

سوالات متلب تمرین سری سوم

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۹۸۱۹۸۹۳

سوال ۱:

(الف)

روش اول: نمایش تابع تبدیل

```
num=[35 30];  
den=[1 7 22 48 32];  
S1=tf(num,den)
```

Command Window

S1 =

$$35s + 30$$
$$s^4 + 7s^3 + 22s^2 + 48s + 32$$

Continuous-time transfer function.

fx >>

روش دوم: نمایش با استفاده از صفر و قطب و بهره

pole(S1)

Command Window

ans =

$$-4.0000 + 0.0000i$$
$$-1.0000 + 2.6458i$$
$$-1.0000 - 2.6458i$$
$$-1.0000 + 0.0000i$$

fx >>

z=[-0.8571];

```
p=[(-4.0000 + 0.0000i) (-1.0000 + 0.0000i) (-1.0000 - 2.6458i) (-1.0000 + 2.6458i)];
k=35;
S2=zpk(z,p,k)
```

Command Window

```
S2 =

          35 (s+0.8571)
-----
(s+4) (s+1) (s^2 + 2s + 8)

Continuous-time zero/pole/gain model.
```

fx >>

روش سوم: نمایش با استفاده از معادله حالت

```
A=[0 1 0 0
    0 0 1 0
    0 0 0 1
    -32 -48 -22 -7];
B=[0 ; 0 ; 0 ; 1];
C=[30 35 0 0];
D=0;
SS=ss(A,B,C,D);
[nu , de]=ss2tf(A,B,C,D);
S3=tf(nu , de)
```

Command Window

```
S3 =

          35 s + 30
-----
s^4 + 7 s^3 + 22 s^2 + 48 s + 32

Continuous-time transfer function.
```

fx >>

```
step(S3)
DC_gain=dcgain(S3)
stepinfo(S3)
```

(ب)

Command Window

```
DC_gain =
```

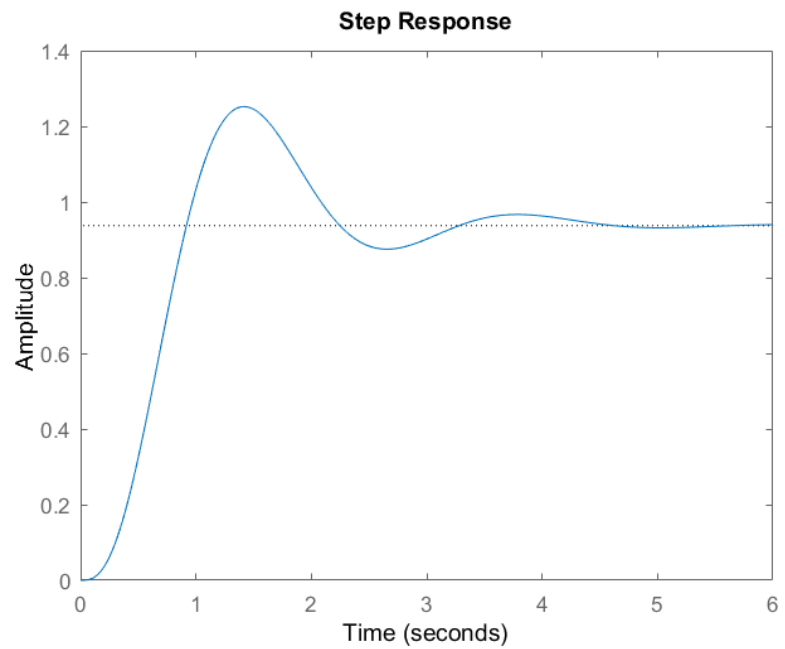
```
0.9375
```

```
ans =
```

```
struct with fields:
```

```
    RiseTime: 0.5527  
    TransientTime: 4.1719  
    SettlingTime: 4.1719  
    SettlingMin: 0.8503  
    SettlingMax: 1.2520  
    Overshoot: 33.5488  
    Undershoot: 0  
    Peak: 1.2520  
    PeakTime: 1.4276
```

```
fx >>
```



ج) از طریق مقدار ماکزیمم فراجش و مقدار زمان نشست، مقدار ζ و ω_n را بدست می آوریم.

```
zeta=0.32837;  
wn=2.33589;  
n=[wn^2];  
d=[1 2*wn*zeta wn^2];  
NS=tf(n , d)  
step(S3 , NS)
```

Command Window

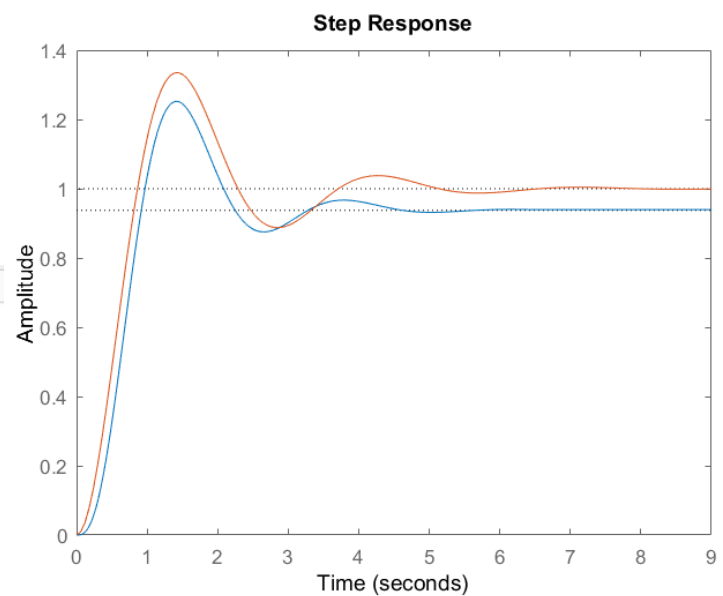
```
NS =
```

```
5.456
```

```
-----  
s^2 + 1.534 s + 5.456
```

```
Continuous-time transfer function.
```

```
fx >>
```



```
info_system3=stepinfo(S3)
info_new_system=stepinfo(NS)
```

Command Window

```
info_system3 =

  struct with fields:

    RiseTime: 0.5527
    TransientTime: 4.1719
    SettlingTime: 4.1719
    SettlingMin: 0.8503
    SettlingMax: 1.2520
    Overshoot: 33.5488
    Undershoot: 0
    Peak: 1.2520
    PeakTime: 1.4276
```

```
info_new_system =

  struct with fields:

    RiseTime: 0.5835
    TransientTime: 4.7642
    SettlingTime: 4.7642
    SettlingMin: 0.8877
    SettlingMax: 1.3352
    Overshoot: 33.5225
    Undershoot: 0
    Peak: 1.3352
    PeakTime: 1.4409
```

fx >> |

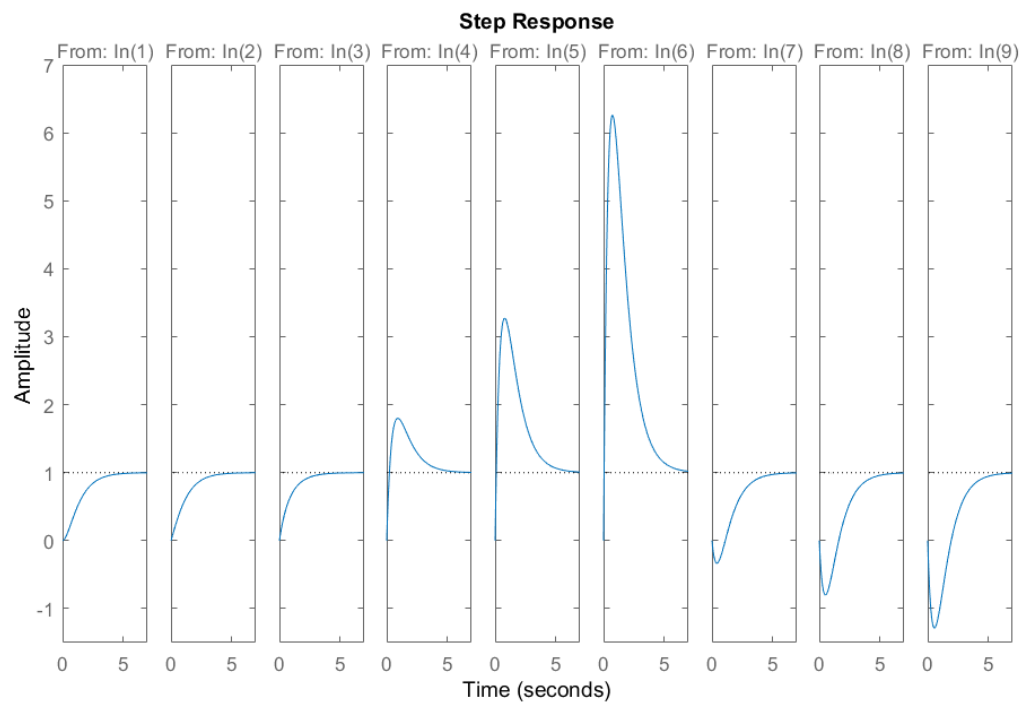
سوال ٢:

```
t=[0 0.3 0.6 3 6 12 -1 -2 -3];
```

```
for i=1:9
n=[2*t(i) 2];
d=[1 3 2];
S(i)=tf(n , d)
```

end

step(S)



در کل تاثیر صفر بیشتر از قطب است.

$$G(s) = \frac{w_n^2(1 + T_z s)}{(s^2 + 2w_n \zeta s + w_n^2)}$$

تابع تبدیل سیستم مرتبه دو:

اگر T_z بزرگتر از یک و افزایش پیدا کند، افزایش شدید فرافشار سیستم داریم؛ اگر منفی و افزایش یابد، فروفشار افزایش پیدا می‌کند، و اگر بین صفر و یک باشد، فروفشار و فرافشار نداریم.

۳ شکل اول فروفشار و فرافشار نداریم. ۳ شکل دوم افزایش فرافشار داریم و ۳ شکل سوم افزایش فروفشار داریم.

خروجی:

S=

۲

$$s^2 + 3s + 2$$

Continuous-time transfer function.

S=

From input 1 to output:

۲

$$s^2 + 3s + 2$$

From input 2 to output:

$$\frac{1}{s + 2}$$

$$s^2 + 3s + 2$$

Continuous-time transfer function.

S=

From input 1 to output:
 $\frac{Y}{s^2 + 3s + 2}$

From input 2 to output:
 $\frac{s}{s^2 + 3s + 2}$

From input 3 to output:
 $\frac{1}{s^2 + 3s + 2}$

Continuous-time transfer function.

S=

From input 1 to output:
 $\frac{Y}{s^2 + 3s + 2}$

From input 2 to output:
 $\frac{s}{s^2 + 3s + 2}$

From input 3 to output:
 $\frac{1}{s^2 + 3s + 2}$

From input 4 to output:
 $\frac{s}{s^2 + 3s + 2}$

Continuous-time transfer function.

S=

From input 1 to output:
 $\frac{Y}{s^2 + 3s + 2}$

From input 2 to output:
 $\frac{s}{s^2 + 3s + 2}$

From input 3 to output:
 $\frac{1}{s^2 + 3s + 2}$

From input 4 to output:
 $\frac{s}{s^2 + 3s + 2}$

From input 5 to output:
 $\frac{1}{s^2 + 3s + 2}$

Continuous-time transfer function.

S=

From input 1 to output:
 $\frac{Y}{s^2 + 3s + 2}$

From input 2 to output:
 $\frac{s}{s^2 + 3s + 2}$

From input 3 to output:
 $\frac{1}{s^2 + 3s + 2}$

From input 4 to output:
 $\frac{s}{s^2 + 3s + 2}$

From input 5 to output:
 $\frac{1}{s^2 + 3s + 2}$

From input 6 to output:
 $\frac{s}{s^2 + 3s + 2}$

Continuous-time transfer function.

S=

From input 1 to output:
 $\frac{Y}{s^2 + 3s + 2}$

From input 2 to output:
 $\frac{s+2}{s^2 + 3s + 2}$

From input 3 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 4 to output:
 $\frac{s+2}{s^2 + 3s + 2}$

From input 5 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 6 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 7 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

Continuous-time transfer function.

S=

From input 1 to output:
 $\frac{Y}{s^2 + 3s + 2}$

From input 2 to output:
 $\frac{s+2}{s^2 + 3s + 2}$

From input 3 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 4 to output:
 $\frac{s+2}{s^2 + 3s + 2}$

From input 5 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 6 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 7 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 8 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

Continuous-time transfer function.

S=

From input 1 to output:
 $\frac{Y}{s^2 + 3s + 2}$

From input 2 to output:
 $\frac{s+2}{s^2 + 3s + 2}$

From input 3 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 4 to output:
 $\frac{s+2}{s^2 + 3s + 2}$

From input 5 to output:
 $\frac{1}{s+2}$
 $\frac{1}{s^2 + 3s + 2}$

From input 6 to output:

$$Y = s + 2$$

$$s^2 + 3s + 2$$

From input 7 to output:

$$Y = s + 2$$

$$s^2 + 3s + 2$$

From input 8 to output:

$$Y = s + 2$$

$$s^2 + 3s + 2$$

From input 9 to output:

$$Y = s + 2$$

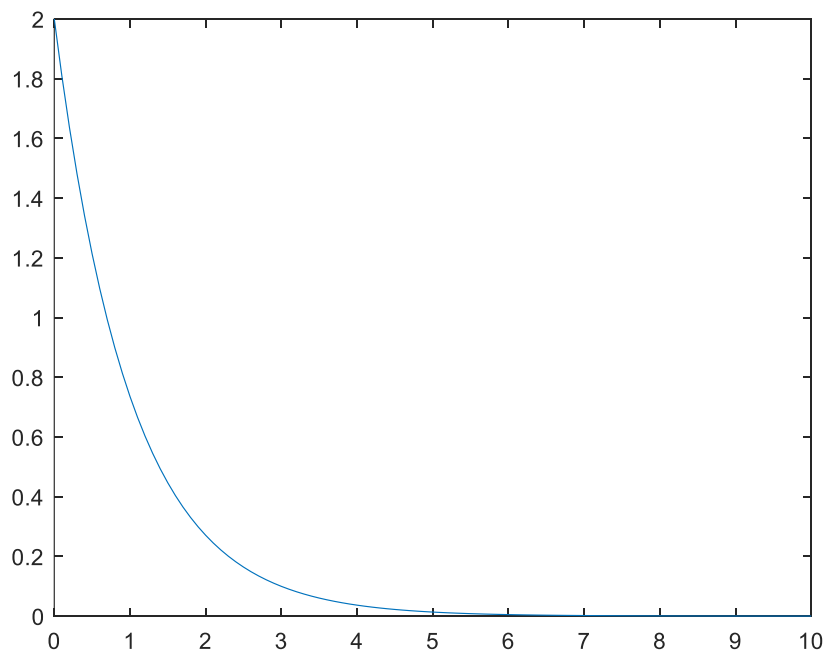
$$s^2 + 3s + 2$$

Continuous-time transfer function.

سوال ۳ (امتیازی):

```
t=0:0.1:10;  
a=[-1];  
b=[1];  
c=[1];  
d=[0];  
x0=[2];  
y=initial(a,b,c,d,x0,t)  
plot(t,y)
```

نمودار:



خروجی:

y =

2.0000

1.8097

1.6375	0.0110
1.4816	0.0100
1.3406	0.0090
1.2131	0.0082
1.0976	0.0074
0.9932	0.0067
0.8987	0.0061
0.8131	0.0055
0.7358	0.0050
0.6657	0.0045
0.6024	0.0041
0.5451	0.0037
0.4932	0.0033
0.4463	0.0030
0.4038	0.0027
0.3654	0.0025
0.3306	0.0022
0.2991	0.0020
0.2707	0.0018
0.2449	0.0017
0.2216	0.0015
0.2005	0.0014
0.1814	0.0012
0.1642	0.0011
0.1485	0.0010
0.1344	0.0009
0.1216	0.0008
0.1100	0.0007
0.0996	0.0007
0.0901	0.0006
0.0815	0.0005
0.0738	0.0005
0.0667	0.0004
0.0604	0.0004
0.0546	0.0004
0.0494	0.0003
0.0447	0.0003
0.0405	0.0003
0.0366	0.0002
0.0331	0.0002
0.0300	0.0002
0.0271	0.0002
0.0246	0.0002
0.0222	0.0001
0.0201	0.0001
0.0182	0.0001
0.0165	0.0001
0.0135	0.0001
0.0122	0.0001