10.6 Use the bilinear transformation to convert the analog filter with system function

$$H(s) = \frac{s + 0.1}{(s + 0.1)^2 + 9}$$

into a digital IIR filter. Select $T = 0.1$ and compare the location of the zeros in $H(z)$ with the locations of the zeros obtained by applying the impulse invariance method in the conversion of $H(s)$.

10.7 Convert the analog bandpass filter designed in Example 10.4.1 into a digital filter by means of the bilinear transformation. Thereby derive the digital filter characteristic obtained in Example 10.4.2 by the alternative approach and verify that the bilinear transformation applied to the analog filter results in the same digital bandpass filter.

10.8 A z-plane pole–zero plot for a certain digital filter is shown in Fig. P10.8. The filter has unity gain at dc.

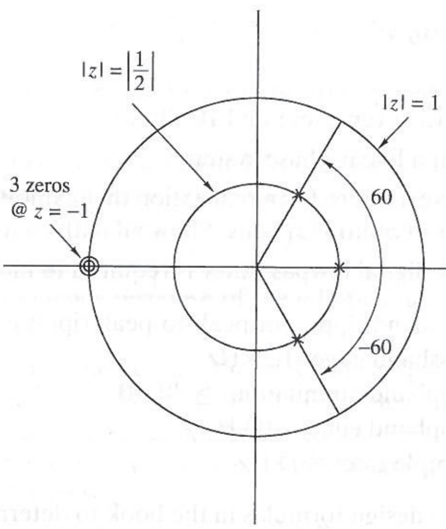

Figure P10.8

(a) Determine the system function in the form

$$H(z) = A\left[\frac{(1 + a_1 z^{-1})(1 + b_1 z^{-1} + b_2 z^{-2})}{(1 + c_1 z^{-1})(1 + d_1 z^{-1} + d_2 z^{-2})}\right]$$

giving numerical values for the parameters A, a_1, b_1, b_2, c_1, d_1, and d_2.

(b) Draw block diagrams showing numerical values for path gains in the following forms:

(a) Direct form II (canonic form)

(b) Cascade form (make each section canonic, with real coefficients)