Midterm Review

1. Hambley P3.70

For the circuit in fig. 1, **determine** $i(t)$**,** $v_L(t)$**,** $v(t)$**, the energy stored in the capacitance, the energy stored in the inductance, and the total stored energy**, given that $v_C(t) = 40\cos(1000t)$ V. (The argument of the cosine function is in radians.)

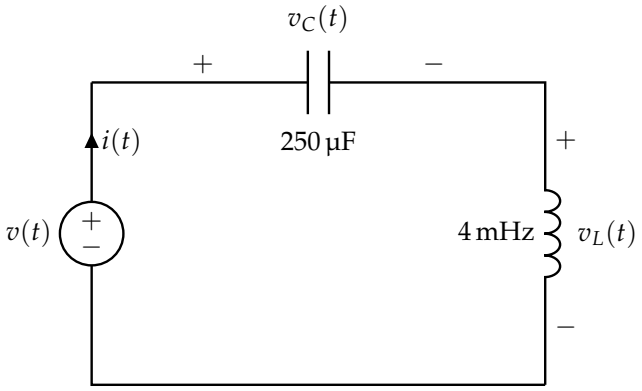

Figure 1

Show that the total stored energy is constant with time. Comment on the results.

2. Hambley P4.34

Consider the circuit shown in fig. 2. The initial current for $i_L(0_-) = 0$.

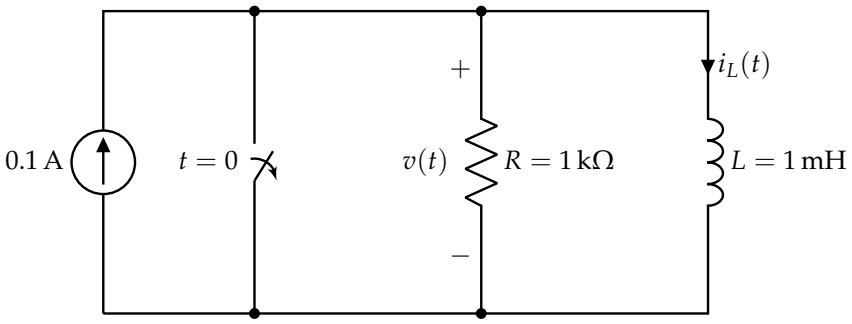

Figure 2: RL Circuit

Find expressions for $i_L(t)$ and $v(t)$ for $t \geq 0$ and qualitatively sketch to scale versus time.

3. Hambley P5.85

Suppose you are given the following two terminal circuit in fig. 3.

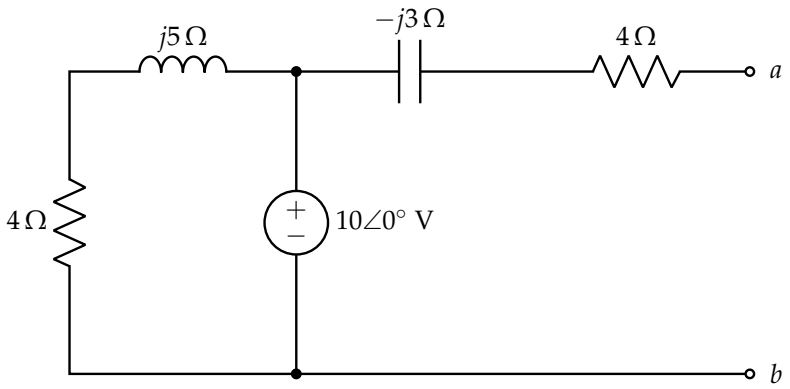

Figure 3: Two Terminal Circuit

Find the Thevenin voltage, Thevenin impedance, and Norton current for the cirucit.

4. Hambley P6.57

The circuit shown fig. 4 has $R_1 = R_2 = 2\,\text{k}\Omega$ and $C = \frac{1}{\pi}\,\mu\text{F}$.

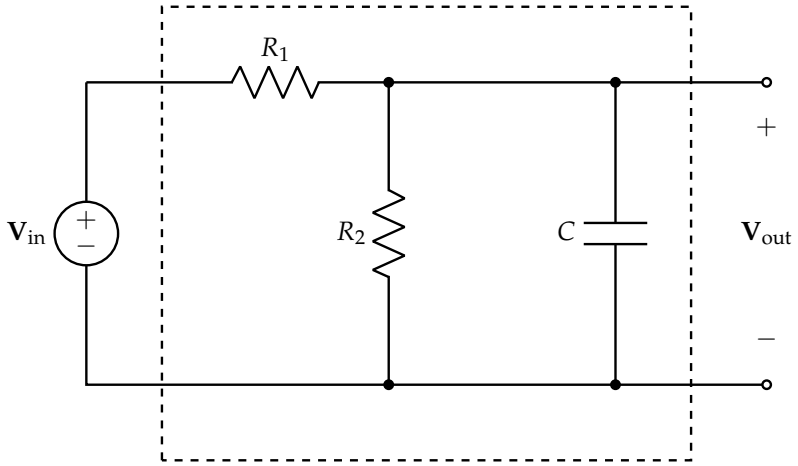

Figure 4

Solve for the transfer function $H(f) = \frac{\mathbf{V}_{\text{out}}}{\mathbf{V}_{\text{in}}}$, calculate the half-power frequency, and analyze the magnitude and phase of $H(f)$ as $f \to 0$ and $f \to \infty$.

5. Hambley P6.82

Consider the parallel resonant circuit shown in fig. 5.

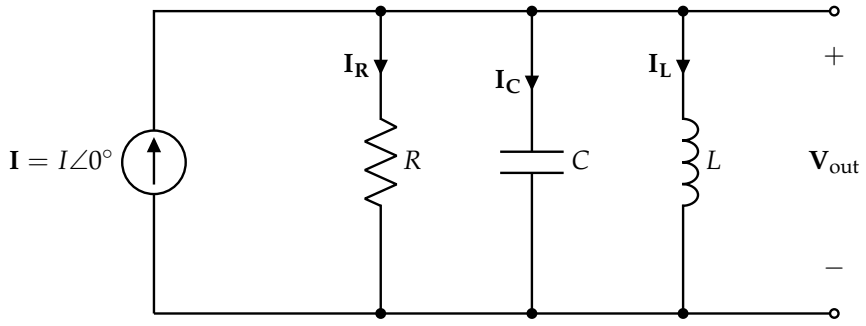

Figure 5: Parallel Resonant Circuit

Determine the L and C values, given $R = 2\,\text{k}\Omega$, $f_0 = 8\,\text{MHz}$, and $B = 500\,\text{kHz}$. Then draw a phasor diagram showing the currents through each of the elements in the circuit at resonance given that $\mathbf{I} = 10^{-3}\angle 0°$.