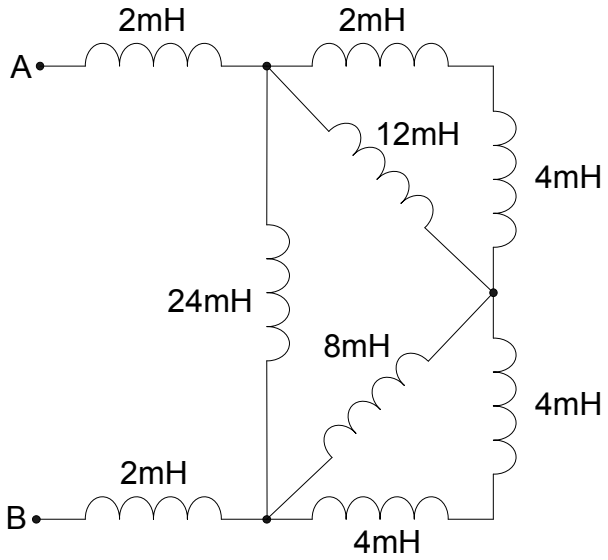
6.7 The waveform for the voltage across a 20mH inductor is shown. Compute the waveform for the inductor current. Sketch the graph of the current. Use i(t<0)=0A.



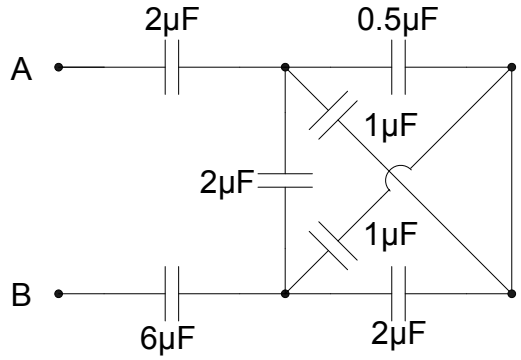
6.8 The voltage across a 10mH inductor is shown. Determine the waveform for the inductor current. Use i(t<0)=-0.4A.



6.9 Determine the inductance between terminals A and B in the network.



6.10 Determine the capacitance between A and B.



TAs:

$$i = C\frac{dv}{dt} \qquad v = L\frac{di}{dt}$$

$$v(t_2) - v(t_1) = \frac{1}{C}\int_{t_1}^{t_2} i\,dt \qquad i(t_2) - i(t_1) = \frac{1}{L}\int_{t_1}^{t_2} v\,dt$$

Please use the above expressions for the i-v relationships in C and L when helping our students.