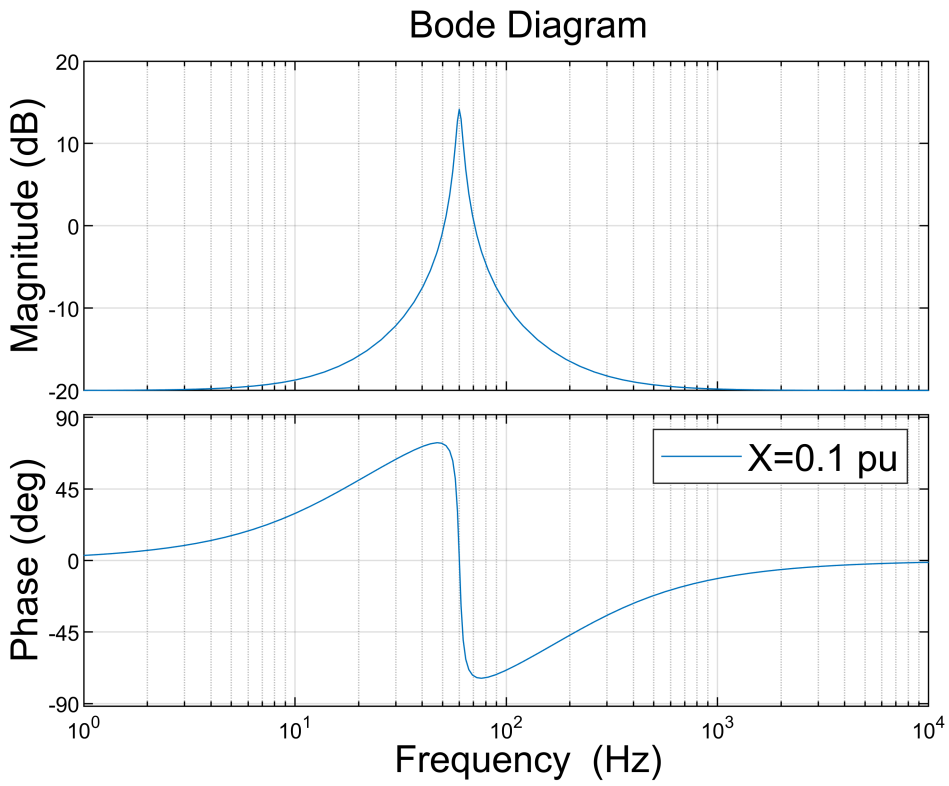
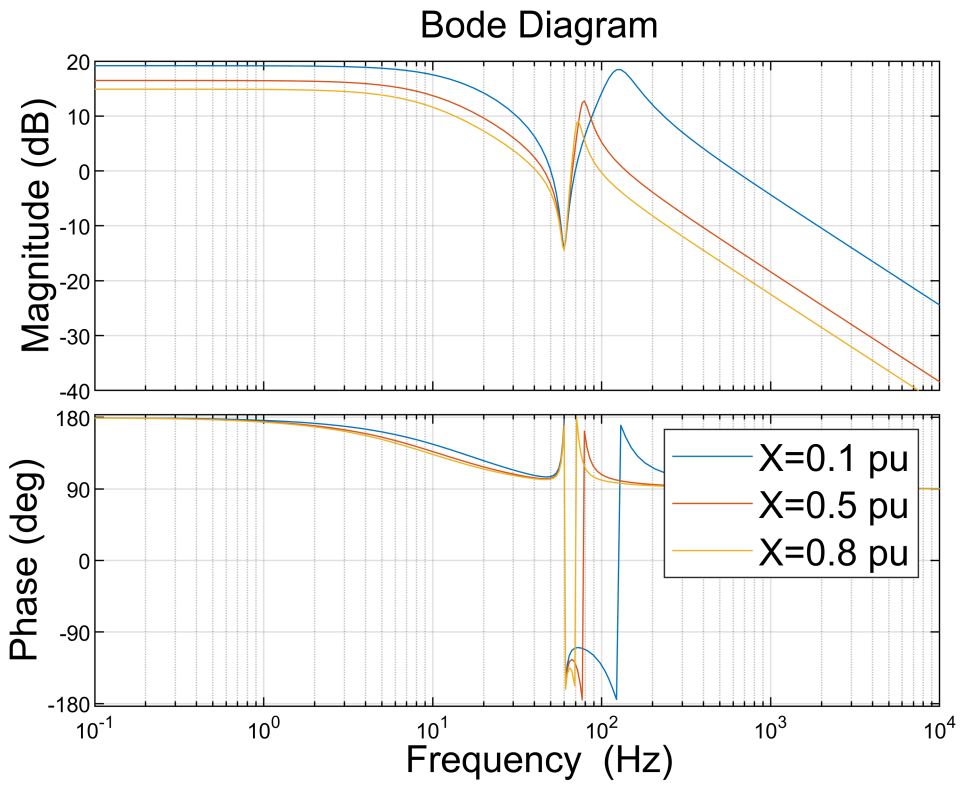
```
% Author: Lingling Fan
% Date: 2/13/2021
% Purpose: This code is to examine the frequency-domain response of a PR
% current controller.

clear; clc; close all
bodeP = bodeoptions;
bodeP.FreqUnits  ='Hz';
bodeP.PhaseWrapping = 'on';
bodeP.XLabel.FontSize =14;
bodeP.YLabel.FontSize =14;
bodeP.Title.FontSize =14;


s = tf('s');
wc = 2*pi*2; w1 =377;
Kp = [1, 0.2, 0.1 ];
Ki = [100, 10, 5 ];
Kp = [0.1 ];
Ki = [5 ];

X_data =[0.1,0.5, 0.8];
n = length(X_data);
%Kp = 0.1; Ki = 10;

for kx=1:n
    k = 1;
PR(k) = Kp(k)+Ki(k)*2*wc*s/(s^2+2*wc*s+w1^2);
X = X_data(kx); L = X/w1; R = X/10;
sys(kx) = feedback(-1/(R+L*s), -PR(k));
str_legend{kx} = strcat('X=', num2str(X),' pu');
end

figure(111);
hold on;
for k=1:1
bode(PR(k),bodeP);grid on;
end
legend(str_legend, 'FontSize', 14);
```

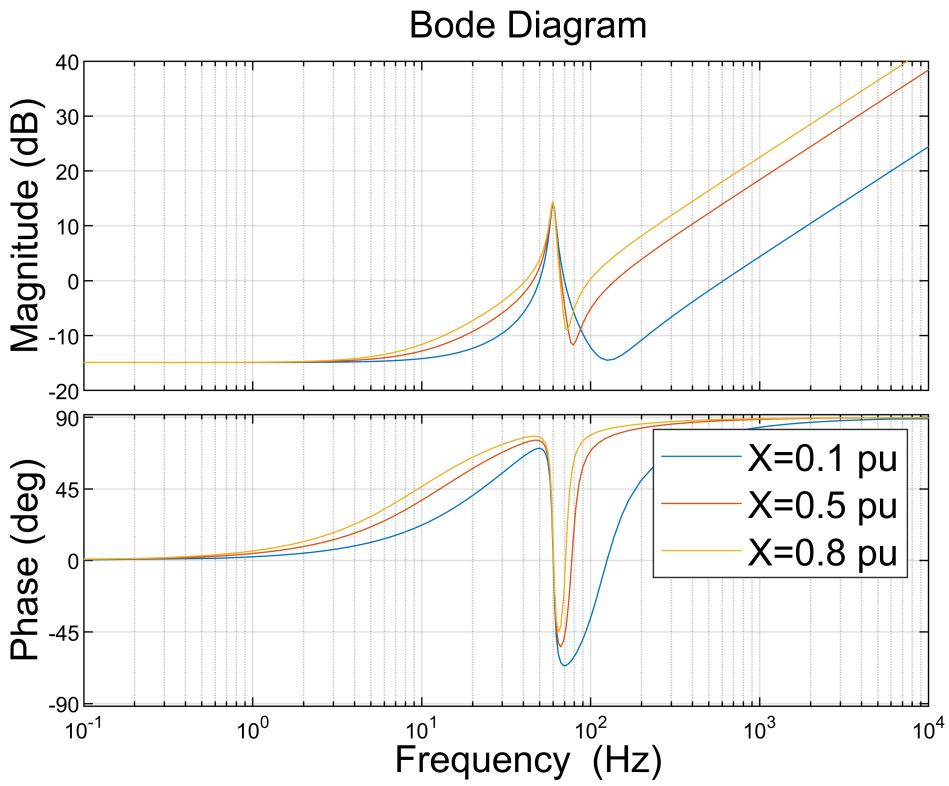
```
Warning: Ignoring extra legend entries.
```



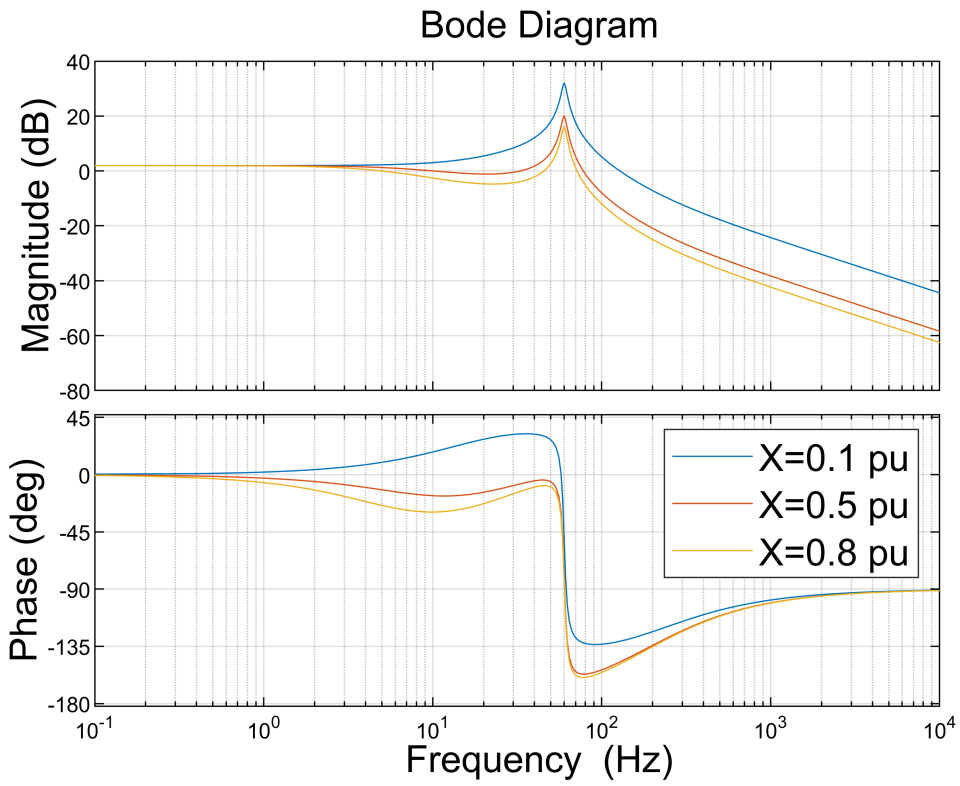

```
%figure_change;

figure(112);
hold on;
for k=1:n
bode(sys(k),bodeP); grid on;
end
legend(str_legend, 'FontSize', 14);
```




```
%figure_change;

figure(113);
hold on;
for k=1:n
bode(R+X_data(k)/w1*s+PR,bodeP); grid on;
end
legend(str_legend, 'FontSize', 14);
```




```
%figure_change

figure(114);
hold on;
for k=1:n
bode(1/(R+X_data(k)/w1*s)*PR,bodeP); grid on;
end
legend(str_legend, 'FontSize', 14);
```




```
%figure_change



dt = 0.0002;
tt1 = [0:dt:0.1]; tt2 =[0.1+dt:dt:0.5];
u = [0*sin(w1*tt1) -0.1*sin(w1*tt2)];
for k=1:n
[y,T]= lsim(sys(k),u,[tt1,tt2]);
Y(:,k) = y;

end

figure(5000);
hold on;
plot(T, Y,'LineWidth',2); grid on;

legend(str_legend, 'FontSize', 14);
xlabel('Time (s)');
ylabel('Change of Current (pu)');
box on;
xlim([0.05,0.2]);

Fh = gcf;                                                    % Handle To Current Figure
Kids = Fh.Children;                                          % Children
AxAll = findobj(Kids,'Type','Axes');
```

```
AxAll.XLabel.FontSize =14;
AxAll.YLabel.FontSize =14;
```