

CONTROL SYSTEM LAB REPORTS

LAB 03

**SUBMITTED BY
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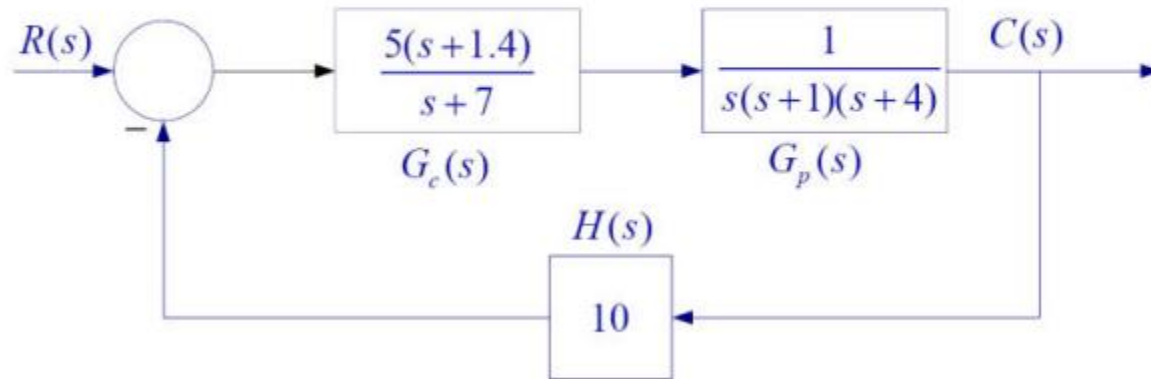
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LAB 03

Lab Task 1: Use the feedback function to obtain the closed-loop transfer function and then *tf2ss* function to obtain the closed-loop state space model of the system in Figure 7.



MATLAB CODE:

```
s=tf('s')
Gc=(5*(s+1.4))/(s+7)
Gp=(1)/(s*(s+1)*(s+4))
Ge=series(Gc,Gp)
feed=feedback(Ge,[10])
num=[5 7]
den=[1 12 39 78 70]
[A,B,C,D]=tf2ss(num,den)
```

MATLAB RESULT:

First we have to find the series of two transfer function,

```
Command Window
>> s=tf('s')
Gc=(5*(s+1.4))/(s+7)

s =

s

Continuous-time transfer function.

Gc =

5 s + 7
-----
s + 7

Continuous-time transfer function.
```

```
Command Window
>> Gp=(1)/(s*(s+1)*(s+4))
Ge=series(Gc,Gp)

Gp =

      1
-----
s^3 + 5 s^2 + 4 s

Continuous-time transfer function.

Ge =

      5 s + 7
-----
s^4 + 12 s^3 + 39 s^2 + 28 s

Continuous-time transfer function.
```

Our feedback has gain of 10, so using feedback command to find the closed loop transfer function,

```
Command Window
>> feed=feedback(Ge,[10])

feed =

      5 s + 7
-----
s^4 + 12 s^3 + 39 s^2 + 78 s + 70

Continuous-time transfer function.
```

Closed loop transfer function is achieved, so extract the num and den values,

```
Command Window
>> num=[5 7]
den=[1 12 39 78 70]

num =

      5      7

den =

      1      12      39      78      70
```

Now use tf2ss command to find the state matrix from closed loop transfer function

```
>> [A,B,C,D]=tf2ss(num,den)
```

A =

-12	-39	-78	-70
1	0	0	0
0	1	0	0
0	0	1	0

B =

1
0
0
0

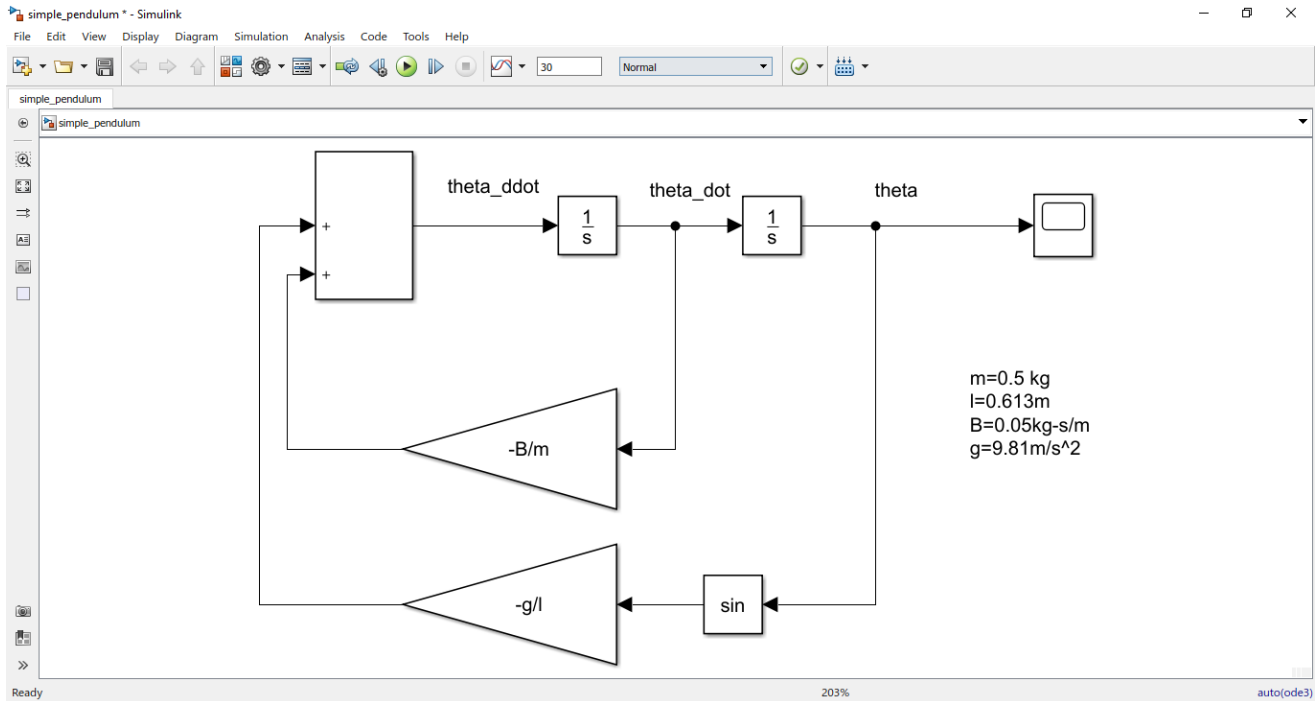
C =

0	0	5	7
---	---	---	---

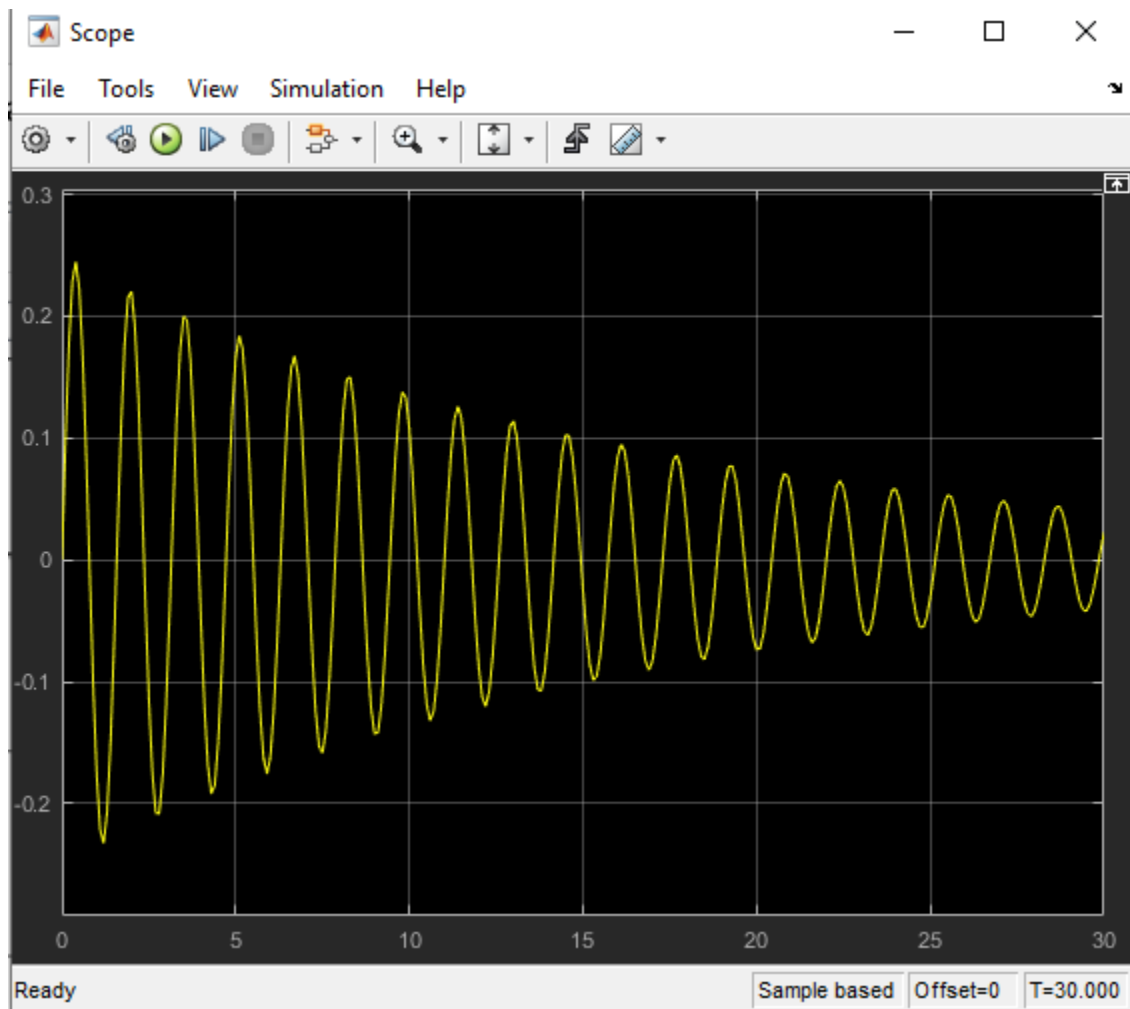
D =

f_x 0

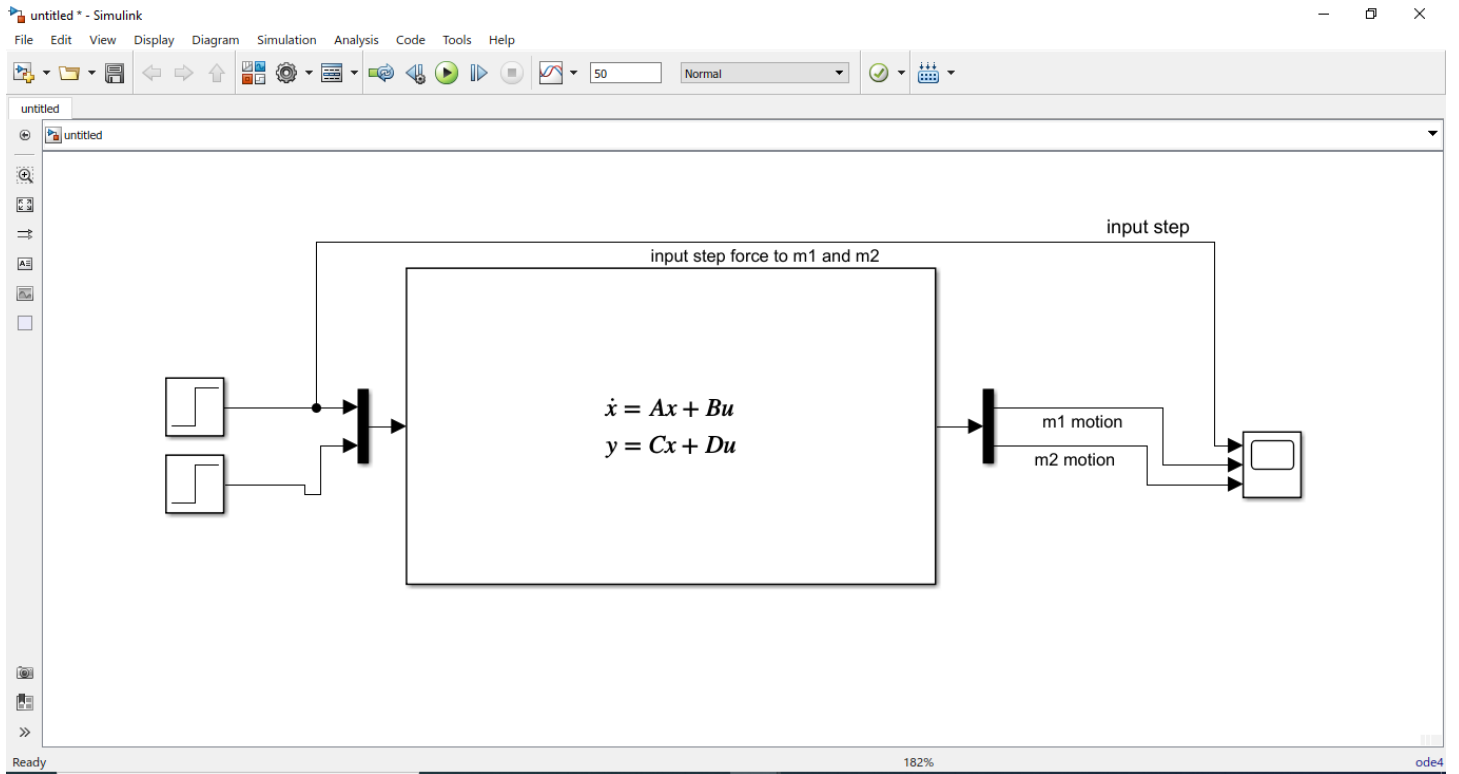
TASK 02:



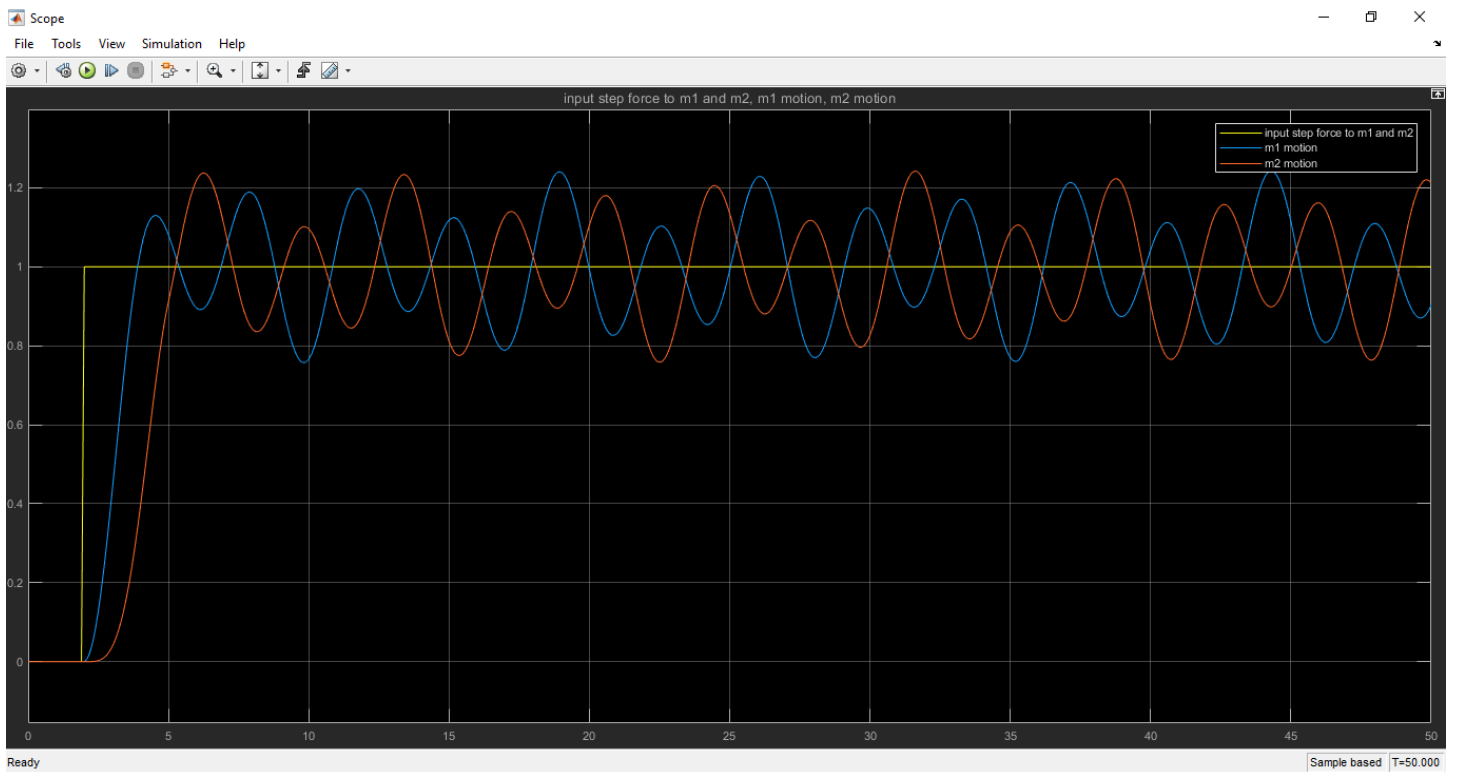
Simulation results:



TASK 03:



SIMULINK RESULT:



When the A-Matrix is changed so the result obtained is;

