EE304 – Problem Set 6

Problem 11.97 [S&S 7/e]

11.97 An amplifier has a dc gain of 10^4 and poles at 10^5 Hz, 3.16×10^5 Hz, and 10^6 Hz. Find the value of β, and the corresponding closed-loop gain, for which a phase margin of 45° is obtained.

Recall: PM = 180 – |phase[L($j\omega_u$)]|

Problem 17.2 [S&S 7/e]

17.2 A sinusoid with 1-V peak amplitude is applied at the input of a filter having the transfer function

$$T(s) = \frac{2\pi \times 10^4}{s + 2\pi \times 10^4}$$

Find the peak amplitude and the phase (relative to that of the input sinusoid) of the output sinusoid if the frequency of the input sinusoid is (a) 1 kHz, (b) 10 kHz, (c) 100 kHz, and (d) 1 MHz.

Problem 17.14 [S&S 7/e]

***17.14** Analyze the RLC network of Fig. P17.14 to determine its transfer function $V_o(s)/V_i(s)$ and hence its poles and zeros. (*Hint:* Begin the analysis at the output and work your way back to the input.)

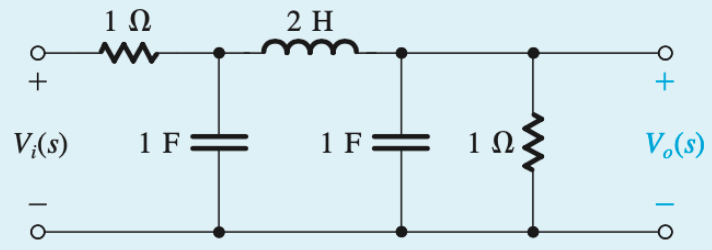


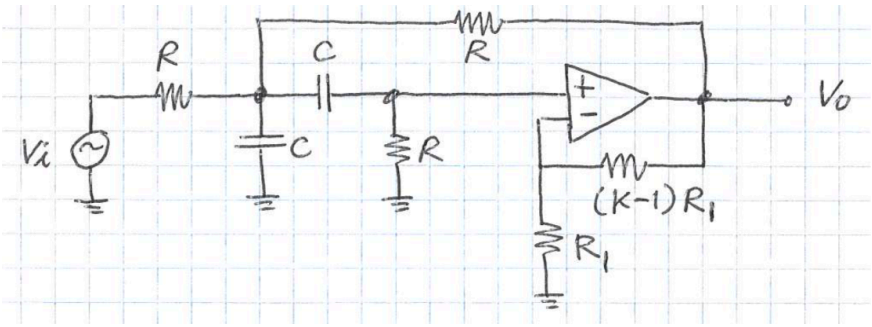
Figure P17.14

Problem 17.37 [S&S 7/e]

17.37 Find the transfer function of a second-order bandpass filter for which the center frequency $f_0 = 10$ kHz, the 3-dB bandwidth is 500 Hz, and the center-frequency gain is 10. Also, give the locations of the poles and zeros.

Problem

Given the following biquadratic filter:



Derive:

(a) The transfer function T(s) = Vo(s)/Vi(s).
Write the transfer function in a format that make it easy to tell what are the values of a_0, a_1, a_2, ω_0/Q and Q
(b) What are the values of a_0, a_1, a_2, ω_0 and Q?
(c) What type of filter does the circuit implement?
(d) What is the max value of |T|?
(e) For what values of K does the circuit become unstable?