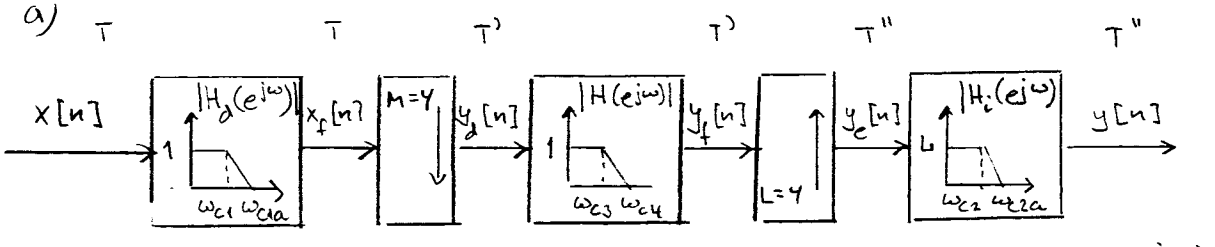
Opg 1

a)



$X(e^{j\omega})$ $X_f(e^{j\omega})$ $X_d(e^{j\omega})$ $Y_f(e^{j\omega})$ $Y_e(e^{j\omega})$ $Y(e^{j\omega})$

$\omega_{c1} = \frac{\pi}{4}$

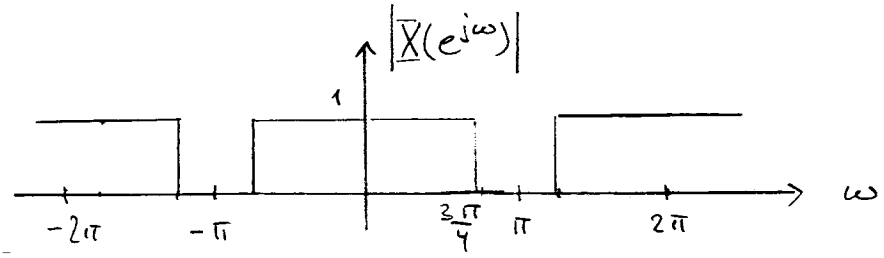
$\omega_{c1a} = \frac{3\pi}{8}$

$\omega'_{c3} = \frac{3\pi}{8}$

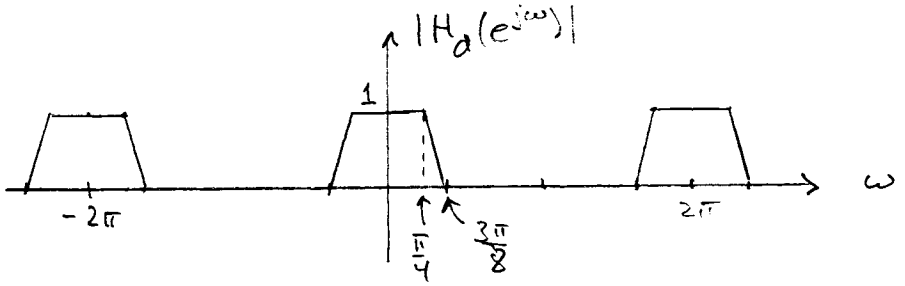
$\omega'_{c4} = \frac{\pi}{2}$

$\omega''_{c2} = \frac{\pi}{4}$

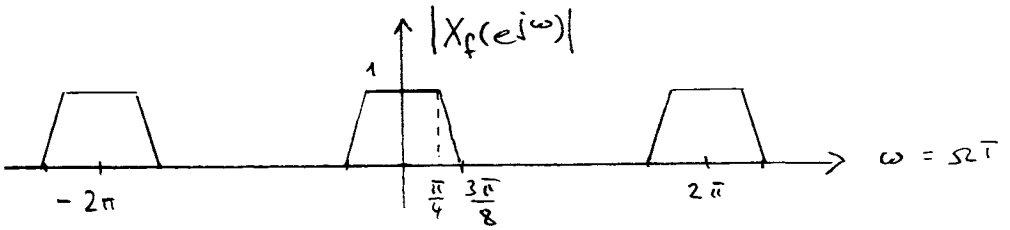
$\omega''_{c2a} = \frac{3\pi}{8}$

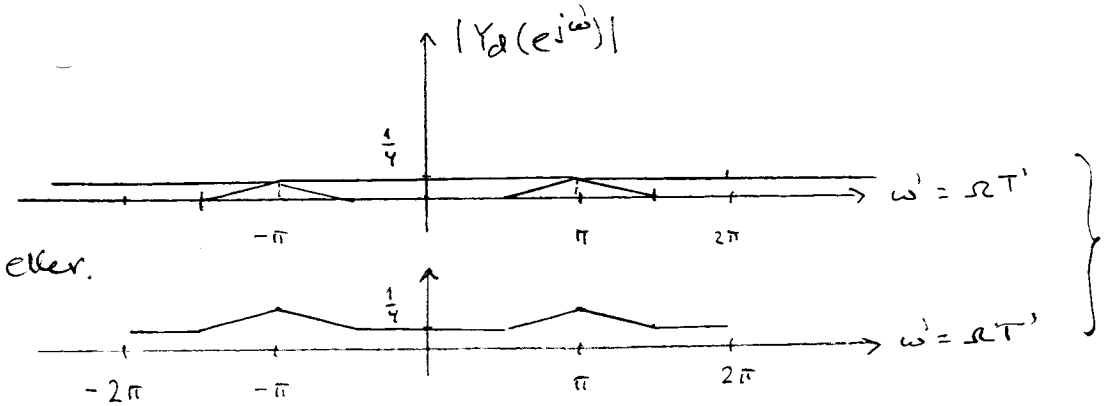


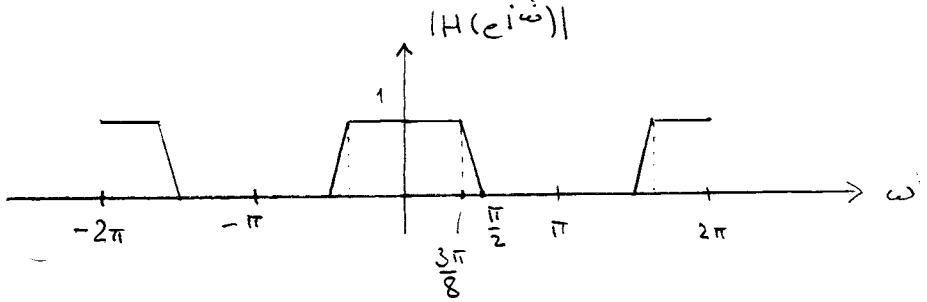
Der skal egentlig kun tegnes for $0 < \omega < 2\pi$.



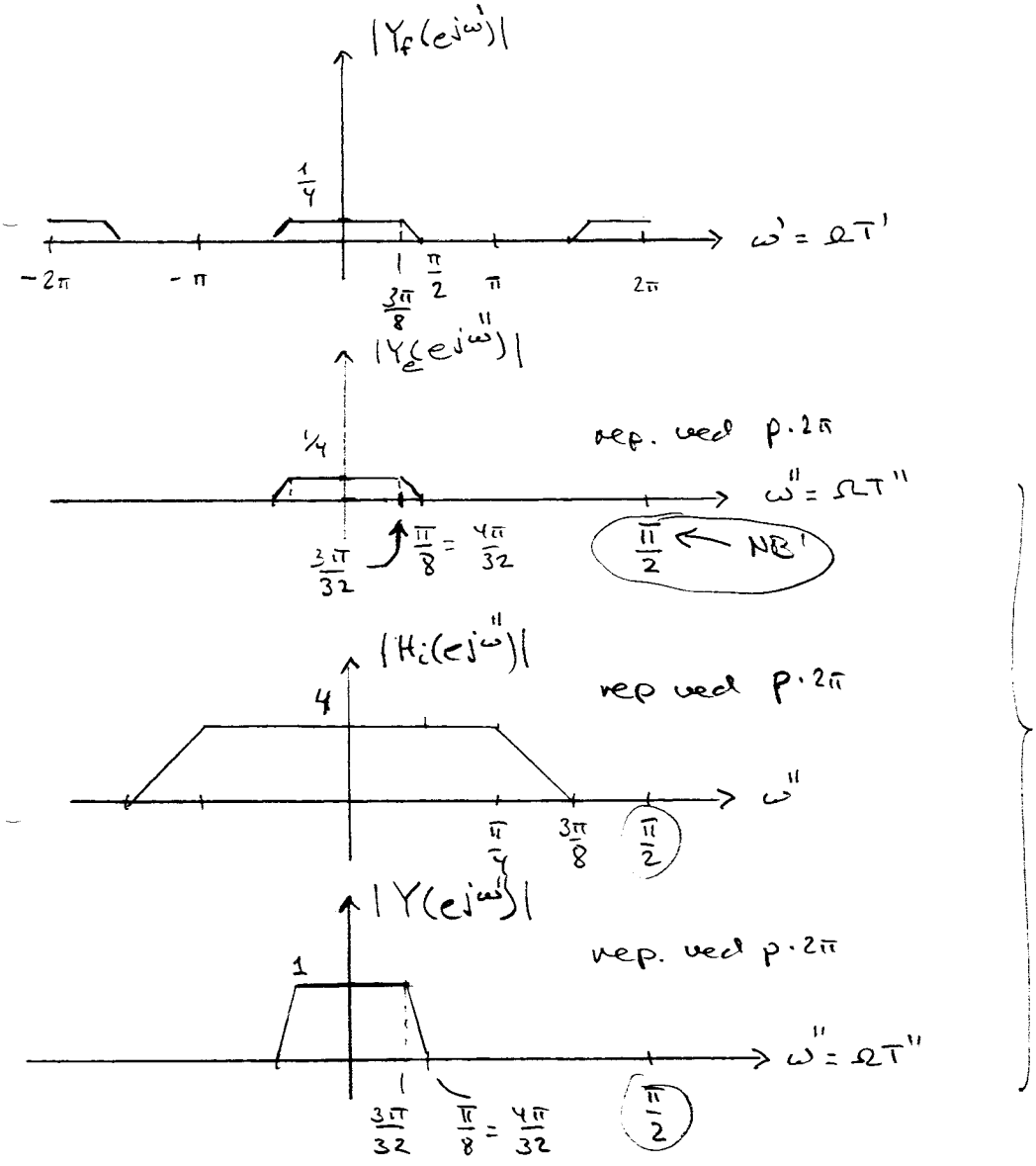
1' filter







2' filter



OBS!

Ny tegne-målestok

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b) $H_d(z)$ og $\downarrow 4$ kan kun ombygges, hvis $H_d(z)$ kan omskrives til et polyfasefilter:

$$H_d(z) = E_0(z^4) + E_1(z^4)\,z^{-1} + E_2(z^4)\,z^{-2} + E_3(z^4)\,z^{-3}$$

for at kunne anbringes efter nedsamplingen som

$$E_0(z) + E_1(z)\,z^{-1} + E_2(z)\,z^{-2} + E_3(z)\,z^{-3}$$

Dette er i hvert fald muligt, hvis $H_d(z)$ er et FIR-filter.

Filtrering efter nedsampling har generelt den virkning, at der er M gange så lang tid til beregningerne (læs multiplikationerne).