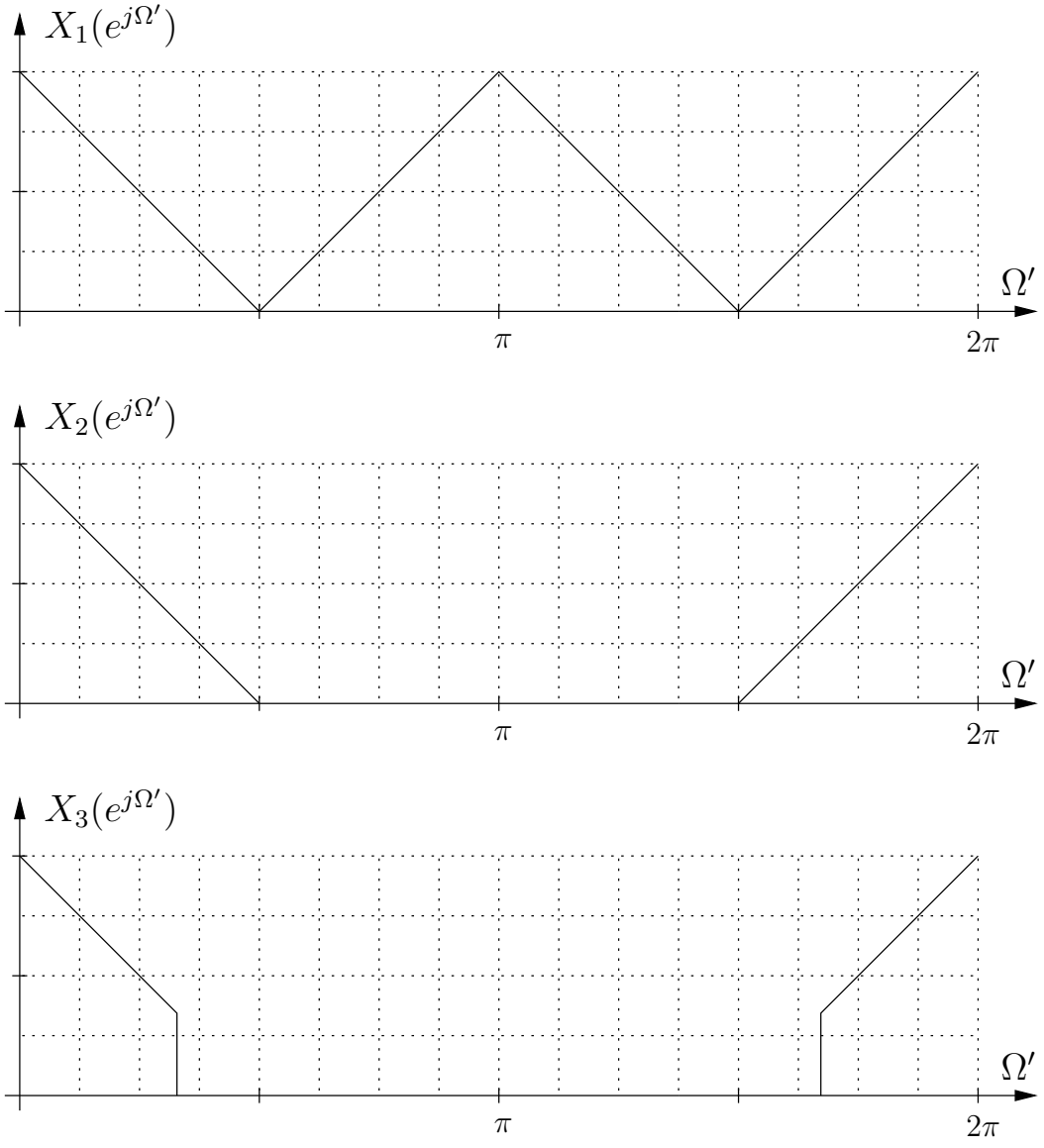
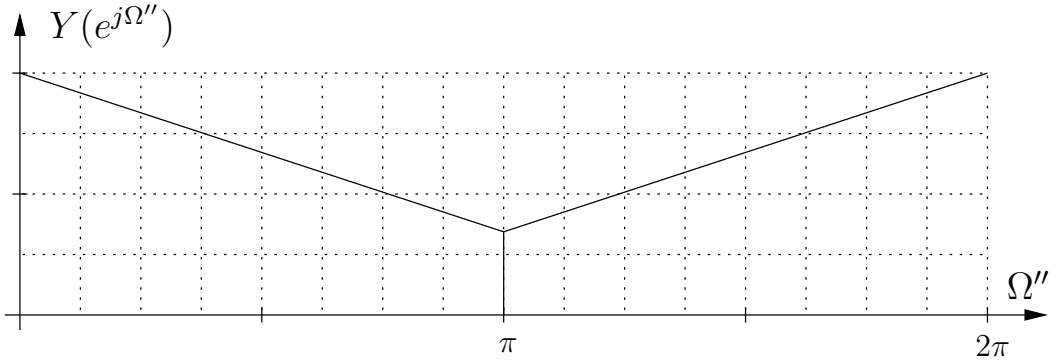
Musterlösung zur Klausur „Digitale Signalverarbeitung“ 9.10.2008

Aufgabe 1

a.)

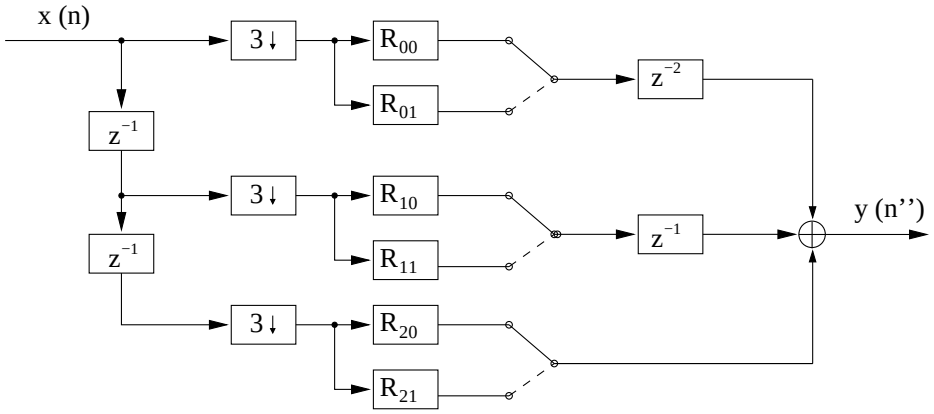




b.) $\Omega'_{g3} = \frac{\pi}{3}$

c.) $f'_s = 48$ kHz
$f''_s = 16$ kHz

d.)



Aufgabe 2

a.) $\delta_p = 0.05$
$\delta_{st} = 0.005$
$\Omega_p = 0.6\pi$
$\Omega_{st} = 0.8\pi$

b.) Toleranzschema vgl. Skript Seite 145.

c.) d_{st} = -20 log(δ_{st}) = 46.0206 dB
R_p = 20 log(1 + δ_p) - 20 log(1 - δ_p) = 0.8693 dB

d.) Nur Blackman/Hamming erfüllt die Sperrdämpfung.

e.) $\Omega_c = 0.7\pi$

f.) $d = \delta_{st} = 46.0206$ dB
$\beta = 4.0909$

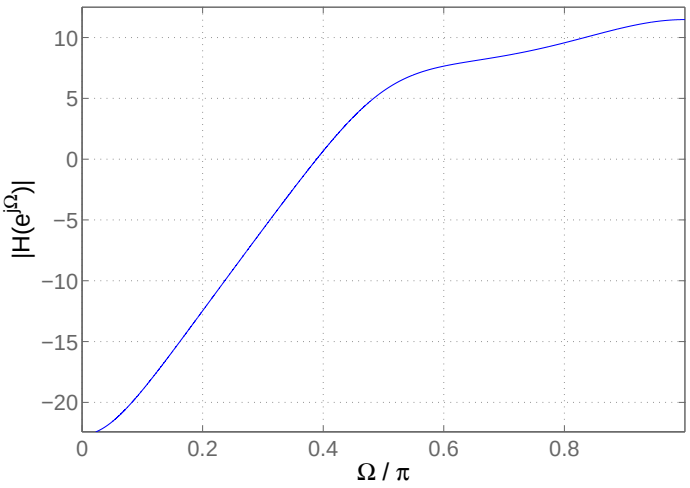
g.) $N_b \geq 26.54$
$\Rightarrow N_b = 27$

h.) $N_b \geq 15.772$
$\Rightarrow N_b = 16$

Aufgabe 3

a.) $z_{0,1} = 0$
$z_{0,2} = 0.5$
$z_{0,3} = 0.7$
$z_{\infty,1} = +j \cdot 0.6$
$z_{\infty,2} = -j \cdot 0.6$
$z_{\infty,3} = -0.5$

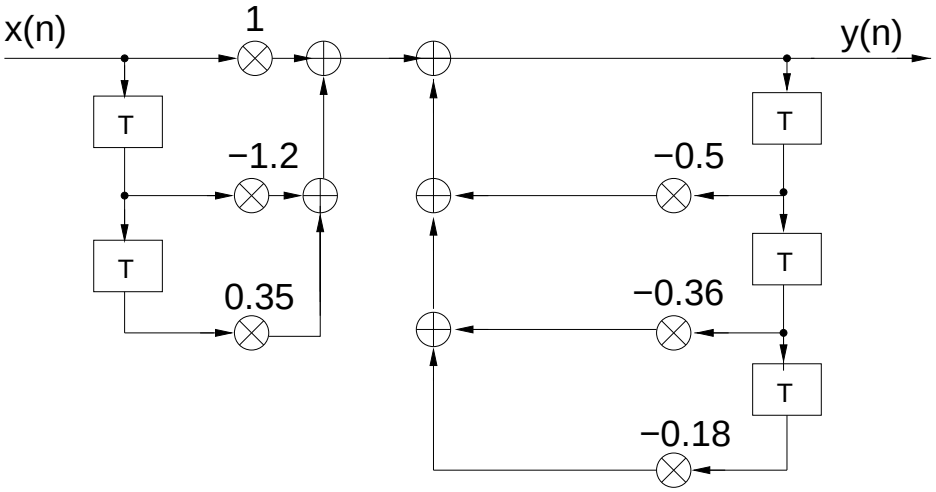
b.)



c.) $G(z) = \frac{Y(z)}{X(z)} = \frac{(1-0.5z^{-1})(1-0.7z^{-1})}{(1+0.36z^{-2})(1+0.5z^{-1})}$

$\Rightarrow y(n) = x(n) - 1.2x(n-1) + 0.35x(n-2) - 0.5y(n-1) - 0.36y(n-2) - 0.18y(n-3)$

d.)



e.) $|G(e^{j\Omega})| = 3.75$
$\phi(\Omega = \pi) = 0$

f.) ROC: $|z| > 0.6$

g.) ROC: $0.5 < |z| < 0.6$

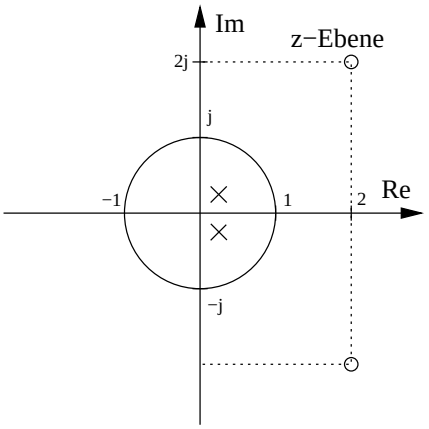
Aufgabe 4

a.) Diagramm 1: Tiefpass
Diagramm 2: Allpass
Diagramm 3: Hochpass

b.) Diagramm 1: nicht minimalphasig
Diagramm 2: nicht minimalphasig
Diagramm 3: minimalphasig

c.) Diagramm 1: reellwertige Impulsantwort
Diagramm 2: komplexwertige Impulsantwort
Diagramm 3: reellwertige Impulsantwort

d.)



$z_{0,1} = 2 + 2j$
$z_{\infty,1} = \frac{1}{4} + \frac{j}{4}$
$z_{0,2} = 2 - 2j$
$z_{\infty,2} = \frac{1}{4} - \frac{j}{4}$