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`% Question 4`

`% alot of this is scratch work, may not be useful to parse`

```
A = [[0 1 0];[-4 0 0];[0 0 0]];
eig(A);
B = [0;1;0];
C = [1 0 1];
```

reachability

```
rank([B A*B A*A*B])
Omega = [C' A'*C' A'*A'*C']
```

```
p = [-2;-2;-2];
```

```
ans =
```

```
2
```

```
Omega =
```

```
1      0     -4
0      1      0
1      0      0
```

testing observer gain

```
K = acker(A',C',p)
```

```
K2 = [0 0 1]*inv(Omega)*[6;12;8]
```

```
eig(A-K'*C)
```

```
alpha = A'^3 + 6*A'^2 + 12*A' + 8*eye(3)
```

```
[0 0 1]*inv(Omega)*alpha
```

```
pp = [-2+2j, -2-2j, 0]
```

`[Ao,Bo,Co]=obsvf(A,B,C)`

`K =`

`4 8 2`

`K2 =`

`0.5000`

`ans =`

`-2.0000 + 0.0000i`
`-2.0000 + 0.0000i`
`-2.0000 - 0.0000i`

`alpha =`

`-16 -32 0`
`8 -16 0`
`0 0 8`

`ans =`

`4 8 2`

`pp =`

`-2.0000 + 2.0000i -2.0000 - 2.0000i 0.0000 + 0.0000i`

`Ao =`

`0 0.7071 0`
`-2.8284 0 -2.8284`
`0 0.7071 0`

`Bo =`

`0`
`1`
`0`

`Co =`

`-0.0000 0 1.4142`

testing controller gain

```
acker(A,B,[pp])
```

```
T = [[0 1 0];[1 0 0];[0 0 1]]  
inv(T)
```

```
[Ac,Bc,Cc] = ctrbf(A,B,C)
```

```
eig(Ac)
```

Warning: Matrix is singular to working precision.

```
ans =
```

```
NaN NaN NaN
```

```
T =
```

```
0 1 0  
1 0 0  
0 0 1
```

```
ans =
```

```
0 1 0  
1 0 0  
0 0 1
```

```
Ac =
```

```
0 0 0  
0 0 1  
0 -4 0
```

```
Bc =
```

```
0  
0  
1
```

```
Cc =
```

```
1 1 0
```

ans =

0.0000 + 2.0000i

0.0000 - 2.0000i

0.0000 + 0.0000i

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