1. Design a **RC** lowpass filter using the circuit in Fig. P 13.2-1 (p. 643) with the following modifications: change the resistor units from ohms to kohms and the capacitor unit from farads to nanofarads. (a) What is the expression for the transfer function \( H(\omega) = \frac{V_o}{V_i} \) in standard form? What is \( K_{dB} \)? **List the values for any poles or zeros in Hz.** (b) Use B²SPICE and make a Bode plot of \( |H(f)|_{dB}=\frac{V_o}{V_s}_{dB} \). The range of frequency should be from 0.1*(lowest pole or zero) to 10*(highest pole or zero), not including \( f = 0 \) Hz. Assume the magnitude of the source voltage is 1 V.

2. For the given figure on the right, let \( R_1=10k\Omega \), \( R_2=20k\Omega \), and \( C_1=1\mu F \). Use B²SPICE to make a Bode plot of the response \( |H(f)|_{dB}=|V_o/V_s|_{dB} \). The range of the Bode plot should be \( 0.1 \leq f \leq 200 \) Hz.

3. Design a series **RLC** circuit that will have an impedance of 10 \( \Omega \) at a resonant frequency of 30 krad/s and a quality factor of 60. Specify your \( R, L, C \). If driven with a 1 volt source, use B²SPICE to make a plot of the magnitude of the transfer function \( H(f) = \frac{V_o(f)}{V_s} \) where \( V_o \) is the voltage across the resistor. Use linear rectangular grids (not semilog) for the plot. Use the frequency in Hz on the horizontal axis and linear magnitude on the vertical axis. The range of the plots should be \( f_o - 5B \leq f \leq f_o + 5B \) where \( B \) is the bandwidth in Hz. Use enough points for the curves to be smooth.