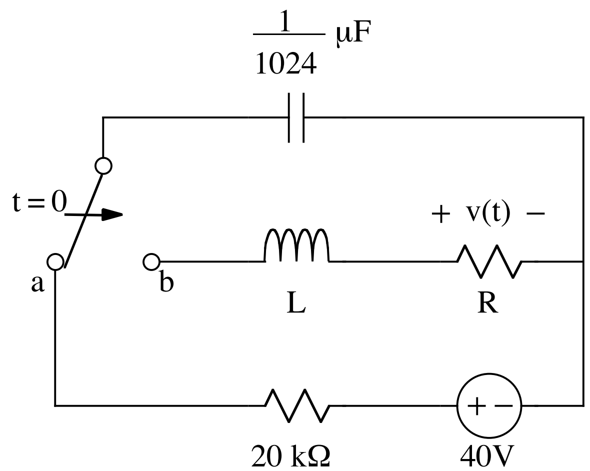
ECE 2270
F 06

HOMEWORK #9

THE UNIVERSITY OF UTAH

1.

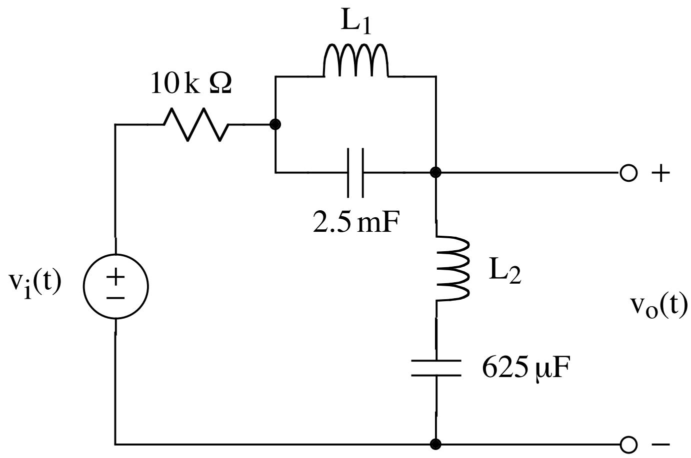


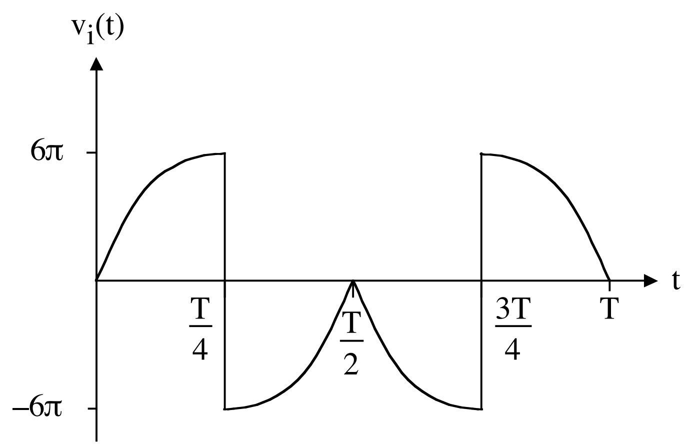
In the above circuit, the switch moves from a to b at t = 0.

Find values of R and L such that the roots of the characteristic equation of the circuit for $t > 0$ are $s_1 = -8\,k$ rad/s and $s_2 = -512\,k$ rad/s.

2. Given that no energy is stored in the inductor at time t = 0 for the circuit in problem 1, find a numerical expression for v(t) for $t > 0$.

3.





T = one period of $v_i(t) = 2\pi/60$ s

$$v_i(t) = \begin{cases} 6\pi \sin(\omega_0 t) \text{ V} & 0 < t \le T/4 \\ -6\pi \sin(\omega_0 t) \text{ V} & T/4 < t \le T/2 \\ 6\pi \sin(\omega_0 t) \text{ V} & T/2 < t \le 3T/4 \\ -6\pi \sin(\omega_0 t) \text{ V} & 3T/4 < t \le T \end{cases}$$

Find values of L_1 and L_2 for the above filter circuit such that the transfer function equals zero for the sixth harmonic and zero for the twelfth harmonic of $v_i(t)$, also shown above. Note: the answer is not unique.

4. Find numerical values of coefficients a_v, a_1, a_2, b_1, and b_2 for the Fourier series for $v_i(t)$ in problem 3:

$$v_i(t) = a_v + \sum_{k=1}^{\infty} a_k \cos(k\omega_0 t) + b_k \sin(k\omega_0 t)$$