BIRZEIT UNIVERSITY

Electrical and Computer Engineering Department

ENCS4310, Digital Signal Processing | Assignment 1| 7/5/2023

Consider the following continuous time signal:

$$x(t) = \cos(2\pi.2.t) + 0.5\cos(2\pi.50.t) + 0.25\cos(2\pi.80.t)$$

Let Fs= 160 samples/sec.

a) Plot x[n] for 1 sec (i.e., 160 samples)

b) Consider the moving average filter $y[n] = \frac{1}{M+1}\sum_{k=0}^{M} x[n-k]$ (M: window size)

Plot the filter frequency response $\left|H(e^{j\omega})\right|$ for different values of M (M=0, M=4, M=10), give your conclusions.

Useful MATLAB functions: freqz(), plot(), stem(), ones(), abs() https://www.mathworks.com/help/signal/ref/freqz.html

c) Plot the response (output sequence y[n]) for the different window size.

Useful MATLAB functions: filter() https://www.mathworks.com/help/matlab/ref/filter.html

d) Plot the input signal frequency spectrum $\left|X(e^{j\omega})\right|$ and the output frequency spectrum $\left|Y(e^{j\omega})\right|$.

Useful MATLAB functions: fft() https://www.mathworks.com/help/matlab/ref/fft.html

e) Find the optimum window size (M) to obtain the first sinusoidal signal ($\cos(2\pi.2.t)$)