# 5.1

For each of the following system function, state whether or not it is a minimum-phase system. Justify your answers:

# 5.2

Let denote the impulse response of an ideal lowpass filter with unity passband gain and cutoff frequency . Figure 5-1 shows five system, each of which is equivalent to an ideal LTI frequency-selective filter. For each system shown, sketch the equivalent frequency response, indicating explicitly the band-edge frequencies in terms of . In each case, specify whether the system is a lowpass, highpass, bandpass, bandstop, or multiband filter.

(a)

(b)

(c)

(d)

2

2

(e)

Figure 5-1

# 5.3

A causal linear time-invariant discrete-time system has system function

1. Find expressions for a minimum-phase system and an all-pass system such that
2. Find expressions for a different minimum-phase system and a generalized linear-phase FIR system such that

# 5.4

In this problem, you will consider three different LTI systems. All three are causal and have real impulse responses. You will be given additional information about each system. Using this information, state as much as possible about the poles and zeros of each system function and about the length of the impulse response of the system.

1. has a pole at , and when , .
2. has a zero at , has linear phase and group delay with , and.
3. has a pole at , and for all .