

T-61.3010 Digital Signal Processing and Filtering

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The problems marked with [Pxx] are from the course exercise material (Spring 2009), where Pxx refers to the problem.

In the end of this session you should know: (a) how to find out transfer function of “any block diagram”, and (b) what are direct form (DF) structures.

- [P62] Derive the transfer function of the feedback system shown in Figure 1.

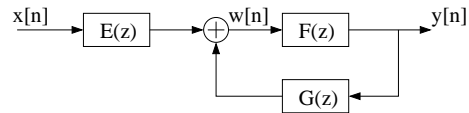


Figure 1: System in Problem 1.

- [P64] Analyze the digital filter structure shown in Figure 2 and determine its transfer function $H(z) = Y(z)/X(z)$.
 - Is the system LTI?
 - Is the structure canonic with respect to delays?
 - Compute $H(z)H(z^{-1})$ (the squared amplitude response). What is the type of this filter (lowpass/highpass/bandpass/bandstop/allpass)?

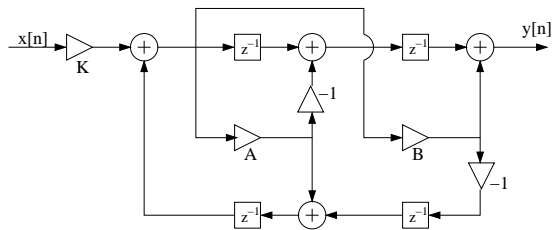


Figure 2: The flow diagram of the system in Problem 2.

- [P63] The filter in Figure 3 is in canonic direct form II (DF II). Draw it in DF I. What is the transfer function $H(z)$?

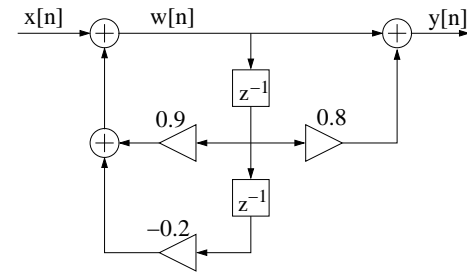


Figure 3: The block diagram of direct form II of Problem 3.