EE 3657

Homework # 3 – Assigned Tu Jun 11 - Due Tu Jun 18

Covers First and Second Order Systems. Your notes and the textbook should be ample material to solve these problems.

1. Discuss the relationship between the poles of the system $H(s)=\frac{2s+1}{s^2+2s+5}$ and the impulse response of the system. Find the exact impulse response of the system by using PFE, also find and plot the impulse response using MATLAB.

2. The transfer function between the elevator and altitude of a Boeing 747 aircraft can be approximated as $\frac{h(s)}{\delta_e(s)}=\frac{30(s-6)}{s(s^2+4s+13)}$.
   a. Use MATLAB to plot the time history for a 1 degree *impulsive* elevator input commanded by the pilot. Describe the behavior observed and research the physical reason for the behavior that you see.
   b. By comparing with the actual plot, examine the accuracy of the following definitions:
      i. $t_r \approx \frac{1.8}{\omega_n}$; (definition for transition between 10% and 90% of final value)
      ii. $t_s = \frac{4.6}{\sigma}$; (definition for settling time to get to within 1%)
      iii. $M_p = e^{-\pi\zeta/\sqrt{1-\zeta^2}}$;

3. Find the allowable regions in the s-plane for the poles of a transfer function of a standard second-order system if the system response requirements are $t_r \le 0.6$ seconds, $M_p \le 10\%$, and $t_s \le 3$ seconds. Use the definitions given in Problem 2 for t_r, M_p, and t_s.