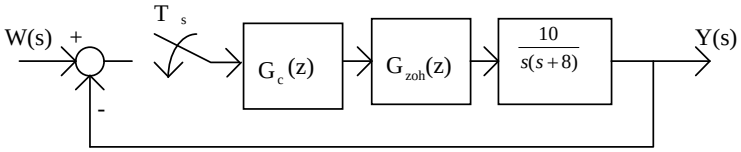
Due Wednesday, March 24 EE572 HW #16

1. Problem 1 is to keep working on your project. You should be making a lot of progress.

2. Given the following digital control system for a servo with open-loop transfer function G(s) = 10/(s(s+8)):



a) Find an S-domain model for the open-loop system including the ZOH if T_s = 10 msec.

b) What type number is your S-domain model?

c) Find e_{ss} due to a unit step, e_{ss} due to a unit ramp, and e_{ss} due to a unit parabola for your uncompensated model.

d) Given the following transient specifications: $t_s \leq 0.4$ sec and $M_p \leq 2\%$. Illustrate the region of the s-plane and then the z-plane where we must place our dominant poles to satisfy these specs.

e) Pick a pair of dominant closed-loop poles to meet the above specs then sketch the root locus. Does the root locus pass thru the desired poles? If not, design a lead compensator (filter) $G_c(s)$ then find $G_c(z)$ (using the bilinear transformation) to force the root locus to pass thru these poles and meet the specs given in part d).

f) Sketch the compensated root locus of $G_cG_{zoh}G(s)$ in the S-plane.

g) Use Matlab to determine where all the closed-loop compensated poles and zeros are (Hint: Find the closed-loop compensated transfer function, $Y(s)/W(s)=G_cG_{zoh}G(s)/(1+ G_cG_{zoh}GH(s))$ then use the Matlab roots() function to find the poles and zeroes)

h) Does your compensated system have closed-loop dominant poles which meet the specifications?