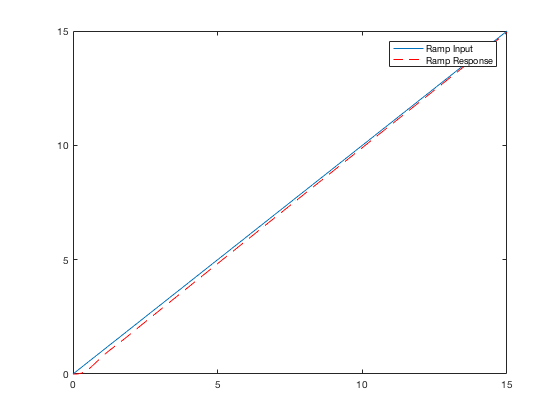
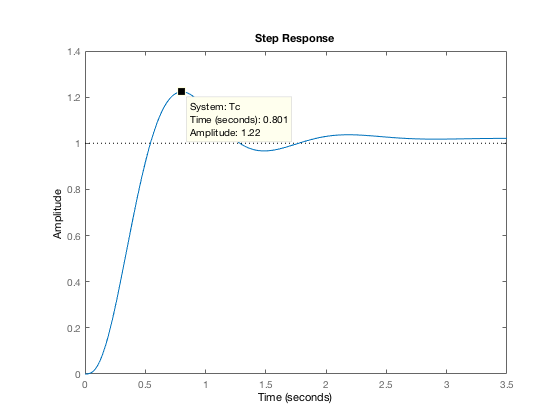
Prob 27

PD compensated step response gives settling time just short of 2 seconds. Calculated PD pole at -2.95 with gain of 294.57



Ramp response to input starts with some lag but converges to input signal within 15 seconds.

Final transfer function gain has 22% OS and settles within the 2 second design criteria.

os\_pcnt = 25;

t\_settle = 2;

zeta = (-log(os\_pcnt/100)) / sqrt(pi^2 + log(os\_pcnt/100)^2);

sigma = 4/t\_settle;

w\_d = sigma \* tan(acos(zeta));

s\_12 = (-sigma + w\_d\*1i);

ang\_con = -(180 + (-angle(s\_12) - angle(s\_12 + 4) - angle(s\_12 + 6) - angle(s\_12 + 10))\*(180/pi));

p\_comp = (w\_d / (tand(ang\_con)) + sigma);

gain\_pd = -real(s\_12 \* (s\_12 + 4) \* (s\_12 + 6) \* (s\_12 + 10) / (s\_12 + 2.95));

% G = zpk([],[0 -4 -6 -10],1);

% Gc = zpk([-p\_comp],[],[gain\_pd]);

% Tc = feedback(Gc\*G, 1);

% step(Tc)

gain\_pid = -real(s\_12^2 \* (s\_12 + 4) \* (s\_12 + 6) \* (s\_12 + 10) / ((s\_12 + 2.95) \* (s\_12 + 0.1)));

sprintf('G\_c(s) = %1.1f (s + 0.1)(s + %1.2f) / s',gain\_pid, p\_comp)

G = zpk([],[0 -4 -6 -10],1);

Gc = zpk([-0.1 -p\_comp],[0],[gain\_pid]);

Tc = feedback(Gc\*G, 1);

step(Tc)

figure

t = 0:0.1:15;

u = t;

y = lsim(Tc,u,t);

plot(t,u,t,y,'r--');

legend('Ramp Input','Ramp Response')