EX1 : DETERMINE POLES AND ZEROS

```
clc;
clear all;
close all;
numerator=[1 4 3 ];
denominator=[1 6 11 6];
G=tf(numerator,denominator);
disp('Transfer Function G(s):');
G
[z,p,k] =tf2zp(numerator,denominator);
disp('Zeros of G(s):');
disp(z);
disp('Poles of G(s):');
disp(p);
disp('Gain of G(s):');
disp(k);
figure;
pzmap(G);
grid on;
title('Pole-Zero Configuration of G(S) in s-plane');
xlabel('Real Axis');
ylabel('Imaginary Axis');
```

EX2 : DETERMINE STEADY STATE ERROR

```
clc
clear all
close all
Num=[20]
a=conv([1 0],[1 2])
```

```
Den =conv(a,[1 2 20])

G=tf(Num,Den)

kp=dcgain(G)

ess1=1/(1+kp)

G1=tf(conv(Num,[1 0]),Den)

kv=dcgain(G1)

ess2=1/kv

G2=tf(conv(Num,[1 0 0]),Den)

ka=dcgain(G2)

ess3=1/ka
```

EX3 : OUTPUT RESPONSE OF SECOND ORDER SYSTEM

```
clc;
clear all;
L=0.1;
C=0.1e-3;
R=80;
a=1/(2*R*C);
w0=1/sqrt(L*C);
wd=sqrt(w0*w0-a*a);
B1=10;
B2=(a./wd).*B1-10/(wd*R*C)+0.6/(wd*C);
t=0:0.0001:0.12;
v=B1*exp(-a*t).*cos(wd*t)+B2*exp(-a*t).*sin(wd*t);
hold off;
plot(1000*t,v)
hold on;
```

EX4 :TIME DOMAIN SPECIFICATION OF SECOND ORDER SYSTEM

```
zeta=0.5;
wn=6;
num=[36];
den=[1 6 36];
G=tf(num,den)
wd=wn*sqrt(1-zeta*zeta);
teta=atan(sqrt(1-zeta*zeta)/zeta);
tr=((pi-teta)/wd);
tp=pi/wd;
Mp=exp(-zeta*pi/sqrt(1-zeta*zeta))*100
ts=4/(zeta*wn);
step(G)
```

```
xlabel('time(t)');
ylabel('response c(t)');
```

EX5 :PLOT ROOT LOCUS OF TRANSFER FUNCTION

```
clc;
clear all;
close all;
num=[1];
den=conv([1 0],conv([1 2],[1 4]));
G=tf(num, den);
disp('Open-loop transfer function G(s):');
G
figure;
rlocus(G);
title('Root Locus of
G(s)=1/[s(s+2)(s+4)]');
grid on;
rlocfind(G)
```

EX6 :ANALYZE THE STABILITY OF SYSTEM USING BODE PLOT

```
clc;
clear all;
num=[1];
den=[1 2 1];
g=tf(num,den)
bode(g);
grid on;
title('Bode Plot');
margin(g)
```

EXTRA CODE:

```
clc;
clear all;
Gb=zpk([ ],[-2,-4,-5],1)
bode(Gb);
grid on;
```

EX7 : STABILITY ANALYSIS USING NYQUIST AND POLAR PLOT

USING NYQUIST PLOT

```
clc
 clear all
 num= [1];
 num1= [1 3];
 den= [1 2 1];
 den1= [2 4 5];
 g= tf(num,den)
 g1= tf(num1,den1)
 sys2= tf(num1,den)
 nyquist(g,'r',g1,'b',sys2,'gx')
 grid on
```

USING POLAR PLOT

```
clc
clear all
num=[1];
den=[1 3 1];
G=tf(num,den);
figure;
polarplot(G);
title('Polar Plot of Open-Loop Transfer Function G(s)');
grid on;
[GM,PM,Weg]=margin(G);
fprintf('\n--- Stability Analysis ---\n');
fprintf('Gain Margin (GM):%.2f dB\n',20*log10(GM));
fprintf('Phase Margin(PM):%.2f degrees\n',PM);
fprintf('Gain Crossover Frequency (Wcg):%.2f rad/s\n',Wcg);
fprintf('Phase Crossover Frequency (Wcp):%.2f rad/s\n',Wcp);
```

EX8 : STATE SPACE MODEL FOR TRANSFER FUNCTION

```
clc;

clear;

close all;

num=[5 3];

den=[1 4 6];

G=η(num,den);

disp('Original Transfer FuncΘon:')

G

[A,B,C,D]=η2ss(num,den);

disp('State-Space RepresentaΘon:')

A,B,C,D

sys_ss=ss(A,B,C,D);

disp('Transfer FuncΘon from State-Space:')

η(sys_ss)
```