ENEL 563 Biomedical Signal Analysis

Fall 2008

Assignment 3

Design a second-order Butterworth lowpass filter with a -3 dB cutoff frequency of 80 Hz and sampling frequency of 200 Hz. Follow the design procedure and example on pp 122-124 of the textbook. Show all calculations and derivations done by hand.

Derive the transfer function of the filter in terms of the Laplace variable, that is, $H(s)$. Use the bilinear transformation and obtain the transfer function $H(z)$. Normalize the filter so as to have unit gain at DC.

Plot the pole-zero diagram of the filter in the Laplace and z domains.

Use the MATLAB command "freqz" and obtain a plot of the frequency response of your filter.

Use the MATLAB command "butter" with the same parameters as above and confirm the validity of your results.

Submit all handwritten work and plots as above.

Total marks: 10.

Due date: 4:00 PM, Friday, 7 November, 2008, in the box for ENEL 563, 2nd floor, ICT building.