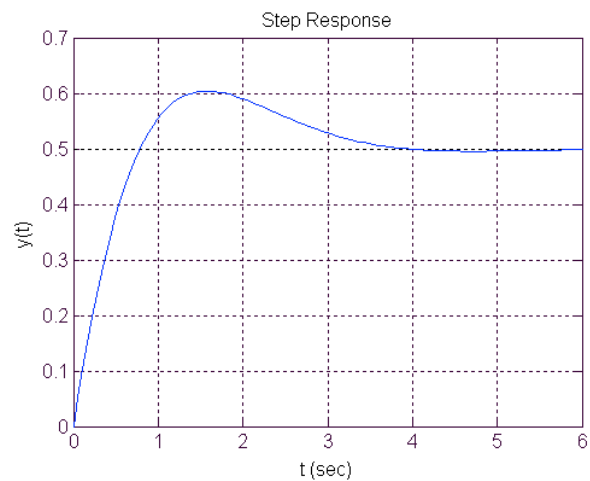
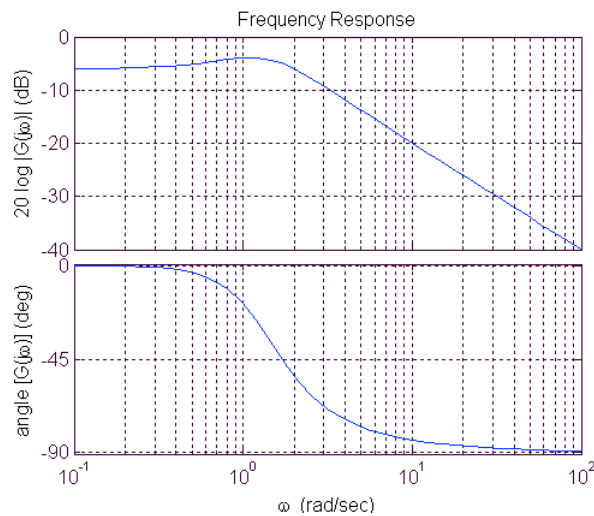


Homework Assignment #11

1. A continuous-time filter has the transfer function

$$G(s) = \frac{s + 1}{s^2 + 2s + 2}.$$

The frequency response and step response plots of the system are shown.



Using the bilinear transformation, find two discrete-time approximants $H(z)$ to the given transfer function, one with $T = 1$ and the other with $T = 0.1$.

For each of the two approximants, make a plot of

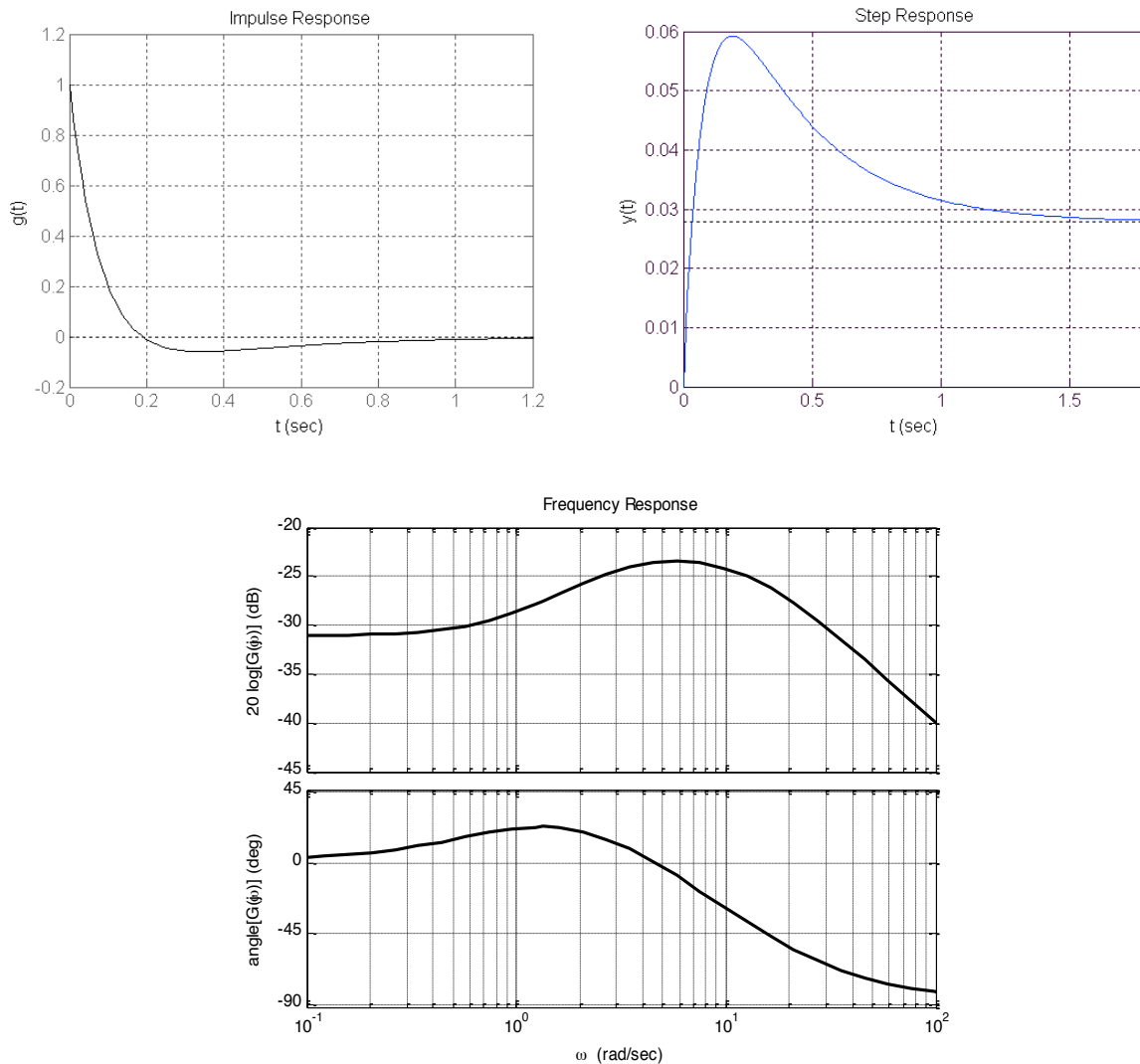
- (a) the poles and zeros,
- (b) the frequency response, and
- (c) the step response.

(See Problems 2 and 3 on reverse.)

2. A continuous-time filter with the transfer function

$$G(s) = \frac{s + 1}{(s + 3)(s + 12)}$$

has the impulse response, the step response, and the frequency response shown.



The continuous-time filter is to be approximated using a discrete-time FIR filter.

For the resulting discrete-time approximation,

- choose an appropriate value of the sampling period T , and an appropriate system order,
 - find the transfer function $H(z)$,
 - plot the impulse response sequence $h(k)$,
 - plot the step response sequence, and
 - plot the frequency response.
3. Repeat Problem 2, but determine the approximation using step invariance.