Beau Pasquier

Exam 6 part b

Band pass filter $F_s = 16000$ Reject 0 and 8kHz

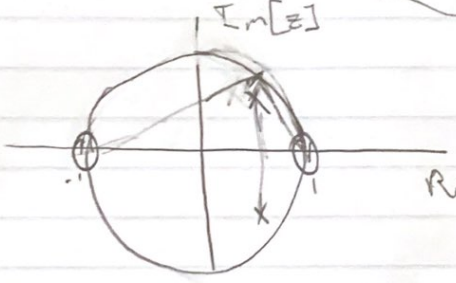
$\theta = 2\pi\left(\frac{2k}{16k}\right) = \frac{\pi}{4}$ rads/sample max gain

$z = e^{\pm j\frac{\pi}{4}} \Rightarrow z = .707 \pm .707j$ poles

closer in for stability $z = 0.5 \pm .5j$

$\theta = 0$ and $\theta = 2\pi\left(\frac{8k}{16k}\right) = \pi$

$z = e^{j0} = 1$ $z = e^{j\pi} = -1$ zeros



Transfer function $= G\frac{(z-1)(z+1)}{(z-(.5+.5j))(z-(.5-.5j))}$

$= G\frac{(z^2-1)}{(z-.5-.5j)(z-.5+.5j)}$

$z^2 - .5z + .5z - .25 - .25j + .5jz + .25j$

$= G\frac{(z^2-1)}{(z^2 - z + .5)}$

At $\theta = \frac{\pi}{4}$ Gain = 1

$G = 1 = \frac{N_1 N_2}{D_1 D_2}$

$N_1 = \sqrt{(1-.707)^2 + (0-.707)^2}$
$= .765$

$N_2 = \sqrt{(-1-.707)^2 + (0-.707)^2}$
$= 1.85$

$D_1 = \sqrt{(.5-.707)^2 + (.5-.707)^2}$
$D_1 = 0.085$

$D_2 = \sqrt{(-.5-.707)^2 + (-.5-.707)^2}$
$D_2 = 2.91$

$\frac{(.765)(1.85)}{(0.085)(2.91)} = 1$

$G = .175$

$H(z) = \frac{.175(z^2-1)}{(z^2 - z + .5)}$ $|z| > ?$