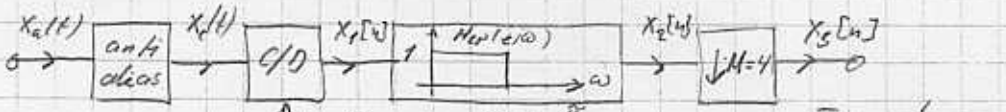
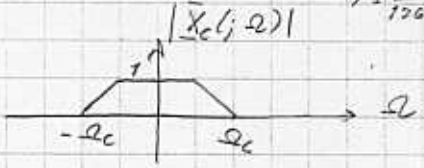
i-sig2 - locs - ops 1 - 09.06.00

Opg 1

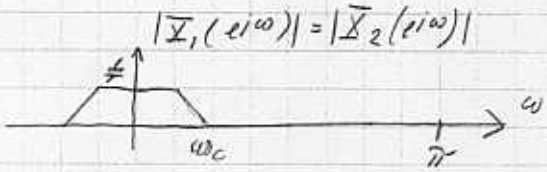


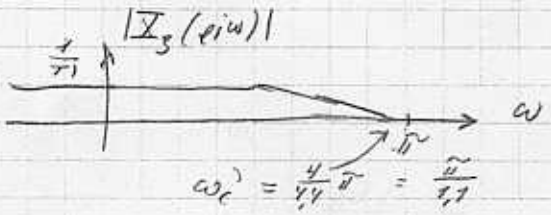


$\Omega_c = 2\pi\, 20.000\ s^{-1}$

a)

$\frac{1}{T} = 176\,kHz$ $\qquad$ $\frac{1}{T_1} = 44\,kHz$

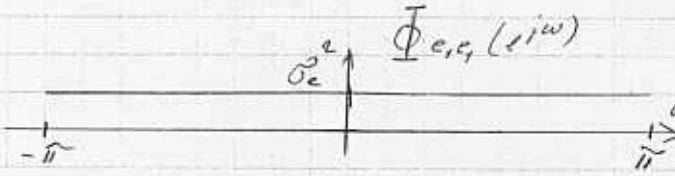


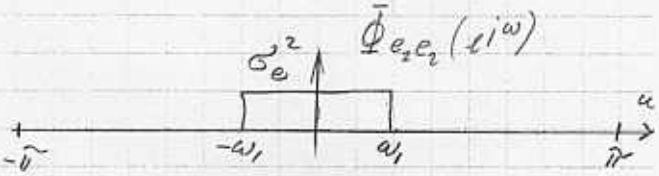


$\omega_c = \Omega_c T = \frac{2\pi\, 20.000}{176.000}$

$\omega_c = \frac{\pi}{4,4}$

b)





$\sigma_e^2 = \frac{\Delta^2}{12} = \frac{2^{-30}}{12}$

$\omega_1 = \Omega_1 T = \frac{2\pi\, 22000}{176000} = \frac{\pi}{4}$

c)

$$P_{e1} = \frac{1}{2\pi}\int_{-\pi}^{\pi} \sigma_e^2\, d\omega = \sigma_e^2 \qquad P_{e2} = \frac{1}{2\pi}\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sigma_e^2\, d\omega = \frac{1}{4}\sigma_e^2$$

$$SNR_1 = 10\log\left(\frac{P_1}{P_{e1}}\right) = 10\log\left(\frac{12\cdot 0{,}25}{2^{-30}}\right) = 95\ dB$$

$$SNR_2 = 10\log\left(\frac{P_1}{P_{e2}}\right) = 10\log\left(\frac{4\cdot 12\cdot 0{,}25}{2^{-30}}\right) = 101\ dB$$

d)

Antialiasrings filtrets flanke stejlhed kan være ca. M gange mindre

SNR ved $x_3[n]$ er $10\log(M)$ større ved oversampling end uden.