Prob 16

Compensated system transfer function:

b.) The added closed loop pole at -0.01 is cancelled with the compensator zero at -0.01. The other higher order poles are more than 10 times further left in the s-plane so this contribution is negligible. The approximation is valid.

os\_pcnt = 20.5;

t\_settle = 3;

G = zpk([],[0 0 -4 -12],1);

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

sigma = 4/t\_settle;

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

d\_poles = (-sigma + w\_d\*1i);

% Let compensator have zero at 0.01

% G\_c(s) = (K(s+0.01) / (s+p))

ang\_con = 180 + (angle(d\_poles + 0.01) - 2\*angle(d\_poles) - angle(d\_poles + 4) - angle(d\_poles + 12))\*(180/pi);

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

new\_gain = -real(((d\_poles + p\_comp) \* d\_poles^2 \* (d\_poles + 4) \* (d\_poles + 12))/(d\_poles + 0.01));

sprintf('G\_c(s) = %1.1f (s + 0.01) / s + %1.2f',new\_gain, p\_comp)

Gc = zpk(-0.01, -p\_comp, new\_gain);

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

step(Tcomp)

legend('Compensated System')