

ECED 4601 Digital Control Systems

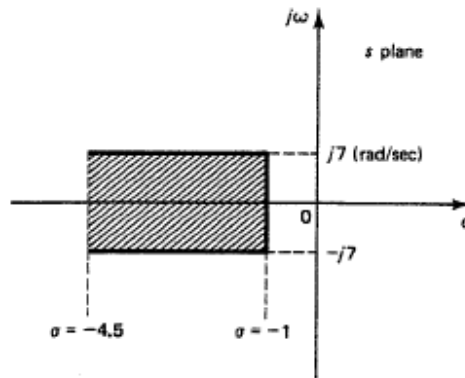
Assignment #3

<http://www.jasongu.org/4601/assignments.html>

Due date: October 19,2017. Late submission will not be accepted.

Assignment #4 contains the following problems:

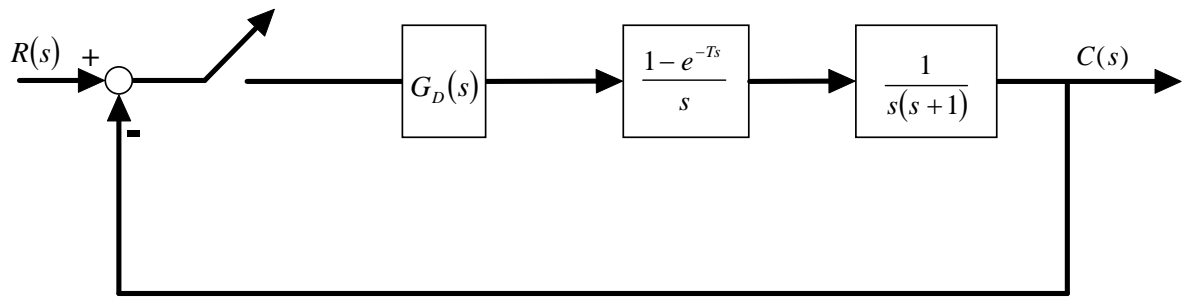
- 1) Problem B-4-1: Consider the region in the s plane shown in figure. Draw the corresponding regions in the z plane. The sampling period T is assumed to be 0.3 second.



- 2) B-4-3 determine the stability of the following discrete-time system.
 - a) using Jury stability criterion
 - b) Using the bilinear transformation coupled with the routh stability criterion.

$$\frac{X(z)}{Y(z)} = \frac{z^{-3}}{1 + 0.5z^{-1} - 1.34z^{-2} + 0.24z^{-3}}$$

- 3) B-4-9 Consider the system in figure, design a digital controller $G_D(z)$ such that the damping ratio ξ of the dominant closed loop poles is 0.5 and the number of samples per cycle of damped sinusoidal oscillation is 8. assume that the sampling period is 0.1 second. Determine the static velocity error constant. Also, determine the response of the designed system to a unit step input.



- 4) B-4-16 Consider the digital control system shown in figure. Using the bode diagram approach in the w plane, design a digital controller such that the phase margin is 60 degree, the gain margin is 12 dB or more, and the static velocity error constant is 5 sec^{-1} . The sampling period is assumed to be 0.1 sec.

