ECE-382: Homework 7

Due: Mar. 2nd, 2007

1. Problems B-5-3, B-5-4, B-5-8 from the textbook.

2. Problem B-5-11 from the textbook. Use MATLAB to plot the step response of the system, and verify the performance specs with what you have derived. What is the steady-state error of the system?

Problem 3: Consider a system with the transfer function

$$H(s) = \frac{s^2 + 5s + 24}{(s+5)(s^2+s+4)}. \tag{1}$$

a Plot the step response of the system by using Matlab. From the plot, estimate the parameters t_d, t_r, t_p, M_p, and t_s (5% criterion).

b Approximate $H(s)$ by a second order transfer function $H_{approx}(s)$ by simply discarding the term in the partial fraction expansion of $H(s)$ corresponding to the pole at $s = -5$.

c Consider the step response of the system with transfer function $H_{approx}(s)$. Find analytically the parameters t_d, t_r, t_p, M_p, and t_s (5% criterion) for this system, and compare the results with those in part (a). What conclusion can you draw from it?

(Hint: For Part (a) of the problem, you may either visually estimate the parameters from the plot directly, or use the procedure in p253 of the textbook. **Keep in mind that the definition of these parameters are based on *percentage* values of the step response.**)