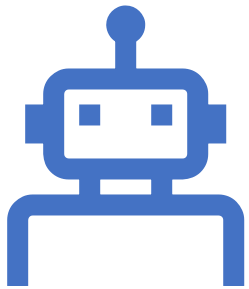


MC3008 Control Systems Laboratory Project

Alperen Ertürk 1505421

1a

- a11= -0.320
- a12=60.75
- a13=0.105
- a21=-0.0150
- a22=-0.450
- a23=0.050
- a32=67.5
- K=[a11 a12;a21 a22];
- L=[a13;a23];
- C=[0 a32];
- D=[0];
- [num,den]=ss2tf(K,L,C,D)

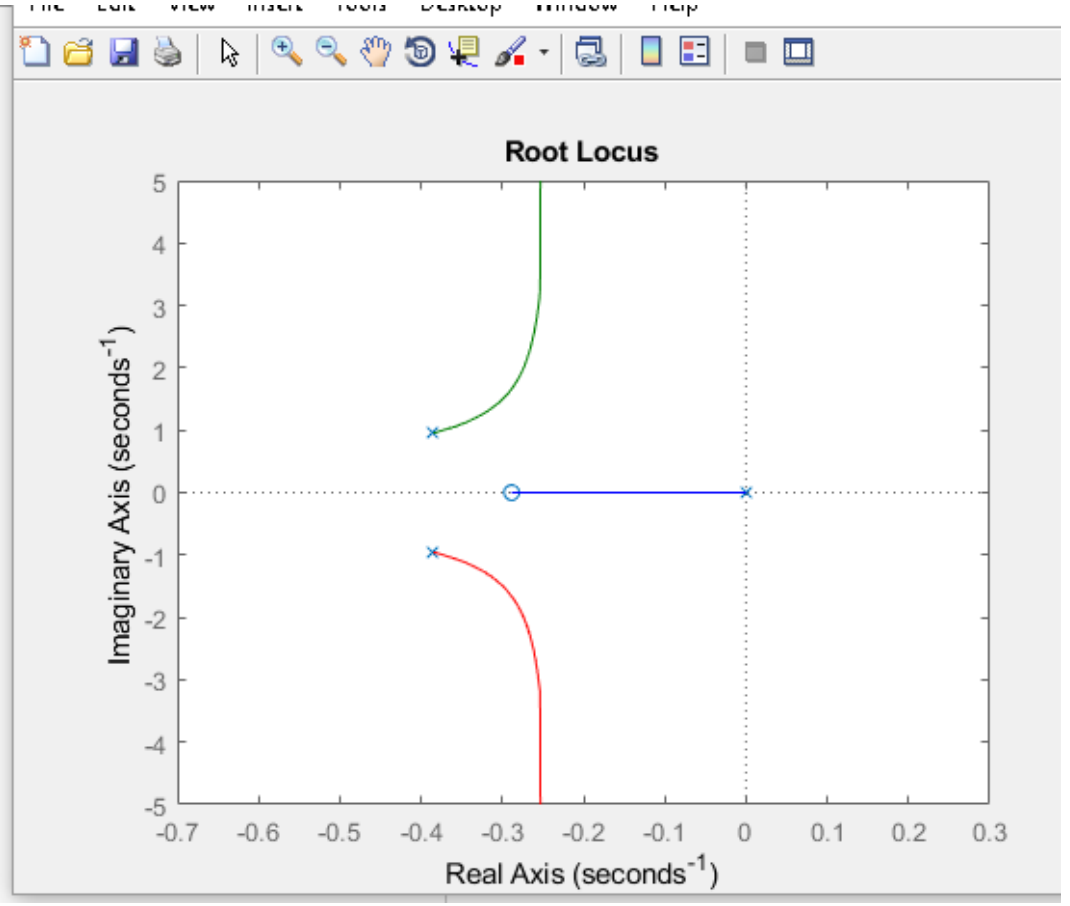
- num1=[0 3.3750 0.9737];
- den1=[1.0000 0.7700 1.0553 0];
- G=tf(num1,den1)
- step(G,10)

With this part after identifying every matrices' column and row, I seperated the matrices.Then used a code which is called ss2tf for changing state space to transfer function, then find it's numerator and denominator

After getting the numerator and denominator results from the upper code,I wrote it as a transfer function again, then took it's step with the t=10 to get the step response and used root locus to find poles and zeros.(Code for poles and zeros is at 2b part)

1b

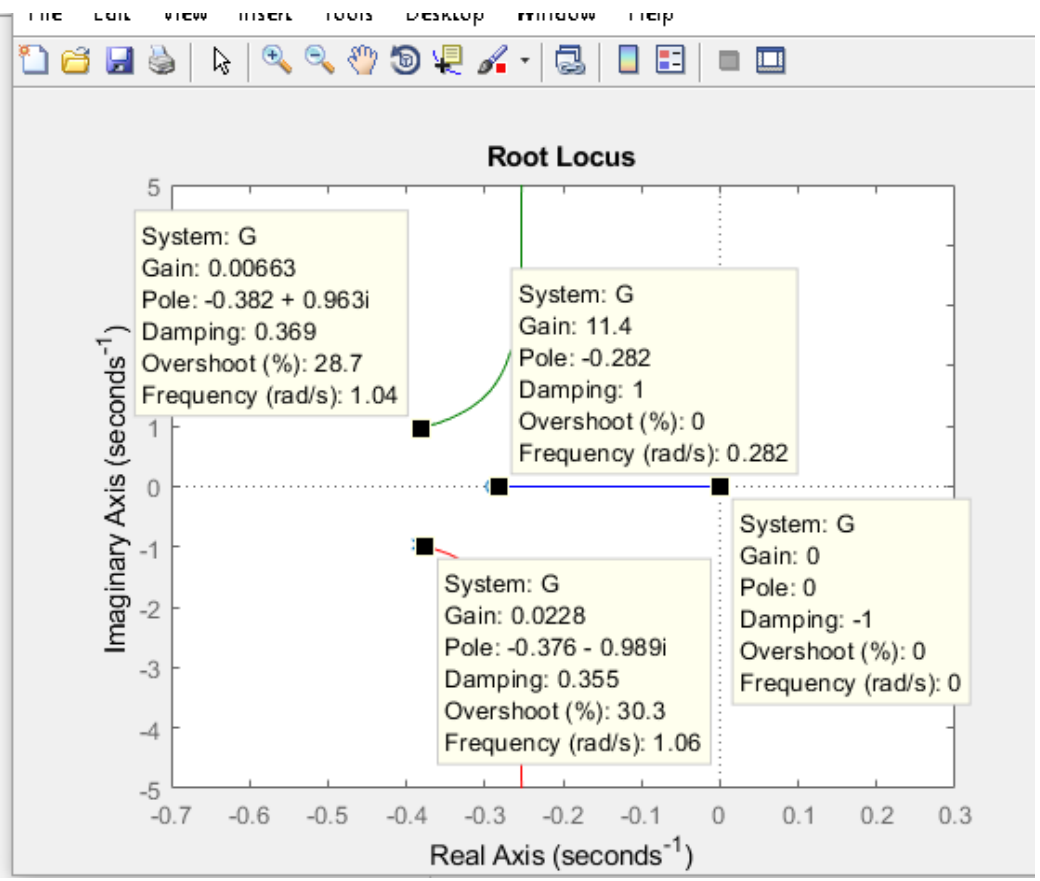
```
a11= -0.320
a12=60.75
a13=0.105
a21=-0.0150
a22=-0.450
a23=0.050
a32=67.5
K=[a11 a12;a21 a22];
L=[a13;a23];
C=[0 a32];
D=[0];
[num,den]=ss2tf(K,L,C,D)

num1=[0 3.3750 0.9737];
den1=[1.0000 0.7700 1.0553 0];
G=tf(num1,den1)
step(G,10)
rlocus(G)
```



The system seems pretty unstable.We have 3 poles,1 zeros.The order of the system is 3 (Next page poles,zeros values)

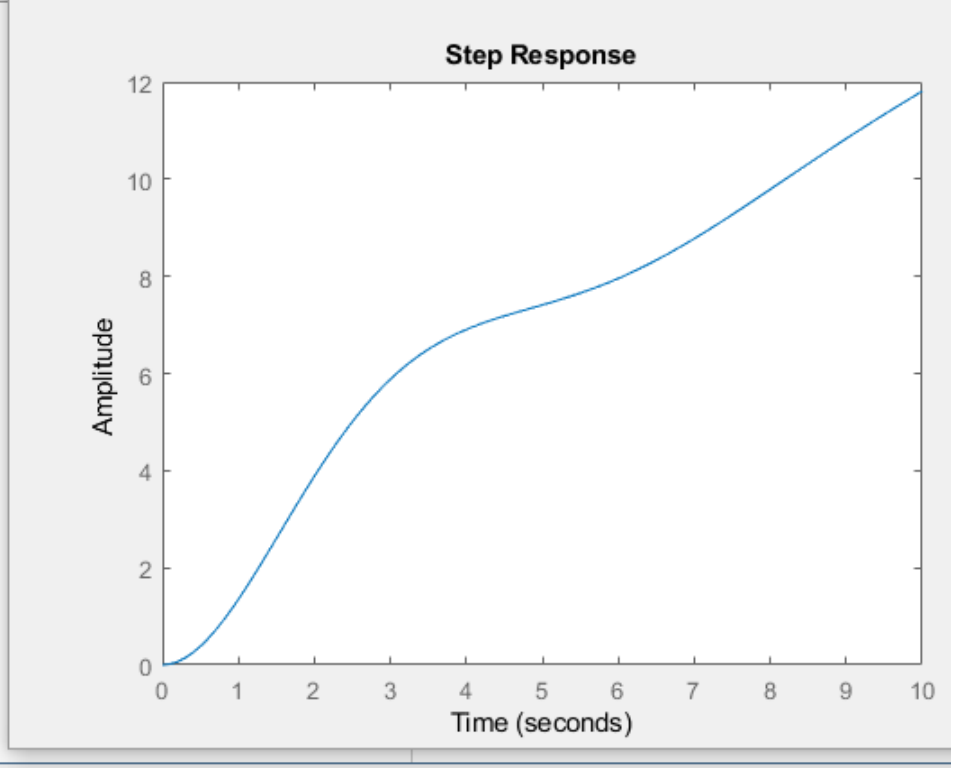
1b

```
a11= -0.320
a12=60.75
a13=0.105
a21=-0.0150
a22=-0.450
a23=0.050
a32=67.5
K=[a11 a12;a21 a22];
L=[a13;a23];
C=[0 a32];
D=[0];
[num,den]=ss2tf(K,L,C,D)

num1=[0 3.3750 0.9737];
den1=[1.0000 0.7700 1.0553 0];
G=tf(num1,den1)
step(G,10)
rlocus(G)
```



1c

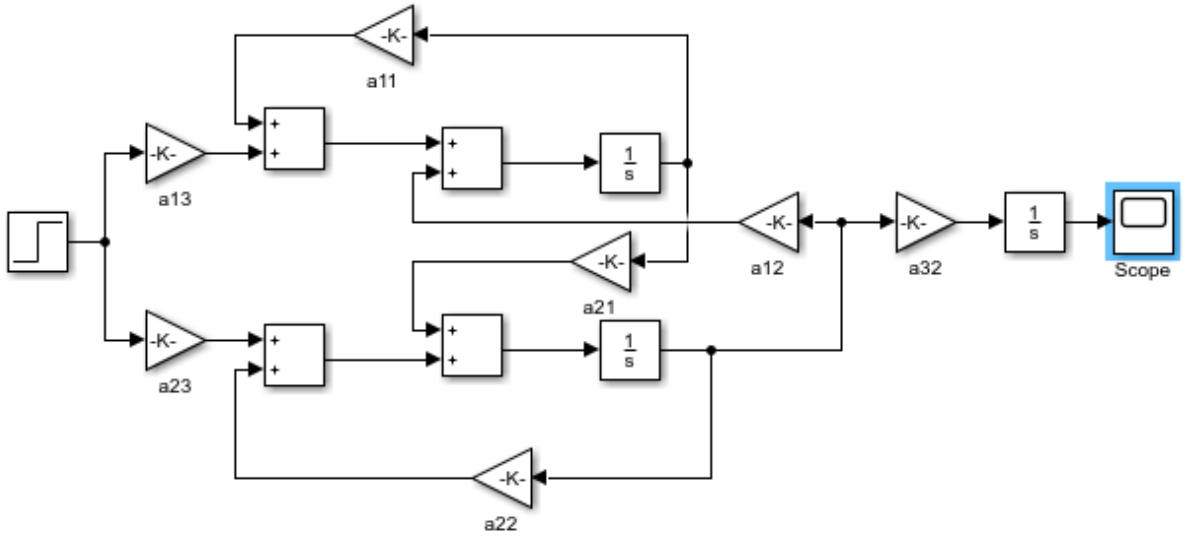
```
1 -    a11= -0.320
2 -    a12=60.75
3 -    a13=0.105
4 -    a21=-0.0150
5 -    a22=-0.450
6 -    a23=0.050
7 -    a32=67.5
8 -    K=[a11 a12;a21 a22];
9 -    L=[a13;a23];
10 -   C=[0 a32];
11 -   D=[0];
12 -   [num,den]=ss2tf(K,L,C,D)
13
14 -   num1=[0 3.3750 0.9737];
15 -   den1=[1.0000 0.7700 1.0553 0];
16 -   G=tf(num1,den1)
17 -   step(G,10)
18
```

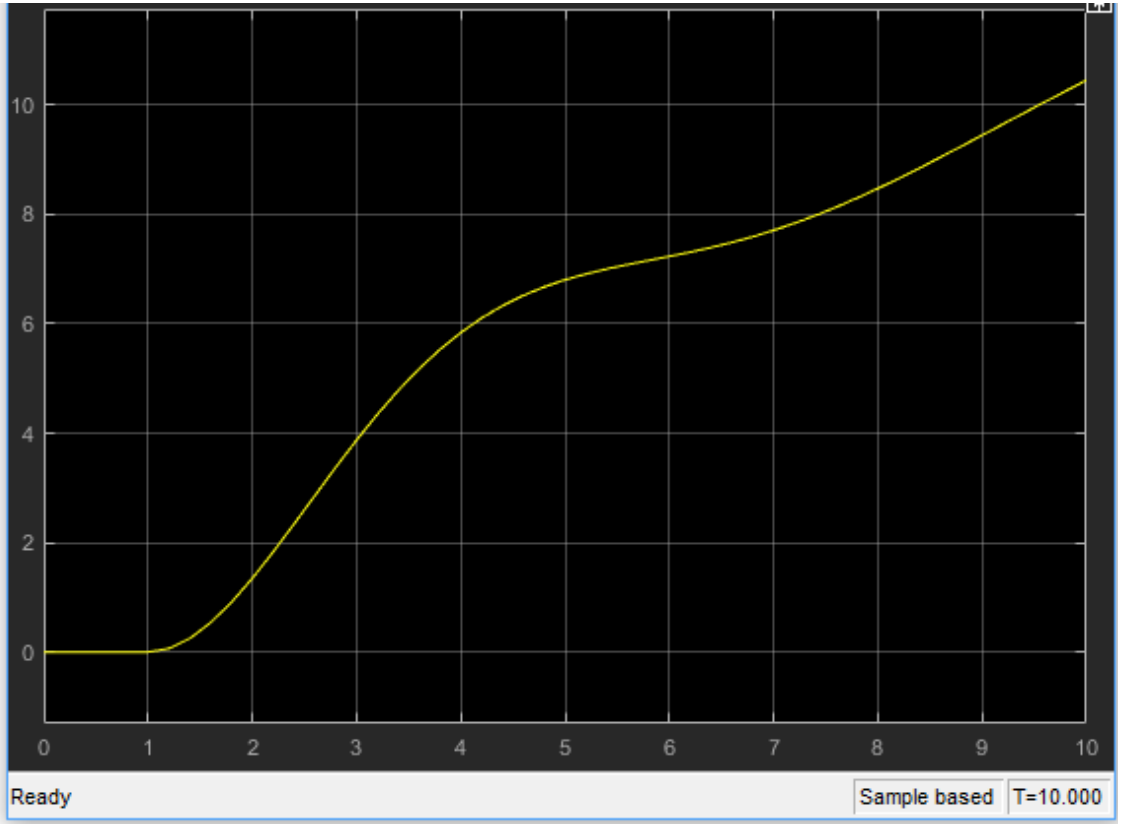


Command Window

```
G =

      3.375 s + 0.9737
  ------------------------
  s^3 + 0.77 s^2 + 1.055 s

Continuous-time transfer function.

fx >>
```

At the previous pictures there was not command window so I added this part to let you see the transfer function that I got with the codes that I wrote.





1d body diagram with mathematical model

1d

- Body diagram with transfer function