
Table of Contents

.....	1
Problem 11-4	1
Problem 11-10	1
Problem 11-13	2
Problem 6 d	2
Problem 6 e	3
Problem 6f	3

```
% Praful Sigdel  
% Linear Control Theory HW #7
```

Problem 11-4

```
A = [-1 0 1; 1 -2 0; 0 0 -3];  
B = [0; 0; 1];  
C = [1 1 0];  
D = 0;
```

```
[num, den] = ss2tf(A, B, C, D)
```

num =

```
0      0      1.0000      3.0000
```

den =

```
1      6      11      6
```

Problem 11-10

```
num = [0 10.4 47 160];  
den = [1 14 56 160];  
[A, B, C, D] = tf2ss(num, den)
```

A =

```
-14      -56      -160  
1         0         0  
0         1         0
```

B =

```
1
```

```
0
0
```

```
C =
```

```
10.4000    47.0000   160.0000
```

```
D =
```

```
0
```

Problem 11-13

```
A = [-1 -2 -2; 0 -1 1; 1 0 -1];
B = [2; 0; 1];
C = [1 1 0];
D = 0;
Ob_m = obsv(A,C);
ctrb_m = ctrb(A,B);
controllable_rank = rank(ctrb_m);
observable_rank = rank(Ob_m);
unobservable_states = length(A) - observable_rank % This value equals 0
implies fully observable
uncontrollable_states = length(A) - controllable_rank % This value equals 0
implies fully controllable
```

```
unobservable_states =
```

```
0
```

```
uncontrollable_states =
```

```
0
```

Problem 6 d

```
A = [0 1; 4 0];
B = [0; 1];
C = [-1 1];
D = 0;
```

```
[num, den]=ss2tf(A,B,C,D)
```

```
num =
```

```
0    1.0000   -1.0000
```

den =

1.0000 -0.0000 -4.0000

Problem 6 e

```
A = [0 1;4 0];  
B = [0; 1];  
ctrb_m = ctrb(A,B)
```

ctrb_m =

0 1
1 0

Problem 6f

```
A = [0 1;4 0];  
B = [0; 1];  
K = acker(A,B,[-4 -4])
```

K =

20 8

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