ELEN 236 Project 1.4

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Devon Quaternik

```
%Previous work
L=1;
J=0.0676;
m=0.9048;
r=0.03;
Jb=0.000326;
g=9.81;
p0=.25;

b=m/[(Jb/r^2)+m];

a=[0 1 0 0; 0 0 -b*g 0; 0 0 0 1; -m*g/(m*p0^2+J+Jb) 0 0 0];
B=[0;0;0;1/(m*p0^2+J+Jb)];
c=[1 0 0 0];
d=0;

sys=ss(a,B,c,d);
```

4.4b

```
%previous work that creates the Controllable canonical form. Since
%Observable canonical form is the transpose of CCF, this is easier
 than
%redoing everything.
P=ctrb(sys);
[num, den]=ss2tf(a,B,c,d)
Pc1=[0 0 0 1; 0 0 1 0; 0 1 0 0; 1 0 0 0];
Tc=P*Pc1;
Tc1=inv(Tc);

Ac1=Tc1*a;
Ac=Ac1*Tc;
Bc=Tc1*B;
Cc=c*Tc;
Dc=d;

%Create transpose matrices
Ao=Ac.'
Bo=Cc.'
Co=Bc.'
Do=Dc.'
```

```
A2=a*a;
A3=A2*a;
Q=[c; c*a; c*A2; c*A3];
y=rank(Q);
if y==length(a)
    disp('Observable');
else
    disp('Not Observable');
end
%The OCF shows that this is an observable system, which agrees with
 what
%you find in the observability matrix.
```

```
num =

         0         0         0         0  -56.2797


den =

    1.0000         0    0.0000    0.0000 -499.5435


Ao =

         0         0         0  499.5435
    1.0000         0         0         0
         0    1.0000         0         0
         0         0    1.0000         0


Bo =

  -56.2797
         0
         0
         0


Co =

     0     0     0     1


Do =

     0

Observable
```

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