

Breanna L.

Linear Control System Theory-Homework Assignment

M-File:

```
%%
```

```
%Part_a
```

```
%Create transfer function for each block
```

```
%1st Block
```

```
num1=[4];
```

```
den1=[1];
```

```
sys1=tf(num1, den1);
```

```
%2nd Block
```

```
num2=[1];
```

```
den2=[1 1];
```

```
sys2=tf(num2, den2);
```

```
%3rd Block
```

```
num3=[1 0];
```

```
den3=[1 0 2];
```

```
sys3=tf(num3, den3);
```

```
%4th Block
```

```
num4=[1];
```

```
den4=[1 0 0];
```

```
sys4=tf(num4, den4);
```

```
%5th Block
```

```
num5=[4 2];
```

```
den5=[1 2 1];
```

```
sys5=tf(num5, den5);
```

```
%6th Block
```

```
num6=[50];
```

```
den6=[1];
```

```
sys6=tf(num6, den6);
```

```
%7th Block
```

```
num7=[1 0 2];
```

```
den7=[1 0 0 14];
```

```
sys7=tf(num7, den7);
```

```
%Create structure of systems to find closed loop transfer function
```

```
S23=series(sys2, sys3);  
S235=feedback(S23, sys5);  
S46=feedback(sys4, sys6, +1);  
S23456=series(S235, S46);  
S234567=feedback(S23456, sys7);  
%closed loop transfer function  
Stf=series(sys1, S234567)
```

OUTPUT

```
>>Stf =
```

$$4 s^6 + 8 s^5 + 4 s^4 + 56 s^3 + 112 s^2 + 56 s$$

$$s^{10} + 3 s^9 - 45 s^8 - 125 s^7 - 200 s^6 - 1177 s^5 - 2344 s^4 \\ - 3485 s^3 - 7668 s^2 - 5598 s - 1400$$

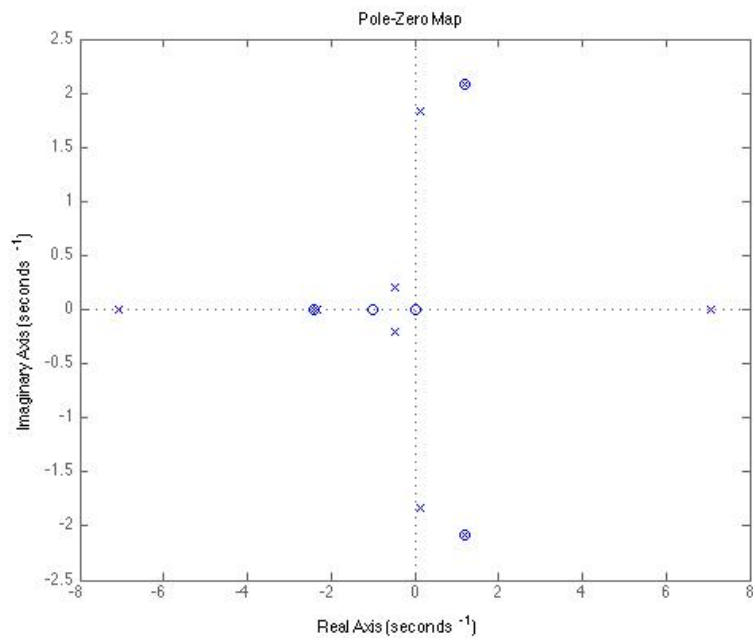
Continuous-time transfer function.

```
%%  
%Part_b  
%Pole-zero map of closed-loop transfer function  
%using pzmap function
```

```
pzmap(Stf)
```

```
%%  
%Part_c  
%Determine explicitly the poles and zeros of the closed-loop transfer function
```

```
P=pole(Stf)  
Z=zero(Stf)
```



P =

$7.0709 + 0.0000i$
 $-7.0713 + 0.0000i$
 $1.2051 + 2.0863i$
 $1.2051 - 2.0863i$
 $0.1219 + 1.8374i$
 $0.1219 - 1.8374i$
 $-2.3933 + 0.0000i$
 $-2.3333 + 0.0000i$
 $-0.4635 + 0.1997i$
 $-0.4635 - 0.1997i$

Z =

$0.0000 + 0.0000i$
 $1.2051 + 2.0872i$
 $1.2051 - 2.0872i$
 $-2.4101 + 0.0000i$
 $-1.0000 + 0.0000i$
 $-1.0000 - 0.0000i$