Due in class, Thursday 28 March

**Problem 1**

The circuit drawn below is excited by a sinusoidal voltage source operating at 2 MHz with 5-V peak-to-peak amplitude. Find $v_o(t)$ in the sinusoidal steady state.

![Circuit Diagram]

**Problem 2**

You have a circuit that is modeled as a resistor and inductor in series, but you do not know the values of $R$ and $L$. When you place a 10-kHz sinusoidal voltage source with 2-V amplitude across the circuit, the measured current amplitude is 8.690 mA. When you lower the test frequency to 6 kHz, the observed current is out of phase by $-51.2^\circ$. What are the values for $R$ and $L$?
Problem 3

Design a first-order low-pass filter with -28 dB attenuation at 300 kHz.

Problem 4

Design a first-order high-pass filter with 8 dB gain in the pass band and 30° phase shift at 75 kHz.

Problem 5

Design a second-order RLC low-pass filter with 80-kHz cutoff and $Q = 0.707$.

Problem 6

The circuit drawn below is the ac model for a MOSFET tuned amplifier. Complete the design so that

- The maximum voltage gain ($v_o/v_i$) is -25.
- The center frequency for maximum voltage gain is 80 MHz.
- The bandwidth is 15 MHz.

Assume $g_m = 5 \times 10^{-3}$ $\Omega$.

![Diagram of the circuit](image-url)