Digital Signal Processing
http://kom.aau.dk/~zt/cources/DSP/

Solutions 8 (MM8)

8.1

(a) M+1=91

(b) M/2=45

(c)

$$h_d[n] = \frac{\sin[0.625\pi(n-45)]}{\pi(n-45)} - \frac{\sin[0.3\pi(n-45)]}{\pi(n-45)}$$

8.2

The Hamming, Hanning, and Blackman windows may be used, since

$20\log_{10}\delta = 20\log_{10}0.05 = -26$

8.3

5. $h_d(n) = \dfrac{\sin\left(\frac{\pi}{4}(n-2)\right)}{(n-2)\cdot\pi}$

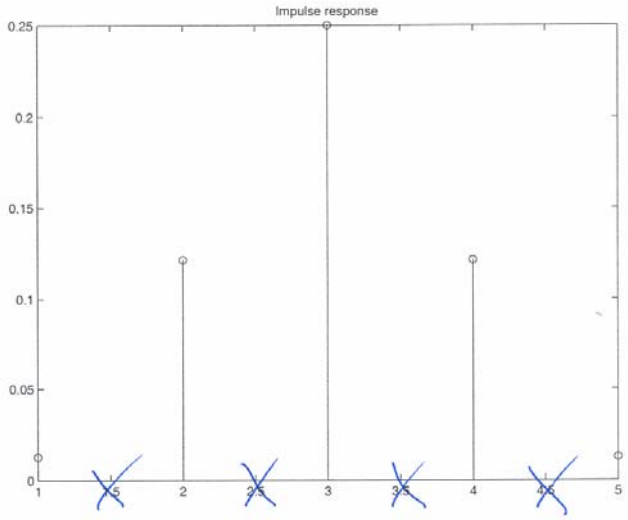
$$w(n) = \begin{cases} 0.54 - 0.46\cos\left(\frac{2\pi n}{M}\right), & 0 \le n \le M \\ 0, & else \end{cases}$$

5.1 $h(n) = h_d(n)\cdot w(n)$

$h(0) = h(4) = \dfrac{\sin\left(\frac{\pi}{2}\right)}{2\pi}\cdot 0.08 = 0.0127$

$h(1) = h(3) = \dfrac{\sin\left(\frac{\pi}{4}\right)}{\pi}\cdot 0.54 = 0.1215$

$h(2) = \lim_{n\to 2}\left(\dfrac{\sin\left(\frac{\pi}{4}(n-2)\right)}{(n-2)\pi}\right) = 0.25$



5.2 $H(z) = 0.0127 + 0.1215\,z^{-1} + 0.25\,z^{-2} + 0.1215\,z^{-3} + 0.0127\,z^{-4}$

5.3 An FIR-filter is always stable independent of the position of the zeros.