1. Design an inverting bandpass op amp amplifier/filter (Figure 1) with a midband voltage gain with a magnitude of 7.3, a lower $-3\text{db}$ frequency of 73 Hz, and an upper $-3\text{db}$ frequency of 23 kHz. The circuit shown in Fig. 1 is suggested. Pick the capacitor $C_1 = 0.22\,\mu\text{F}$ and compute the other components. Perform an ac analysis with LTSpice and Multisim to plot the magnitude of the voltage gain as a function of frequency as the frequency ranges from one tenth of the lower critical frequency to ten times the highest. Assume that the op amp is ideal. Also, plot the Bode plots with both Matlab and Mathcad.

2. Design an op amp noninverting high pass shelving amplifier/filter (Figure 2). The dc gain is to be 1, the infinite frequency gain 7.3, and the pole frequency 43 kHz. The circuit shown in Fig. 2 is suggested. Pick $C_1 = 0.022\,\mu\text{F}$ and solve for the other circuit components. Perform the same analyses as for the circuit in Problem 1.