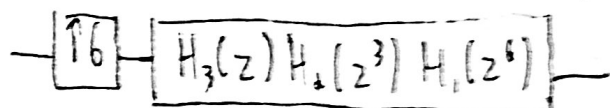


DSP HW 67

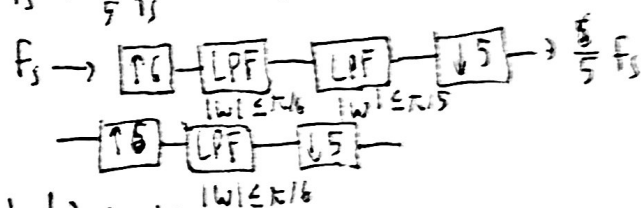
Ivan Chowdhury

1) $(H_1(z^6) H_2(z^3) H_3(z)) (16)$



2) a) 10 kHz

b) ~~120 kHz~~ $f_s \rightarrow \frac{6}{5} f_s$



c) 120 kHz

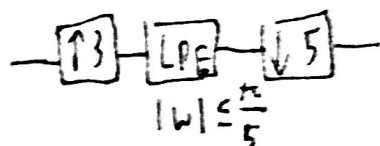
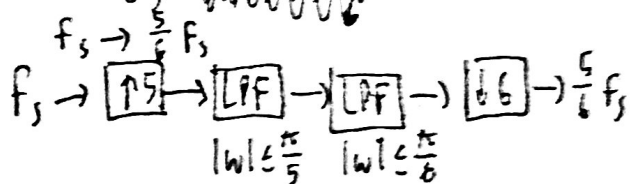
d) $\omega = \frac{2\pi f}{f_s} = \frac{\pi}{6} \text{ rad}$

$f = \frac{1}{12} f_s = \frac{120}{12} = 10 \text{ kHz}$

e) It doesn't lead to a loss of info, because the input is limited to 10 kHz

3) a) 12 kHz

b) ~~120 kHz~~



c) 24 kHz = 120 kHz

d) 10 kHz

e) Yes, it leads to a loss of info, because frequencies from 10-12 kHz are eliminated.

$$4) b) w_0[n] = \frac{1}{2}(h_0[n] * x[n] + (-1)^n h_0[n] * x[n])$$

$$w_1[n] = \frac{1}{2}(h_1[n] * x[n] + (-1)^n h_1[n] * x[n])$$

$$Y[n] = f_0[n] * w_0[n] + f_1[n] * w_1[n]$$

$$f_0[n] * \frac{1}{2}(h_0[n] * x[n] + h_0[n] * (-1)^n x[n])$$

$$\frac{1}{2}((f_0[n] * h_0[n] + f_1[n] * h_1[n]) * x[n] + (f_0[n] * h_0[n] + f_1[n] * h_1[n]) * (-1)^n x[n])$$

$$\frac{1}{2} \frac{f_0[n] * h_0[n] + f_1[n] * h_1[n]}{2}$$

$$G[n] = \frac{1}{2} (f_0[n] * h_0[n] (-1)^n + f_1[n] * h_1[n] (-1)^n)$$

$$\Rightarrow \begin{cases} C = 2 \\ N = 1 \end{cases}$$