自动控制原理实验四

例题

1、频域特性

```
>> num1 =1 ;
>> den = [1 1.414 1];
>> w = 1;
>> Gw = polyval(num1,j*w)./polyval(den,j*w)
Gw =
   0.0000 - 0.7072i
>> Aw = abs(Gw)
Aw =
    0.7072
>> Fw = angle(Gw)
Fw =
   -1.5708
```

2、bode 图

```
>> num =1 ;
>> den = conv([1 1],[1 2])
den =
     1     3     2
>> G = tf(num,[den 0])
G =
          1
  -----------------
  s^3 + 3 s^2 + 2 s
Continuous-time transfer function.
>> bode(G)
>> w = logspace(-1,2);
>> [m,p] = bode(num,den,w);
>> subplot(2,1,1)
>> semilogx(w,20*log10(m))
>> subplot(2,1,2)
>> semilogx(w,p)
```

3、Nyquist 曲线

```
num = 1;
den1 = [conv([1 1],[1 2]),0];
G1 = tf(num,den1);
den2 = conv([1 1],[1 2]);
G2 = tf(num,den2);
```

```
den3 = [1 1 0];
G3 = tf(num,den3);
nyquist(G1,'r',G2,'b:',G3,'g-.',{0.1,180/57.3})
>> w = 1:2;
>> [re,im] = nyquist(G1,w)
re(:,:,1) =
   -0.3000
re(:,:,2) =
   -0.0750
im(:,:,1) =
   -0.1000
im(:,:,2) =
    0.0250
```

4、幅值裕度和相角裕度

```
>> [Gm,Pm,Wcg,Wcp] = margin(G1)
Gm =
    6.0000
Pm =bbb
   53.4109
Wcg =
    1.4142
Wcp =
    0.4457
```

例题 4（1）

```
>> figure(4)
>> wn=1;zeta=0.7;
>> w=logspace(-1,2);
>> for T=[0 0.5 1 2]
G1=tf(wn^2,[1 2*zeta*wn,wn^2]);
G2=tf([T 1],1);
G=G1*G2
bode(G,w)
bode(G,w)
hold on
end
>> [Gm,Pm,Wcg,Wcp]=margin(G)
```

例题 4（2）

```
>> figure(5)
>> wn=1;zeta=0.7;
>> w=logspace(-1,2);
>> n=1;
>> for T=[0.5 2]
G1=tf(wn^2,[1 2*zeta*wn,wn^2]);
G2=tf([T 1],1);
G(n)=G1*G2
n=n+1
end
nyquist(G(1),'r',G(2),'b--')
```

练习题

1、

```
>> den = [0.1 1 0];
>> w = logspace(-1,2);
>> G = tf(10,den);
>> bode(G,w)
>> grid on
```

2、

```
>> num = [10];
>> den1 = conv([0.05 1],[0.1 1]);
>> w = logspace(-1,2);
>> den = conv(den1,[1 0]);
>> G = tf(num,den)
G =
             10
  ------------------------
  0.005 s^3 + 0.15 s^2 + s
Continuous-time transfer function.
>> bode(G,w)
>> grid on
>> [Gm Pm Wcg Wcp] = margin(G)
Gm =
    3.0000
Pm =
   32.6133
Wcg =
   14.1421
Wcp =
7.4937
```

3、

```
>> nyquist(G1,'r',G2,'b--',G3,'p-')
>> G1 = tf(10,[0.1 1]);
G2 = tf(10, [0.05 1 0]);
den = conv([1 20],[1 10]);
G3 = tf(2000,den);
>> nyquist(G1,'r',G2,'b--',G3,'p')
>> nyquist(G1,'r',G2,'b--',G3,'p')
```

4、

```
>> den = conv([10 1],[2 1]);
>> den = conv(den,[0.2 1]);
>> G = tf(20,den);
>> grid on
>> figure (1)
>> figure (1)
>> bode(G)
>> figure(2)
```

```
>> nyquist(G)
```

5、

```
>> num = -6*[0.33 1];
>> den = [-1 1];
>> G = tf(num,den)
G =
  1.98 s + 6
  ----------
    s - 1
Continuous-time transfer function.
>> figure(1)
>> figure(1)
>> bode(G)
>> figure(2)
>> nyquist(G)
```

6、

```
>> num = 10*conv([0.1 1],[0.1 1]);
>> den1 = conv([1 1],[1 1]);
>> den2 = conv(den1,[1 1]);
>> den3 = conv([0.01 1],[0.01 1]);
>> den = conv(den2,den3);
>> G = tf(num,den);
>> figure(1)
>> bode(G)
>> figure(2)
>> nyquist(G)
```

实验三的补充

```
G1=tf(0.5,[0.5 1 0]);
G11=feedback(G1,2,-1)
G2=tf(1,[1 0])
G3=G2*G11
G4=feedback(G3,1,-1)
G=feedback(1,[1 2 2 1])
rlocus(G)
```