**BMEN 3311 – Exam 1 Programming**

1. Construct a double sided power spectrum graph, centered at 0 Hz, for a sine wave that has an amplitude of 3.5 and a frequency of 200 Hz sampled at a frequency of 500 Hz. Title the graph and label both axis.
2. Construct the transfer function in MATLAB for the following differential equation where G(s) =
   1. Is the system stable?
   2. Use MATLAB to find the poles and zeros of the system. Using pole(sys) and zero(sys), where sys is the transfer function
   3. Create a s plane plot using the command pzmap(sys), where sys is the transfer function
3. Using the EEG data from EEGData.xlsx. Use MATLAB to create a subplot with the EEG signal graphed over time, and a single sided power spectrum of the EEG signal. Use a Hamming Window when creating the power spectrum. Label all axis, and title all subplots.

What frequency range has the largest power? Based on the table below, and where the power was observed, what can you deduce about the subject?

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| --- | --- | --- |
| Brain Wave | Frequency | Effect |
| Alpha | 8 – 12 Hz | Relax, calm |
| Beta | 12 – 40 Hz | Stressed, anxious |
| Theta | 4 – 8 Hz | High emotions |
| Delta | 0 – 4 Hz | Deep sleep |