Digital Signal Processing/Processamento Digital de Sinais

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Tutorial Questions/Lista de Exercícios - 6

1. Show that a sub-sampler is a discrete time-varying system.

2. Determine the output y[n] as a function of the input x[n] of the system shown in the block diagram below.

v[n]

vu[n]

x[n]

↑2

↓2↑

wu[n]

w[n]

↑2

↓2↑

$$z^{-1}$$

y[n]

$$z^{-1}$$

3. Consider the filter banks shown in the block diagram below.

y[n]

G0[z]↑

H0[z]↑

x[n]

G1[z]

H1[z]↑

a) Determine the input-output relation of the structure above.

Consider the filters $H\_{0}\left[z\right]=\frac{1+z^{-1}}{2}$ e $H\_{1}\left[z\right]=\frac{1+z^{-1}}{2}$

b) Determine the synthesis filters G0[z] and G1[z] to ensure that the above structure has perfect reconstruction, i.e., y[n] = x[n-d] where d is a positive integer.