

```
disp('Second-order structures coefficients:'); disp(sos);
disp('Gain g:'); disp(g);
```

In the MATLAB command window:

```
Second-order structures coefficients:
   1         *        -1         1         0         0
   1  -837/1858   1/16         1         0         0
Gain g:  1
```

The cascade implementation is illustrated in Fig. 11.12.

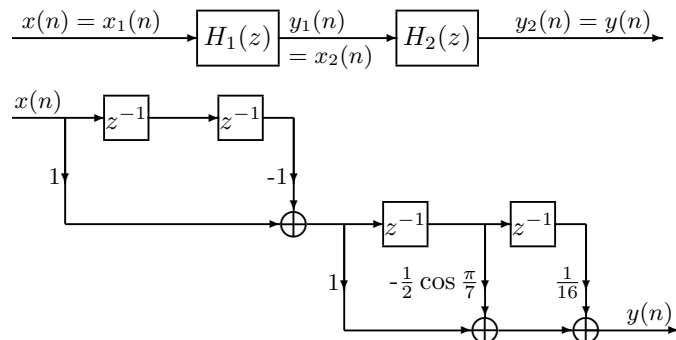


Figure 11.12: Cascade-form realization of the given FIR system

11.4 Exercises

1. Synthesize and draw the structures corresponding to the direct-form, cascade and lattice implementation, respectively. Next FIR systems are considered:

$$H_1(z) = 1 - \frac{5}{6}z^{-1} + \frac{1}{6}z^{-2} - \frac{1}{8}z^{-3};$$

$$H_2(z) = 0.5 + 0.2z^{-1} - 0.3z^{-2} + z^{-3};$$

$$H_3(z) = (1 - 2z^{-1}) \left(1 - 0.8e^{j\frac{\pi}{6}}z^{-1}\right) \left(1 - 0.8e^{-j\frac{\pi}{6}}z^{-1}\right);$$

$$H_4(z) = 1 - 1.27z^{-1} + 1.19z^{-2} + 1.18z^{-3} + 0.4z^{-4}.$$

2. Sketch the block diagram for the direct-form realization and the frequency-sampling realization of the $M = 32$, $\alpha = 0$, linear-phase (symmetric) FIR filter which has frequency samples:

$$H\left(\frac{2\pi k}{32}\right) = \begin{cases} 1, & k = \overline{0, 2} \\ \frac{1}{4}, & k = 3 \\ 0, & k = \overline{4, 15} \end{cases}$$

Compare the computational complexity of these two structures.