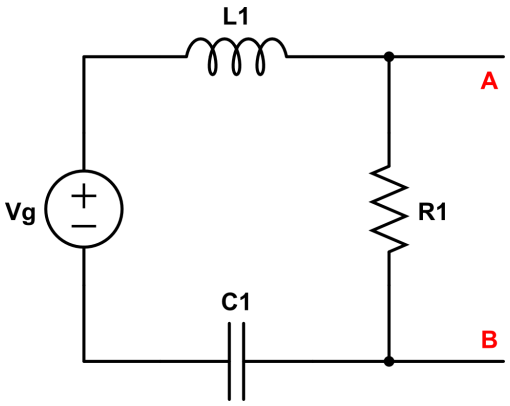
Question 1 [15]

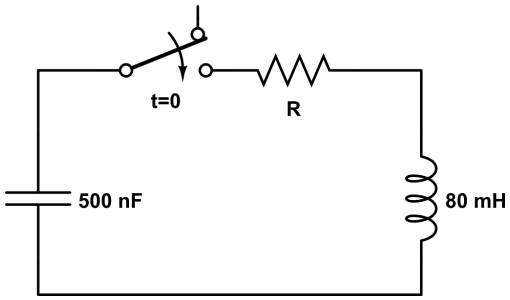
Use source transformation to find the Thevenin equivalent with respect to terminals A and B for the circuit below, if:

- $V_g = 240\angle 0°$
- $L_1 = j60\Omega$
- $C_1 = -j48\Omega$
- $R_1 = 36\Omega$



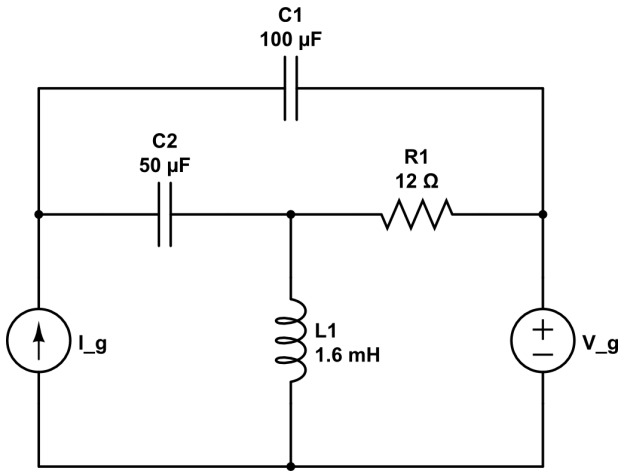
Question 2 [15]

Find the value of R that makes the below circuit Critically Damped.



Question 3 [15]

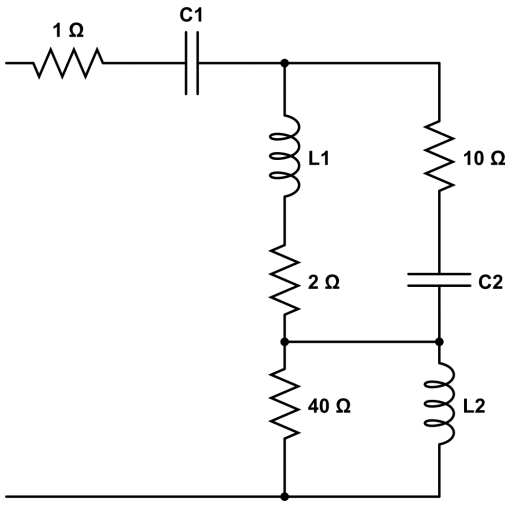
Use the Node-Voltage method to find the matrix representation of V_1 and V_2 if $i_g = 5\cos(2500t)A$ and $v_g = 20\cos(2500t + 90°)V$. You do NOT need to solve for V_1 and V_2, nor reduce the matrix to reduced row echelon form.



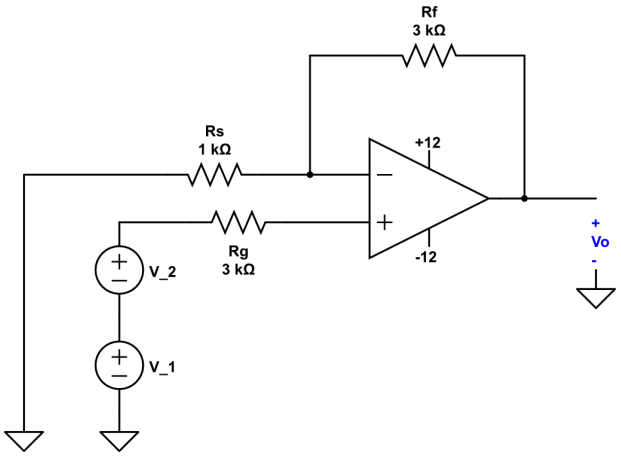
Question 4 [15]

Find Z_{eq} for the circuit below if

- $L_1 = j4\Omega$
- $L_2 = j20\Omega$
- $C_1 = -j8\Omega$
- $C_2 = -j20\Omega$



Question 5 [20]



(a) What are the three Ideal Op Amp assumptions and their implications to voltages and currents in the circuit?

(b) For the Op Amp Circuit above, use Kirchhoff's Laws to derive the gain.

(c) If $v_1 = 1V$ and $v_2 = 3 * \cos\left(\frac{\pi}{2}t\right)$, draw a graph of v_o. Show at least two periods of the output.

Question 6 [20]

The two switches in the below circuit are synchronized. When the Switch 1 opens, Switch 2 closes, and vice versa. Switch 1 has been open for a long time before closing at $t = 0$. Find $i_L(t)$ for $t \geq 0$.