3.46 Determine the expression for the frequency response of each of the LTI discrete-time systems of Figure 2.35 in terms of the frequency responses $H_i(e^{j\omega})$, $1 \le i \le 4$, of the individual blocks.

3.65 An FIR filter of length 3 is defined by a symmetric impulse response; that is, $h[0] = h[2]$. Let the input to this filter be a sum of two cosine sequences of angular frequencies 0.3 rad/samples and 0.6 rad/samples, respectively. Determine the impulse response coefficients so that the filter passes only the low-frequency component of the input.

3.79 Determine the expressions for the group delay of each of the LTI systems whose frequency responses are given below.

(a) $H_a(e^{j\omega}) = a + be^{-j\omega}$, (b) $H_b(e^{j\omega}) = \frac{1}{1+ce^{-j\omega}}$, (c) $H_c(e^{j\omega}) = \frac{a+be^{-j\omega}}{1+ce^{-j\omega}}$, $|c| < 1$,

(d) $H_b(e^{j\omega}) = \frac{1}{(1+ce^{-j\omega})(1+de^{-j\omega})}$, $|c| < 1$, $|d| < 1$.

M 3.8 Write a MATLAB program to simulate the filter designed in Problem 3.65, and verify its filtering operation.

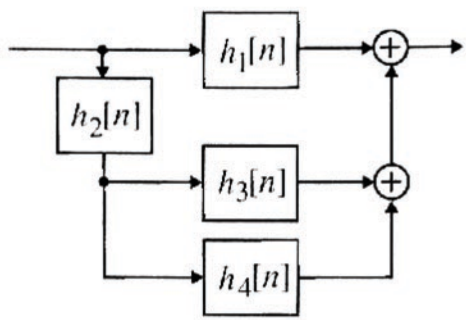

Figure 2.35: The discrete-time system of Example 2.35.

$$h_1[n] = \delta[n] + \tfrac{1}{2}\delta[n-1], \qquad h_2[n] = \tfrac{1}{2}\delta[n] - \tfrac{1}{4}\delta[n-1],$$

$$h_3[n] = 2\delta[n], \qquad h_4[n] = -2\left(\tfrac{1}{2}\right)^n \mu[n].$$