MECH421 HW 7
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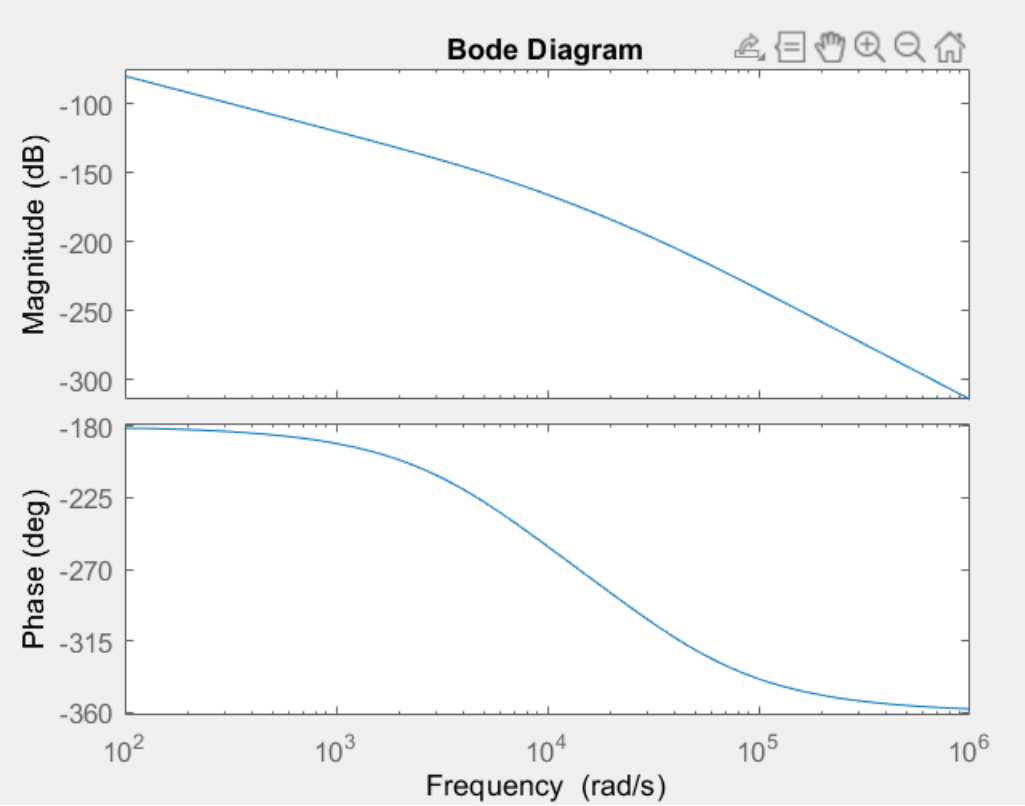
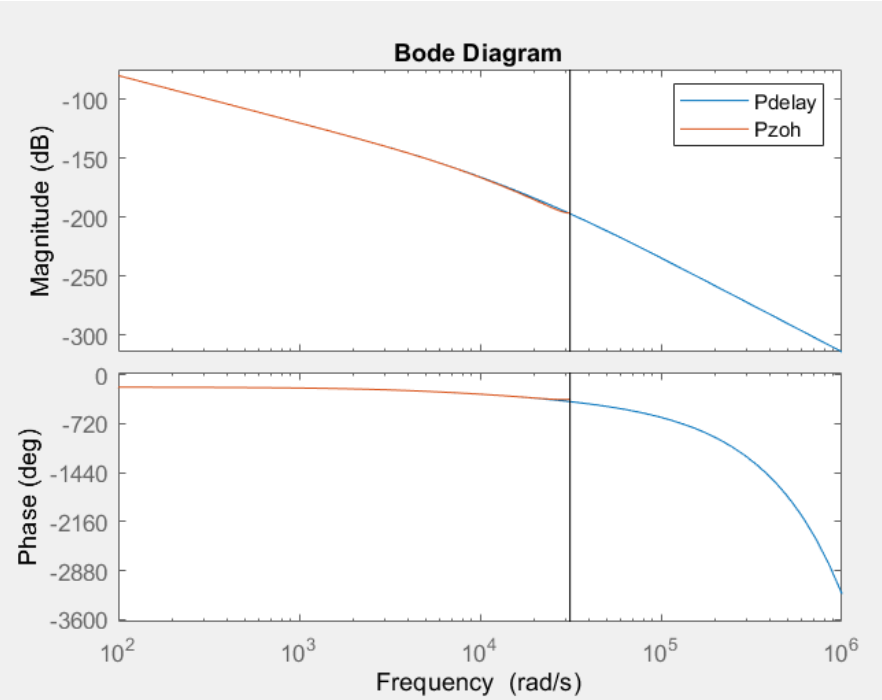
A.
Bode of P:

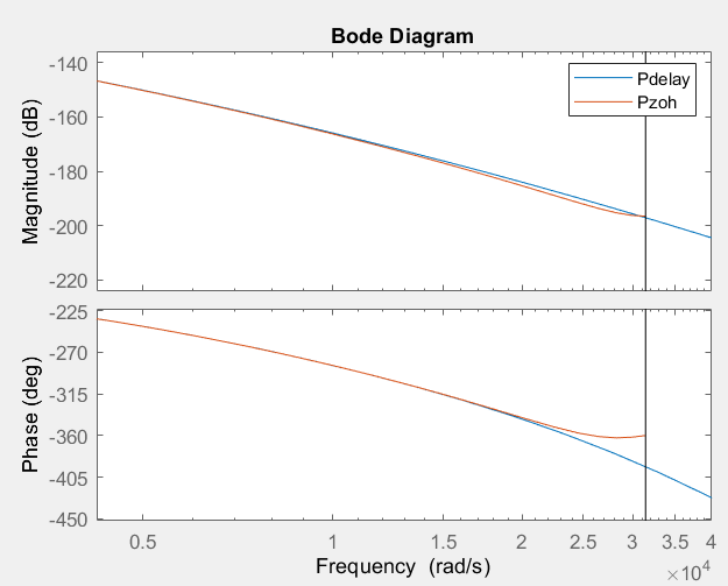



```
% q1
wa = 2*pi*10^3;
ws = 10*pi*10^3;
m = 1;
Kf = 1;
Ga = tf(1,[1/wa 1]);
Gs = tf(1,[1/ws 1]);
Gm = tf(1,[m 0 0]);
fs = 10000;
T = 1/fs;
P = Ga*Kf*Gm*Gs;
bode(P);
```

B.
Bode of P_delay and P_zoh:

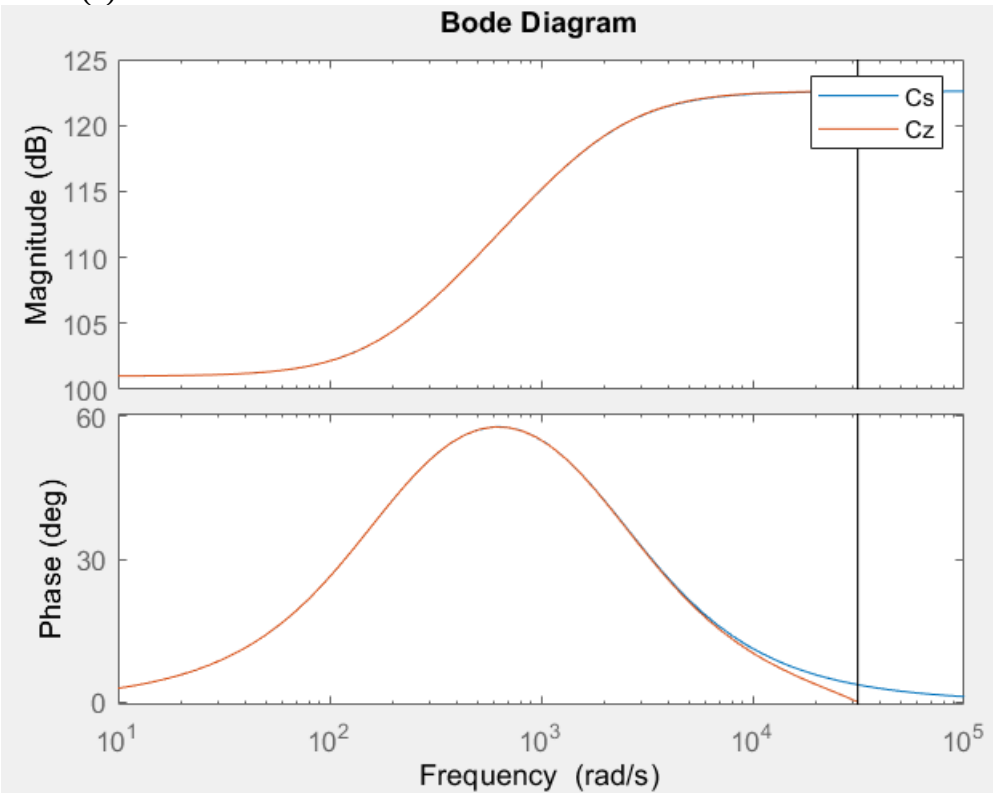


Zoomed in at P_zoh:




```
% q2
Pdelay = P*tf([1],[1], 'InputDelay',T/2);
Pzoh = c2d(P, T, 'zoh');
hold on;
legend on;
bode(Pdelay);
bode(Pzoh);
```

C.
Bode of C(s) and C(z):




```
% q3
w = 100*2*pi; % from hw6, convert from hz to rad/s
phi = 45; % from hw6, deg
phi = phi * pi/180;
a = 12; % from hw6, guess and check
t = 1/(sqrt(a)*w);
Kp = 112202; % from hw6, at 100Hz, this K make gain ~= 0db
Cs = tf([Kp*a*t Kp], [t 1]);
Cz = c2d(Cs, T, 'tustin');
hold on;
legend on;
bode(Cs);
bode(Cz);
```

D.