ApSc608 Final Exam Spring 2018

1. Using MATLAB demonstrate and discuss the importance and effectiveness of a). zero padding and b). frequency leakage for the following signals:

   i). a signal composed of four sinusoids with amplitudes of 2, 3, 5 and 4 with frequencies of 4, 6, 8, and 12 Hz respectively
   ii). a normally distributed random signal
   iii). Combine the signal in (i) with the signal in (ii) then use appropriate methods to evaluate the level of randomness and energy content
2. Coleman text, Exercises 2.2 #10
3. Coleman text, Exercises 3.3 #10
4. Coleman text, Exercises 4.2 #4d
5. Coleman text Exercises 6.3 #1e, 11c
6. Coleman text Exercises 11.1 #13
7. Coleman text, Exercise 11.2 #6
8. For the system used in HW #6, use the SystemID Toolbox to generate an equivalent model. Your discussion, including the parameters and functions that you evaluate and compare, will be essential.
9. Write the equation of a mass-spring-damper system in state-space form with Mass = 1/5 Kg, K = 2 N/m, C = 1.2, and an input f(t) = 5cos(4t)

   - Discretize it as discussed in class (using 'c2d' command).
   - Using MATLAB and/or SIMULINK, generate the unit sample response, the step response, and the response to the forcing function.
   - Compare the step response and the unit sample response; the compare results with those obtained using convolution.
   - Use the SystemID toolbox in MATLAB to generate a model of this system and compare it to the original system.
   - Using a non-zero mean Gaussian input, discuss how processing through a linear system affects the mean of the output signal
   - Convert this system into a nonlinear system and demonstrate how nonlinearity affects random input signals

Choose either #10 or #11

10. Use the pdetool toolbox in Matlab to demonstrate the effect of grid density and time step for a wave equation over a circular domain
11. Use the neural network toolbox in Matlab to model the system of problem #10

END OF EXAM Take care and have a great summer!