CONTROL SYSTEM-2

PRACTICAL FILE

SUBMITTED BY: MANAN MADAN
ROLL NUMBER: 2018UIC3087
Branch: Instrumentation and Control Engineering

List of Experiments

1. **Practical problems using state-space equations in MATLAB**
2. **Pole placement and observer design for a given state-space model using MATLAB**
3. **Modeling and control of Cruise control system using MATLAB**
4. **Modeling and control of DC motor using MATLAB**
5. **The Frequency design method of a Cruise control system.**
6. **Obtain the transfer function of the system-defined by the following state-space equations:**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -5 & -25 & -5\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}0\\ 25\\ -120\end{bmatrix}u$$

$$y = \begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$

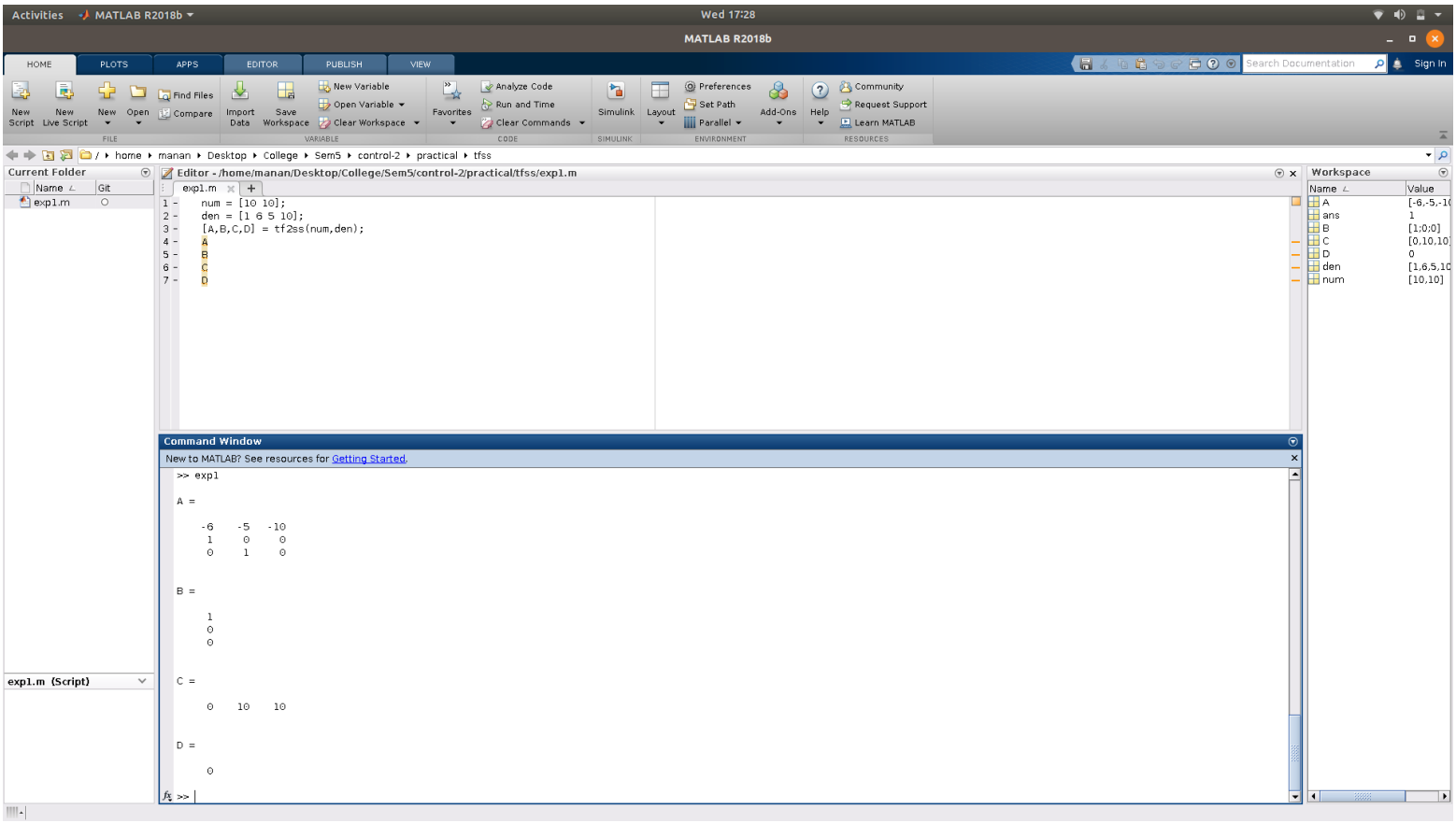
7. **Step response and impulse response of second-order systems for varying damping ratio:**

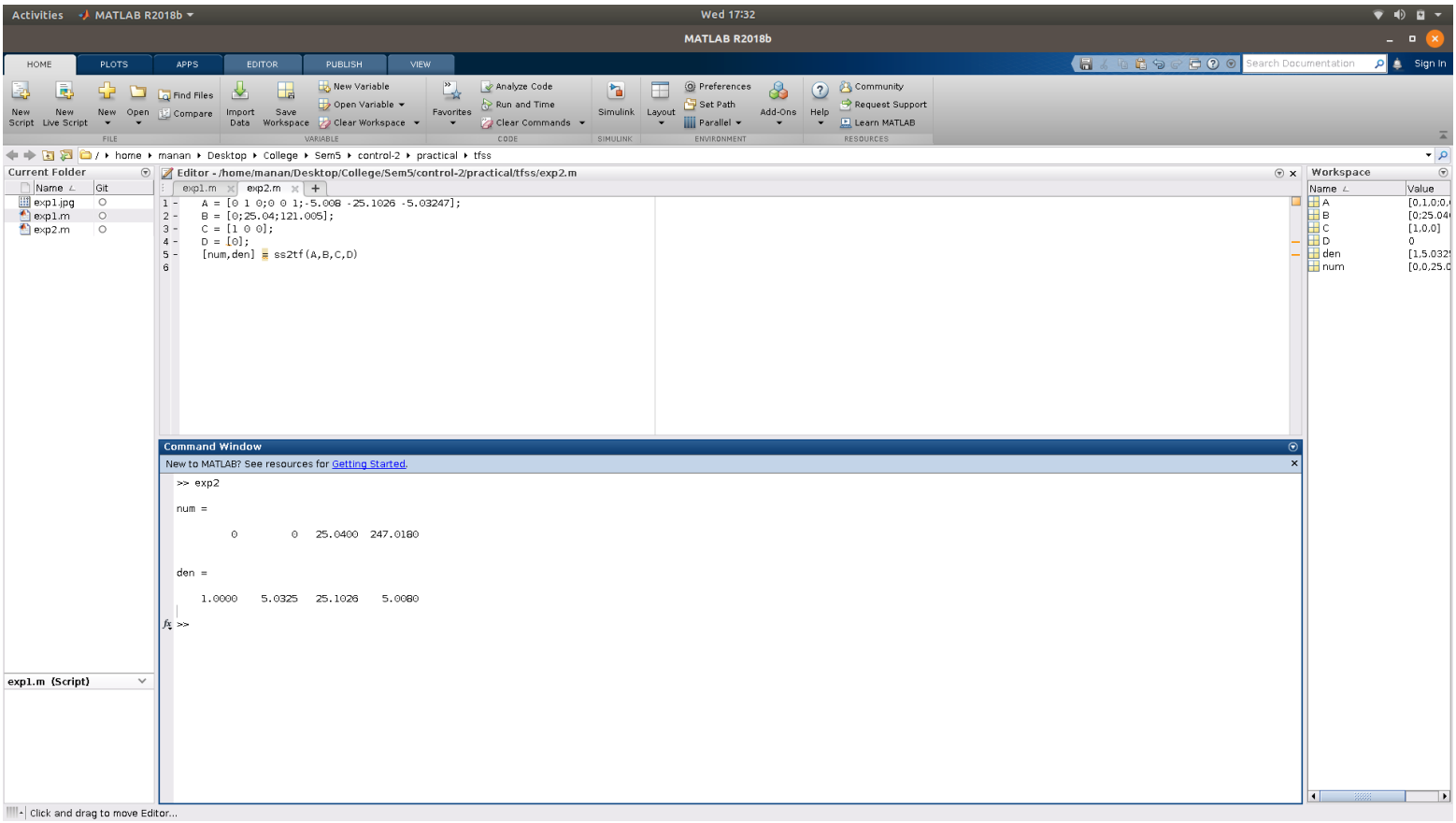
   (i) G(s) = $\frac{10}{s^2+2s+10}$

   (ii) G(s) = $\frac{25}{s^2+4s+25}$

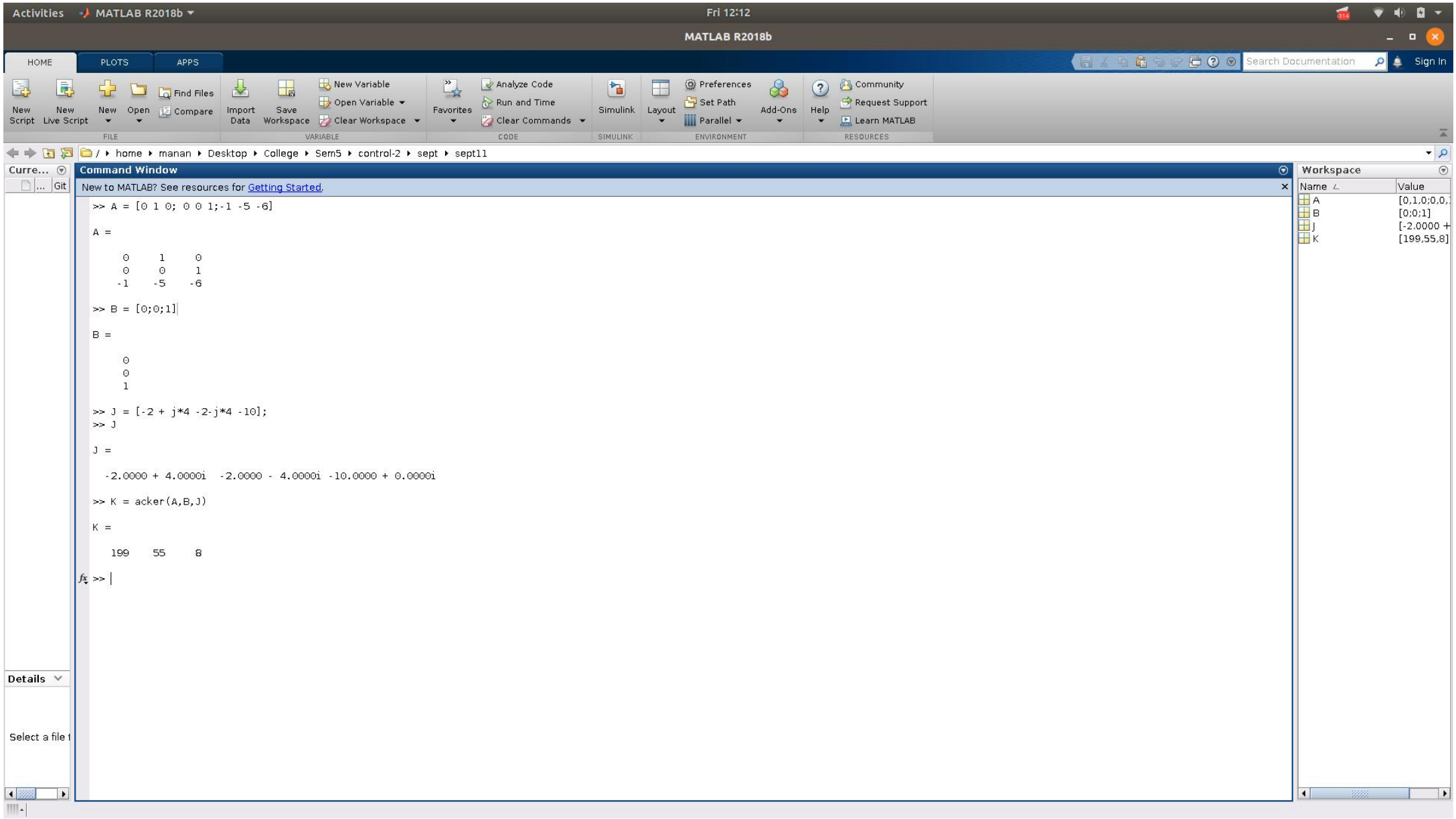
8. **The Frequency design method of DC motor using MATLAB.**

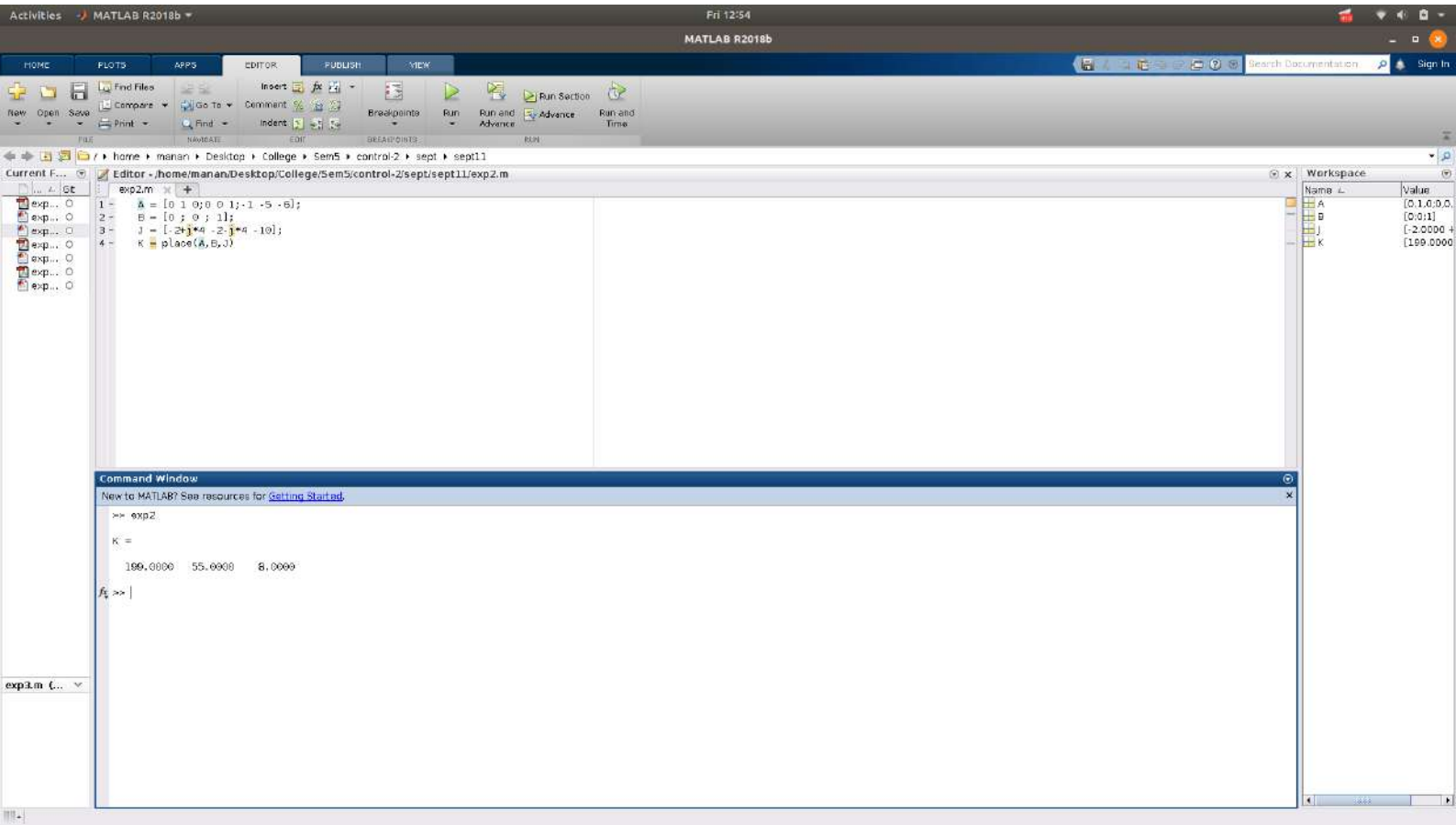
STATE SPACE AND TRANSFER FUNCTION


Activities
MATLAB R2018b
Wed 17:28
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New Script
New Live Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Favorites
Analyze Code
Run and Time
Clear Commands
Simulink
Layout
Preferences
Set Path
Parallel
Add-Ons
Help
Community
Request Support
Learn MATLAB
FILE
VARIABLE
CODE
SIMULINK
ENVIRONMENT
RESOURCES
/ home manan Desktop College Sem5 control-2 practical tfss
Current Folder
Name
Git
exp1.m
exp1.m (Script)
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/tfss/exp1.m
exp1.m
1 - num = [10 10];
2 - den = [1 6 5 10];
3 - [A,B,C,D] = tf2ss(num,den);
4 - A
5 - B
6 - C
7 - D
Command Window
New to MATLAB? See resources for Getting Started.
>> exp1
A =
-6 -5 -10
1 0 0
0 1 0
B =
1
0
0
C =
0 10 10
D =
0
>>
Workspace
Name
Value
A [-6,-5,-10
ans 1
B [1;0;0]
C [0,10,10]
D 0
den [1,6,5,10
num [10,10]


Activities
MATLAB R2018b
Wed 17:32
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New Script
New Live Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Favorites
Analyze Code
Run and Time
Clear Commands
Simulink
Layout
Preferences
Set Path
Parallel
Add-Ons
Help
Community
Request Support
Learn MATLAB
FILE
VARIABLE
CODE
SIMULINK
ENVIRONMENT
RESOURCES
/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ practical ▸ tfss
Current Folder
Name
Git
exp1.jpg
exp1.m
exp2.m
exp1.m (Script)
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/tfss/exp2.m
exp1.m
exp2.m
1 - A = [0 1 0;0 0 1;-5.008 -25.1026 -5.03247];
2 - B = [0;25.04;121.005];
3 - C = [1 0 0];
4 - D = [0];
5 - [num,den] = ss2tf(A,B,C,D)
6
Workspace
Name
Value
A [0,1,0;0,
B [0;25.04
C [1,0,0]
D 0
den [1,5.032
num [0,0,25.0
Command Window
New to MATLAB? See resources for Getting Started.
>> exp2
num =
0 0 25.0400 247.0180
den =
1.0000 5.0325 25.1026 5.0080
>>
Click and drag to move Editor...

POLE PLACEMENT


Activities
MATLAB R2018b
Fri 12:12
MATLAB R2018b
HOME
PLOTS
APPS
Search Documentation
Sign In
New Script
New Live Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Favorites
Analyze Code
Run and Time
Clear Commands
Simulink
Layout
Preferences
Set Path
Parallel
Add-Ons
Help
Community
Request Support
Learn MATLAB
FILE
VARIABLE
CODE
SIMULINK
ENVIRONMENT
RESOURCES
/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ sept ▸ sept11
Curre...
Git
Details
Select a file t
Command Window
New to MATLAB? See resources for Getting Started.
>> A = [0 1 0; 0 0 1;-1 -5 -6]
A =
0 1 0
0 0 1
-1 -5 -6
>> B = [0;0;1]
B =
0
0
1
>> J = [-2 + j*4 -2-j*4 -10];
>> J
J =
-2.0000 + 4.0000i -2.0000 - 4.0000i -10.0000 + 0.0000i
>> K = acker(A,B,J)
K =
199 55 8
>>
Workspace
Name
Value
A
[0,1,0;0,0,
B
[0;0;1]
J
[-2.0000 +
K
[199,55,8]


Activities
MATLAB R2018b
Fri 12:54
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ sept ▸ sept11
Current F...
Editor - /home/manan/Desktop/College/Sem5/control-2/sept/sept11/exp2.m
exp2.m
1 - A = [0 1 0;0 0 1;-1 -5 -6];
2 - B = [0 ; 0 ; 1];
3 - J = [-2+j*4 -2-j*4 -10];
4 - K = place(A,B,J)
Workspace
Name
Value
A
[0,1,0;0,0,
B
[0;0;1]
J
[-2.0000 +
K
[199.0000
Command Window
New to MATLAB? See resources for Getting Started.
>> exp2
K =
199.0000 55.0000 8.0000
fx >>

Activities MATLAB R2018b Fri 12:42

HOME PLOTS APPS EDITOR PUBLISH VIEW

New Open Save Find Files Compare Print Go To Find Insert Comment Indent Breakpoints Run Run and Advance

FILE NAVIGATE EDIT BREAKPOINTS

/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ sept ▸ sept11

Current F...

exp...
exp...

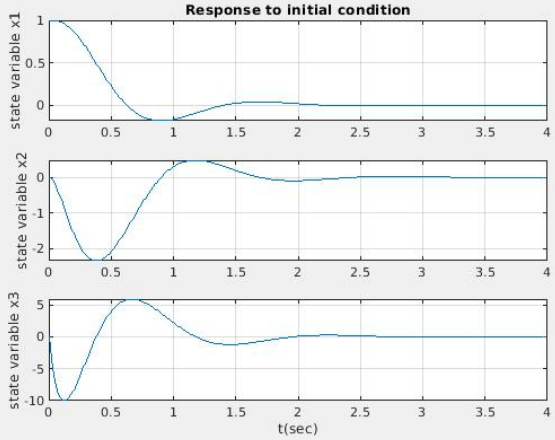
Editor - /home/manan/Desktop/College/Sem5/control-2/sept/sept11/exp3.m

exp3.m

```
1 -    A = [0 1 0;0 0 1;-1 -5 -6];
2 -    B = [0;0;1];
3 -    K = [199 55 8];
4 -    sys = ss(A-B*K,eye(3),eye(3),eye(3));
5 -    t = 0:0.01:4;
6 -    x = initial(sys,[1;0;0],t);
7 -    x1 = [1 0 0]*x';
8 -    x2 = [0 1 0]*x';
9 -    x3 = [0 0 1]*x';
10 -   subplot(3,1,1);plot(t,x1),grid
11 -   title('Response to initial condition')
12 -   ylabel('state variable x1')
13 -   subplot(3,1,2);plot(t,x2),grid
14 -   ylabel('state variable x2')
15 -   subplot(3,1,3);plot(t,x3),grid
16 -   xlabel('t(sec)')
17 -   ylabel('state variable x3')
```

Figure 1

File Edit View Insert Tools Desktop Window Help



Command Window

New to MATLAB? See resources for Getting Started.

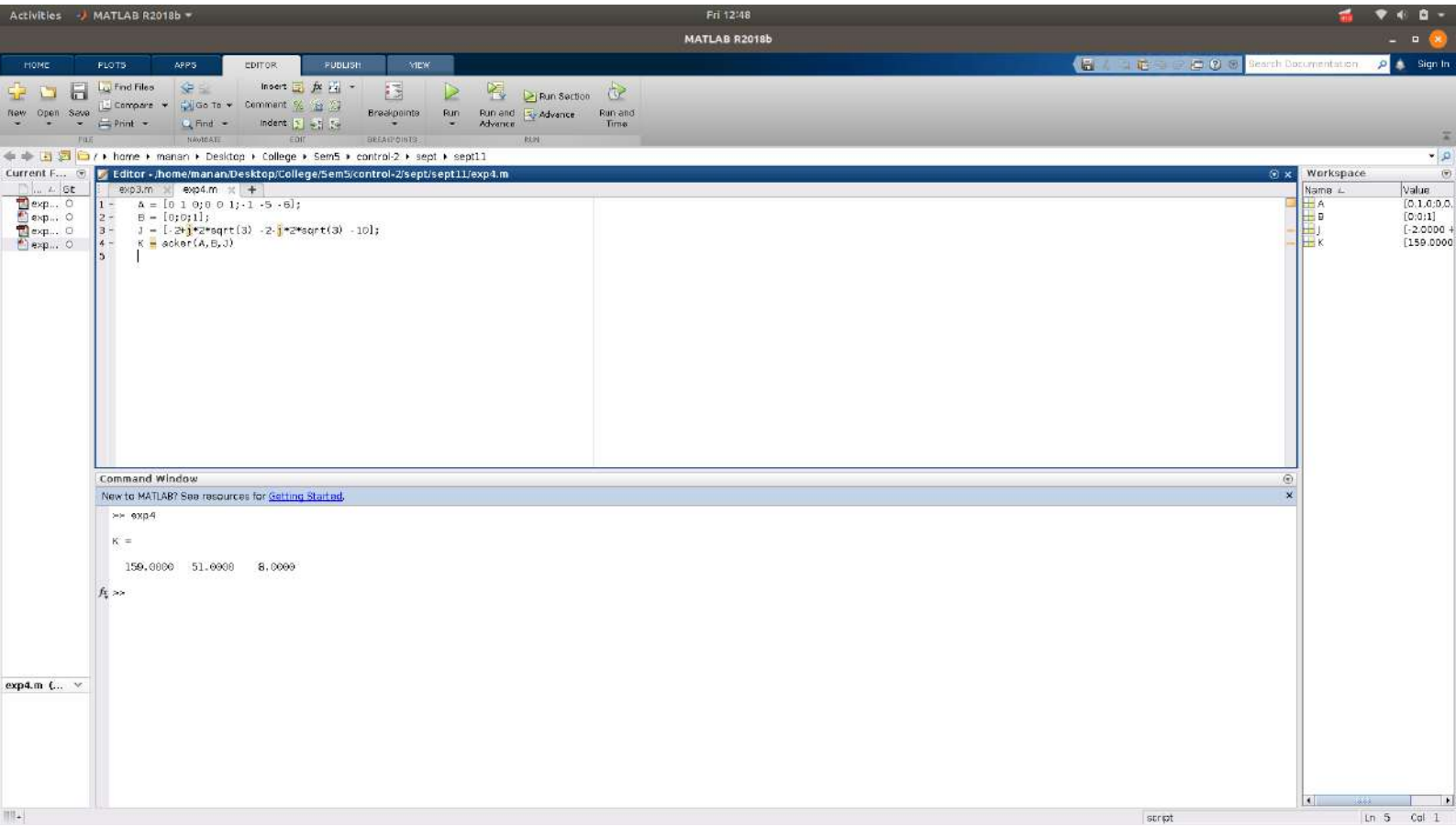
```
>> exp3
>>
```

Workspace

Name	Value
A	[0,1,0;0,0,
B	[0;0;1]
K	[199,55,8]
sys	3x3 ss
t	1x401 dou
x	401x3 dou
x1	1x401 dou
x2	1x401 dou
x3	1x401 dou

Details

Select a file to vie


Activities
MATLAB R2018b
Fri 12:48
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ sept ▸ sept11
Current F...
Editor - /home/manan/Desktop/College/Sem5/control-2/sept/sept11/exp4.m
exp3.m
exp4.m
1 - A = [0 1 0;0 0 1;-1 -5 -6];
2 - B = [0;0;1];
3 - J = [-2+j*2*sqrt(3) -2-j*2*sqrt(3) -10];
4 - K = acker(A,B,J)
5
Workspace
Name
Value
A
[0,1,0;0,0,
B
[0;0;1]
J
[-2.0000 +
K
[159.0000
Command Window
New to MATLAB? See resources for Getting Started.
>> exp4
K =
159.0000 51.0000 8.0000
fx >>
exp4.m (...
script
Ln 5 Col 1

CRUISE CONTROL

```
'Name : Manan'
'Roll No ; 2018UIC3087'
m = 1000;
b = 50;
u = 500;
A = [0 1;0 -b/m];
B = [0;1/m];
C = [0 1];
D = [0];
step(A,B*u,C,D)
[num,den] = ss2tf(A, B, C, D);
kp = 800;
ki = 40;
num1 = [kp,ki];
den1 = [1 0];
num2 = conv(num,num1)
den2 = conv(den,den1)
[numc,denc] = cloop(num2,den2,-1);
t = 0:0.1:20;
step(10*numc,denc,t)
axis([0 20 0 10])
```

```
>> ccmodel

ans =

    'Name : Manan'


ans =

    'Roll No ; 2018UIC3087'


num2 =

         0    0.8000    0.0400         0


den2 =

    1.0000    0.0500         0         0

>>
```

Name	Value
A	[0,1;0,-0.05
ans	'Roll No ; 20
b	50
B	[0;1.0000e-
C	[0,1]
D	0
den	[1,0.0500,0]
den1	[1,0]
den2	[1,0.0500,0,
denc	[1,0.8500,0.
ki	40
kp	800
m	1000
num	[0,1.0000e-
num1	[800,40]
num2	[0,0.8000,0.
numc	[0,0.8000,0.
t	*1x201 doub*
u	500

Activities MATLAB R2018b Sat 21:26

MATLAB R2018b

HOME PLOTS APPS EDITOR PUBLISH VIEW

New Open Save Find Files Compare Print FILE

Go To Find NAVIGATE

Insert Comment Indent EDIT

Breakpoints BREAKPOINTS

Run Run and Advance Run Section Advance Run and Time RUN

Search Documentation Sign In

/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ practical ▸ cruise_control

Current F...

N... Git

2018...
ccm...
ccm...
cnst...
intro...
ssm...

ccmodel1...

Editor - /home/manan/Desktop/College/Sem5/control-2/practical/cruise_control/ccmodel1.m

ccmodel1.m

```
1 -  m=1000;
2 -  b=50;
3 -  u=500;
4 -  A=[0 1;0 -b/m];
5 -  B=[0;1/m];
6 -  C=[0 1];
7 -  D=0;
8
9 -  step(A,B,C,D);
10
11 - [num,den]=ss2tf(A,B,C,D);
12 - k=600;
13 - [numc,denc]=cloop(k*num,den,-1);
14 - t=0:0.1:20;
15 - step(10*numc,denc,t)
16 - axis([0 20 0 10])
17
18
19
20
```

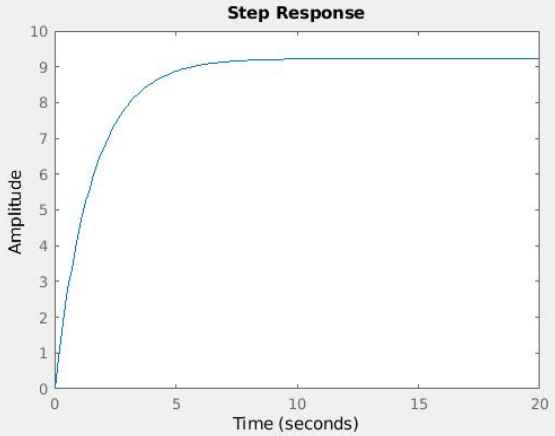
Command Window

New to MATLAB? See resources for Getting Started.

```
>> ccmodel1
fx >>
```

Figure 1

File Edit View Insert Tools Desktop Window Help

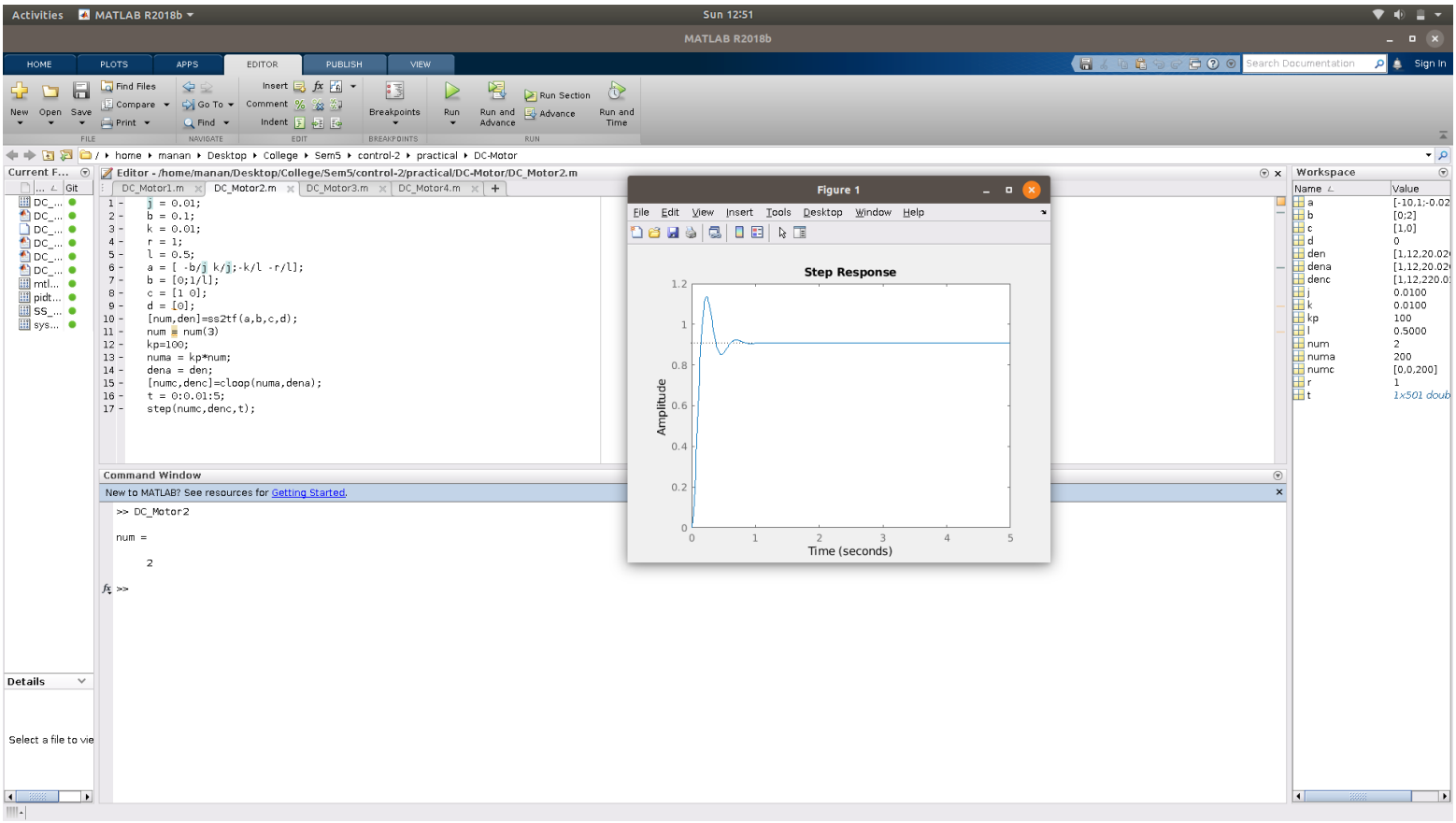


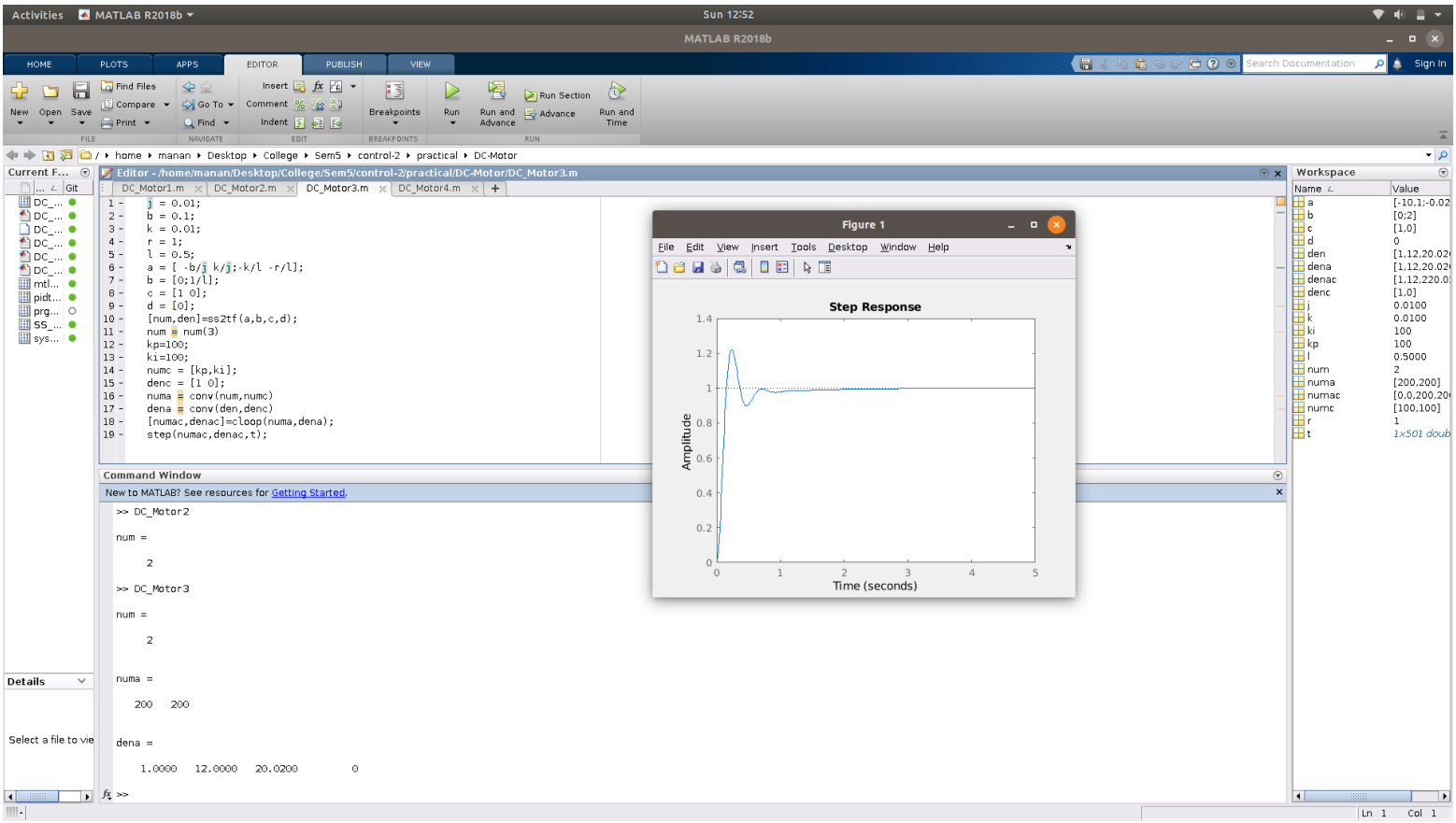
Workspace

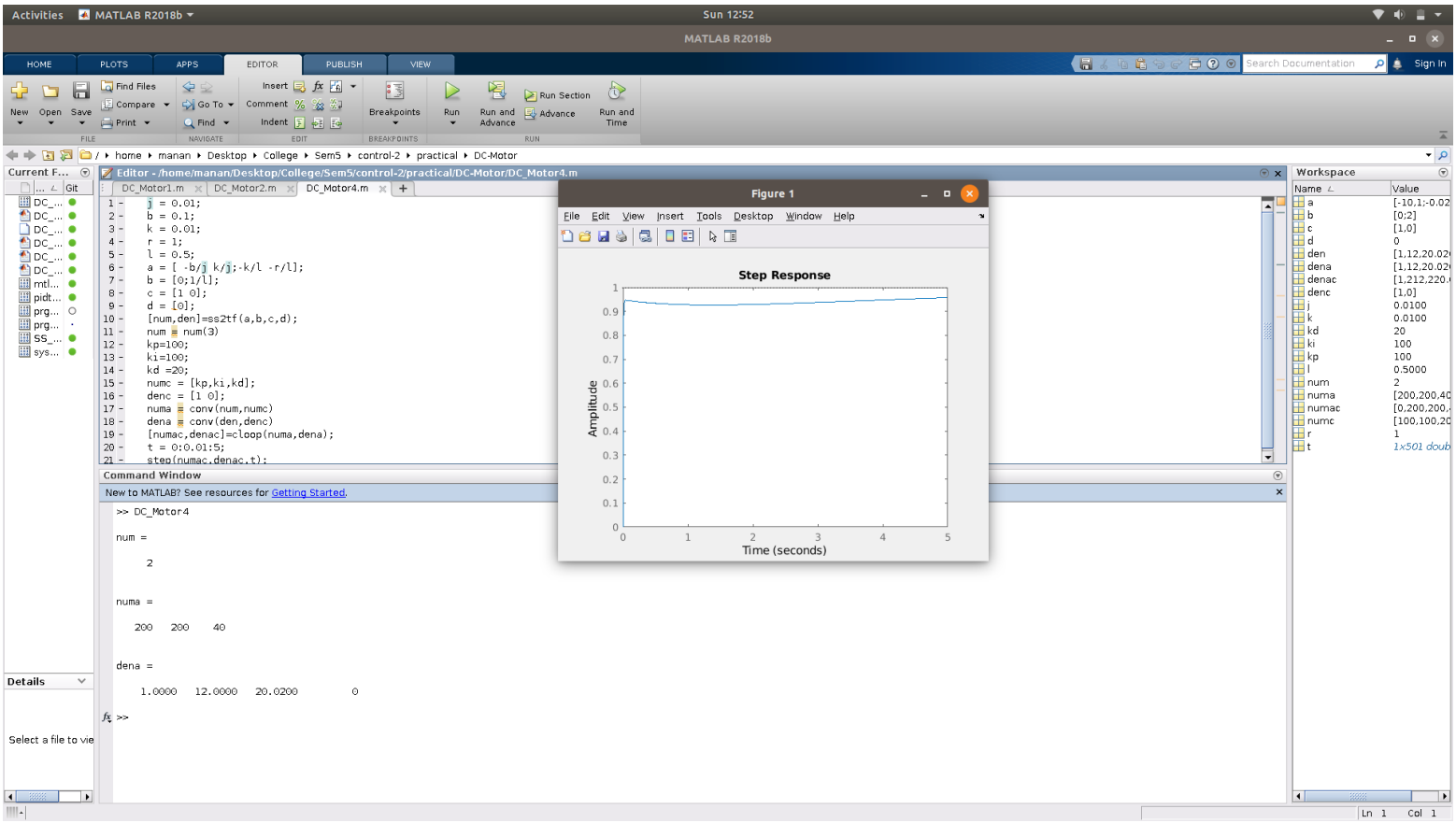
Name	Value
A	[0,1;0,-0.05
b	50
B	[0;1.0000e-
C	[0,1]
D	0
den	[1,0.0500,0]
denc	[1,0.6500,0]
k	600
m	1000
num	[0,1.0000e-
numc	[0,0.6000,0]
t	1x201 doub
u	500

Ln 1 Col 1

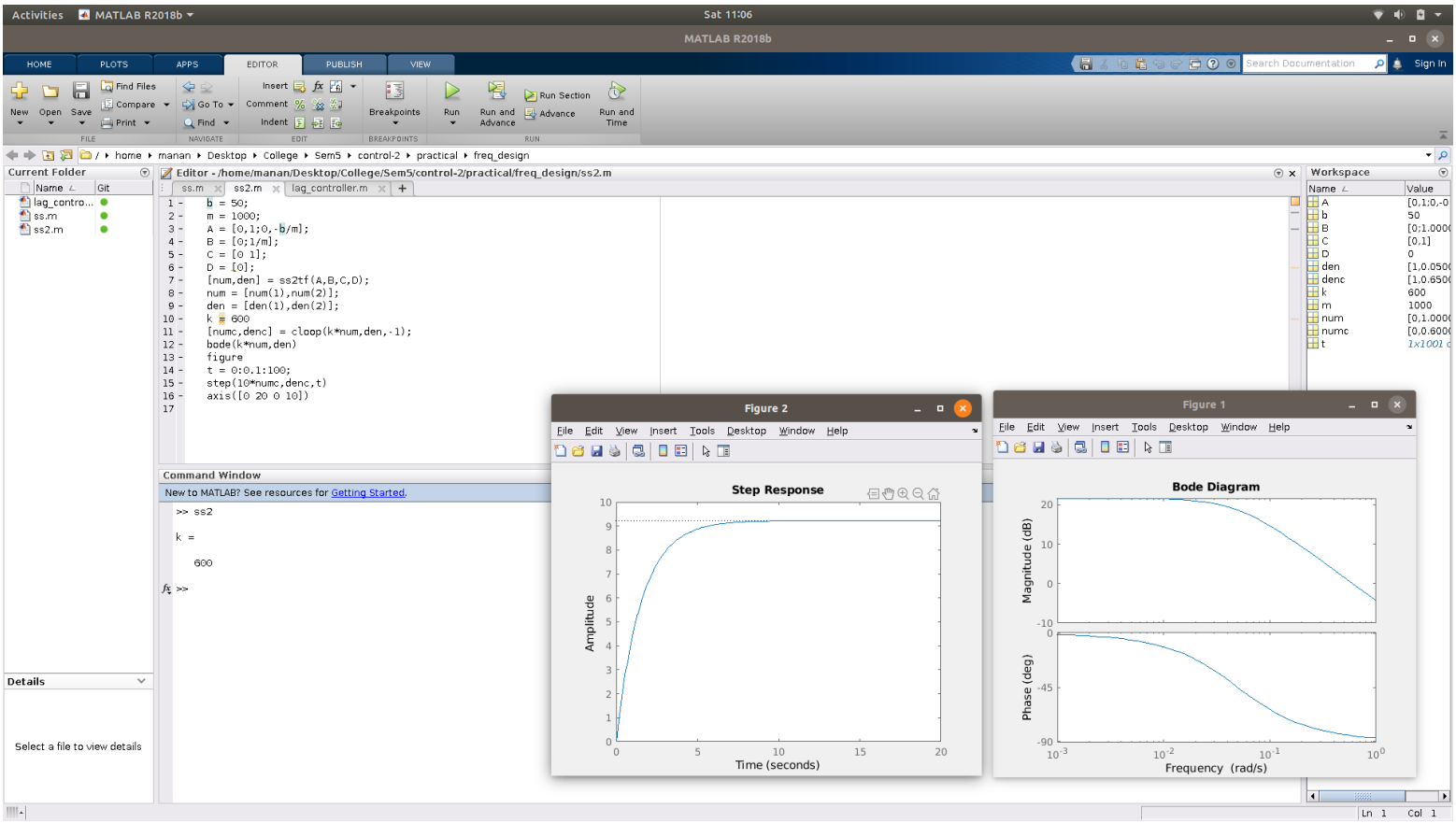
DC MOTOR

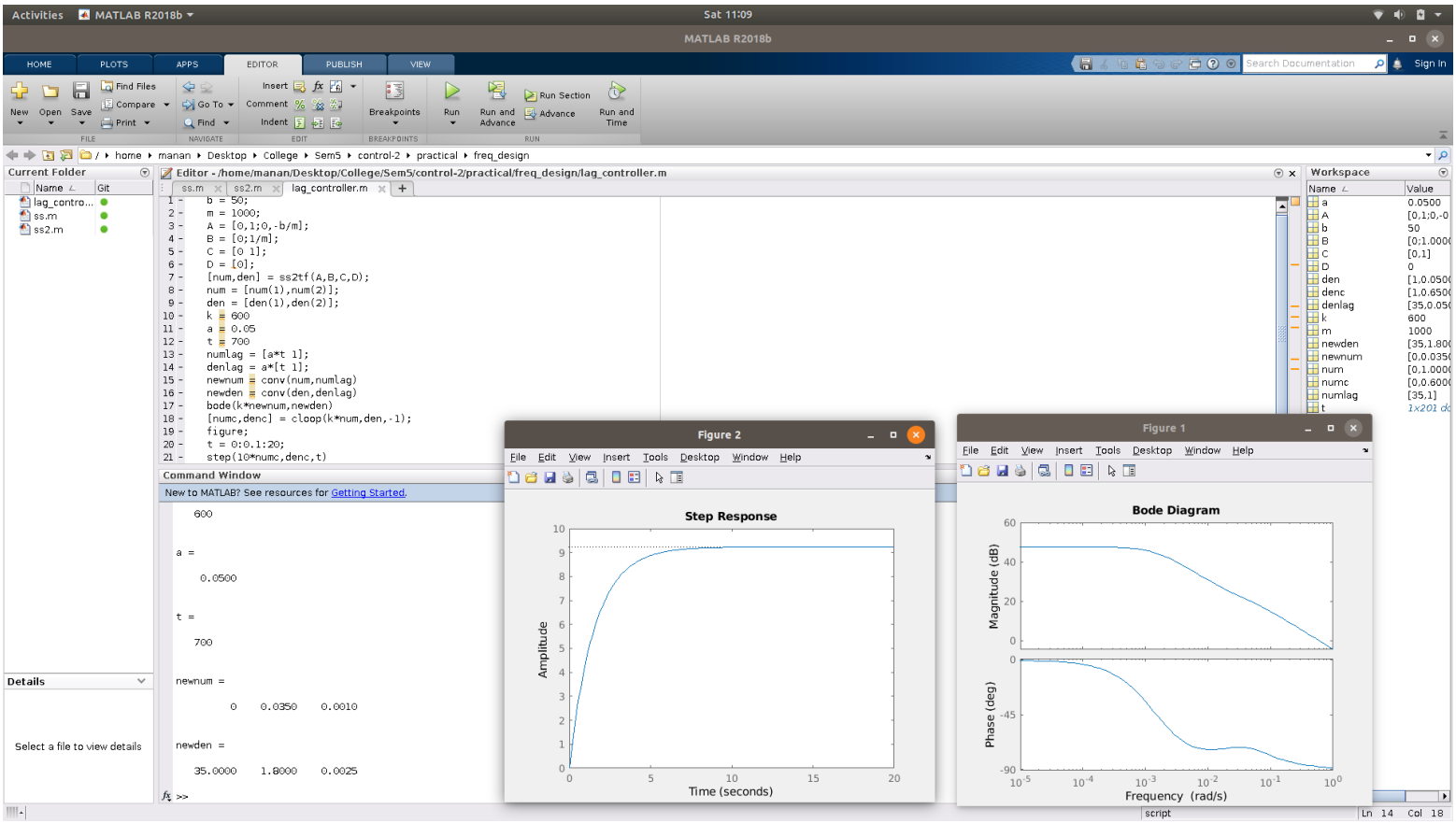

Activities
MATLAB R2018b
Sun 12:51
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ home manan Desktop College Sem5 control-2 practical DC-Motor
Current F...
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/DC-Motor/DC_Motor2.m
DC_Motor1.m
DC_Motor2.m
DC_Motor3.m
DC_Motor4.m
1 - j = 0.01;
2 - b = 0.1;
3 - k = 0.01;
4 - r = 1;
5 - l = 0.5;
6 - a = [-b/j k/j;-k/l -r/l];
7 - b = [0;1/l];
8 - c = [1 0];
9 - d = [0];
10 - [num,den]=ss2tf(a,b,c,d);
11 - num = num(3)
12 - kp=100;
13 - numa = kp*num;
14 - dena = den;
15 - [numc,denc]=cloop(numa,dena);
16 - t = 0:0.01:5;
17 - step(numc,denc,t);
Figure 1
File Edit View Insert Tools Desktop Window Help
Step Response
Amplitude
Time (seconds)
0
0.2
0.4
0.6
0.8
1
1.2
0
1
2
3
4
5
Workspace
Name
Value
a [-10,1;-0.02
b [0;2]
c [1,0]
d 0
den [1,12,20.02
dena [1,12,20.02
denc [1,12,220.0
j 0.0100
k 0.0100
kp 100
l 0.5000
num 2
numa 200
numc [0,0,200]
r 1
t 1x501 doub
Command Window
New to MATLAB? See resources for Getting Started.
>> DC_Motor2
num =
2
>>
Details
Select a file to vie


Activities
MATLAB R2018b
Sun 12:52
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ home manan Desktop College Sem5 control-2 practical DC-Motor
Current F...
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/DC-Motor/DC_Motor3.m
DC_Motor1.m
DC_Motor2.m
DC_Motor3.m
DC_Motor4.m
1 - j = 0.01;
2 - b = 0.1;
3 - k = 0.01;
4 - r = 1;
5 - l = 0.5;
6 - a = [-b/j k/j;-k/l -r/l];
7 - b = [0;1/l];
8 - c = [1 0];
9 - d = [0];
10 - [num,den]=ss2tf(a,b,c,d);
11 - num = num(3)
12 - kp=100;
13 - ki=100;
14 - numc = [kp,ki];
15 - denc = [1 0];
16 - numa = conv(num,numc)
17 - dena = conv(den,denc)
18 - [numac,denac]=cloop(numa,dena);
19 - step(numac,denac,t);
Figure 1
File Edit View Insert Tools Desktop Window Help
Step Response
Amplitude
Time (seconds)
Workspace
Name
Value
Command Window
New to MATLAB? See resources for Getting Started.
>> DC_Motor2
num =
2
>> DC_Motor3
num =
2
numa =
200 200
dena =
1.0000 12.0000 20.0200 0
>>
Details
Select a file to vie
Ln 1 Col 1


Activities
MATLAB R2018b
Sun 12:52
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ home manan Desktop College Sem5 control-2 practical DC-Motor
Current F...
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/DC-Motor/DC_Motor4.m
DC_Motor1.m
DC_Motor2.m
DC_Motor4.m
1 - j = 0.01;
2 - b = 0.1;
3 - k = 0.01;
4 - r = 1;
5 - l = 0.5;
6 - a = [-b/j k/j;-k/l -r/l];
7 - b = [0;1/l];
8 - c = [1 0];
9 - d = [0];
10 - [num,den]=ss2tf(a,b,c,d);
11 - num = num(3)
12 - kp=100;
13 - ki=100;
14 - kd =20;
15 - numc = [kp,ki,kd];
16 - denc = [1 0];
17 - numa = conv(num,numc)
18 - dena = conv(den,denc)
19 - [numac,denac]=cloop(numa,dena);
20 - t = 0:0.01:5;
21 - step(numac,denac,t);
Figure 1
File Edit View Insert Tools Desktop Window Help
Step Response
Amplitude
Time (seconds)
Command Window
New to MATLAB? See resources for Getting Started.
>> DC_Motor4
num =
2
numa =
200 200 40
dena =
1.0000 12.0000 20.0200 0
>>
Workspace
Name
Value
a [-10,1;-0.02
b [0;2]
c [1,0]
d 0
den [1,12,20.02
dena [1,12,20.02
denac [1,212,220.
denc [1,0]
j 0.0100
k 0.0100
kd 20
ki 100
kp 100
l 0.5000
num 2
numa [200,200,40
numac [0,200,200,
numc [100,100,20
r 1
t 1x501 doub
Details
Select a file to vie
Ln 1
Col 1

FREQUENCY DESIGN


Activities
MATLAB R2018b
Sat 11:06
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ home manan Desktop College Sem5 control-2 practical freq_design
Current Folder
Name
Git
lag_contro...
ss.m
ss2.m
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/freq_design/ss2.m
ss.m
ss2.m
lag_controller.m
b = 50;
m = 1000;
A = [0,1;0,-b/m];
B = [0;1/m];
C = [0 1];
D = [0];
[num,den] = ss2tf(A,B,C,D);
num = [num(1),num(2)];
den = [den(1),den(2)];
k = 600
[numc,denc] = cloop(k*num,den,-1);
bode(k*num,den)
figure
t = 0:0.1:100;
step(10*numc,denc,t)
axis([0 20 0 10])
Workspace
Name
Value
A [0,1;0,-0
b 50
B [0;1.000
C [0,1]
D 0
den [1,0.050
denc [1,0.650
k 600
m 1000
num [0,1.000
numc [0,0.600
t 1x1001
Command Window
New to MATLAB? See resources for Getting Started.
>> ss2
k =
600
>>
Details
Select a file to view details
Figure 2
File Edit View Insert Tools Desktop Window Help
Step Response
Amplitude
Time (seconds)
Figure 1
File Edit View Insert Tools Desktop Window Help
Bode Diagram
Magnitude (dB)
Phase (deg)
Frequency (rad/s)
Ln 1
Col 1


Activities
MATLAB R2018b
Sat 11:09
MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
Sign In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ home manan Desktop College Sem5 control-2 practical freq_design
Current Folder
Name
Git
lag_contro...
ss.m
ss2.m
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/freq_design/lag_controller.m
ss.m
ss2.m
lag_controller.m
1 - b = 50;
2 - m = 1000;
3 - A = [0,1;0,-b/m];
4 - B = [0;1/m];
5 - C = [0 1];
6 - D = [0];
7 - [num,den] = ss2tf(A,B,C,D);
8 - num = [num(1),num(2)];
9 - den = [den(1),den(2)];
10 - k = 600
11 - a = 0.05
12 - t = 700
13 - numlag = [a*t 1];
14 - denlag = a*[t 1];
15 - newnum = conv(num,numlag)
16 - newden = conv(den,denlag)
17 - bode(k*newnum,newden)
18 - [numc,denc] = cloop(k*num,den,-1);
19 - figure;
20 - t = 0:0.1:20;
21 - step(10*numc,denc,t)
Workspace
Name
Value
a 0.0500
A [0,1;0,-0
b 50
B [0;1.000
C [0,1]
D 0
den [1,0.050
denc [1,0.650
denlag [35,0.05
k 600
m 1000
newden [35,1.80
newnum [0,0.035
num [0,1.000
numc [0,0.600
numlag [35,1]
t 1x201 do
Command Window
New to MATLAB? See resources for Getting Started.
600
a =
0.0500
t =
700
newnum =
0 0.0350 0.0010
newden =
35.0000 1.8000 0.0025
>>
Details
Select a file to view details
Figure 2
File Edit View Insert Tools Desktop Window Help
Step Response
Amplitude
Time (seconds)
Figure 1
File Edit View Insert Tools Desktop Window Help
Bode Diagram
Magnitude (dB)
Phase (deg)
Frequency (rad/s)
script
Ln 14 Col 18

Obtain the transfer function of the system-defined by the following state-space equations:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -5 & -25 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 25 \\ -120 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ practical ▸ exp6

Current Folder

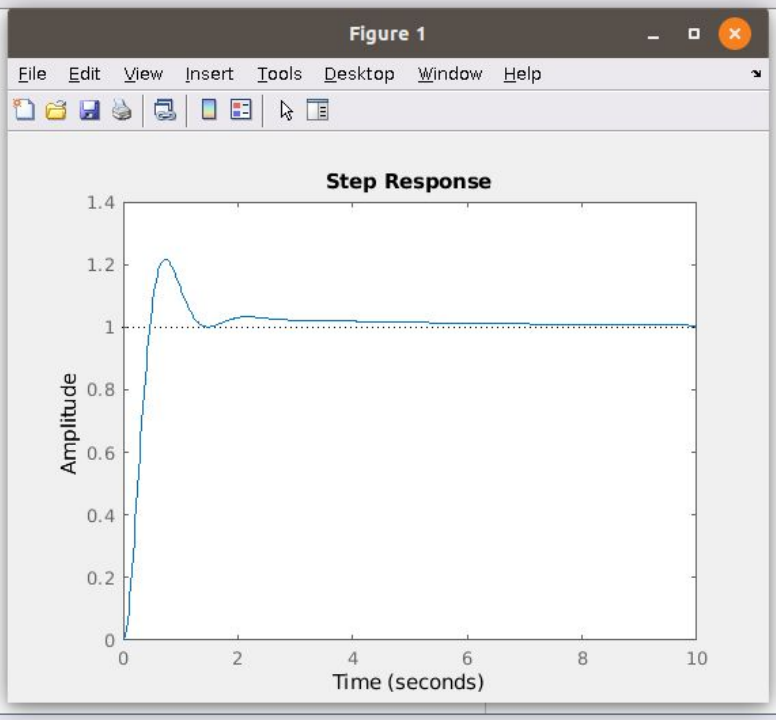
Name | Git

exp6.m

Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp6/exp6.m

exp6.m

```
1 -  A = [0 1 0;0 0 1;-5 -25 -5];
2
3 -  B = [0;25;-120];
4
5 -  C = [1 0 0];
6
7 -  D = [0];
8
9 -  [num den] = ss2tf(A,B,C,D)
10 -  sys = tf(num,den);
11 -  step(sys)
```

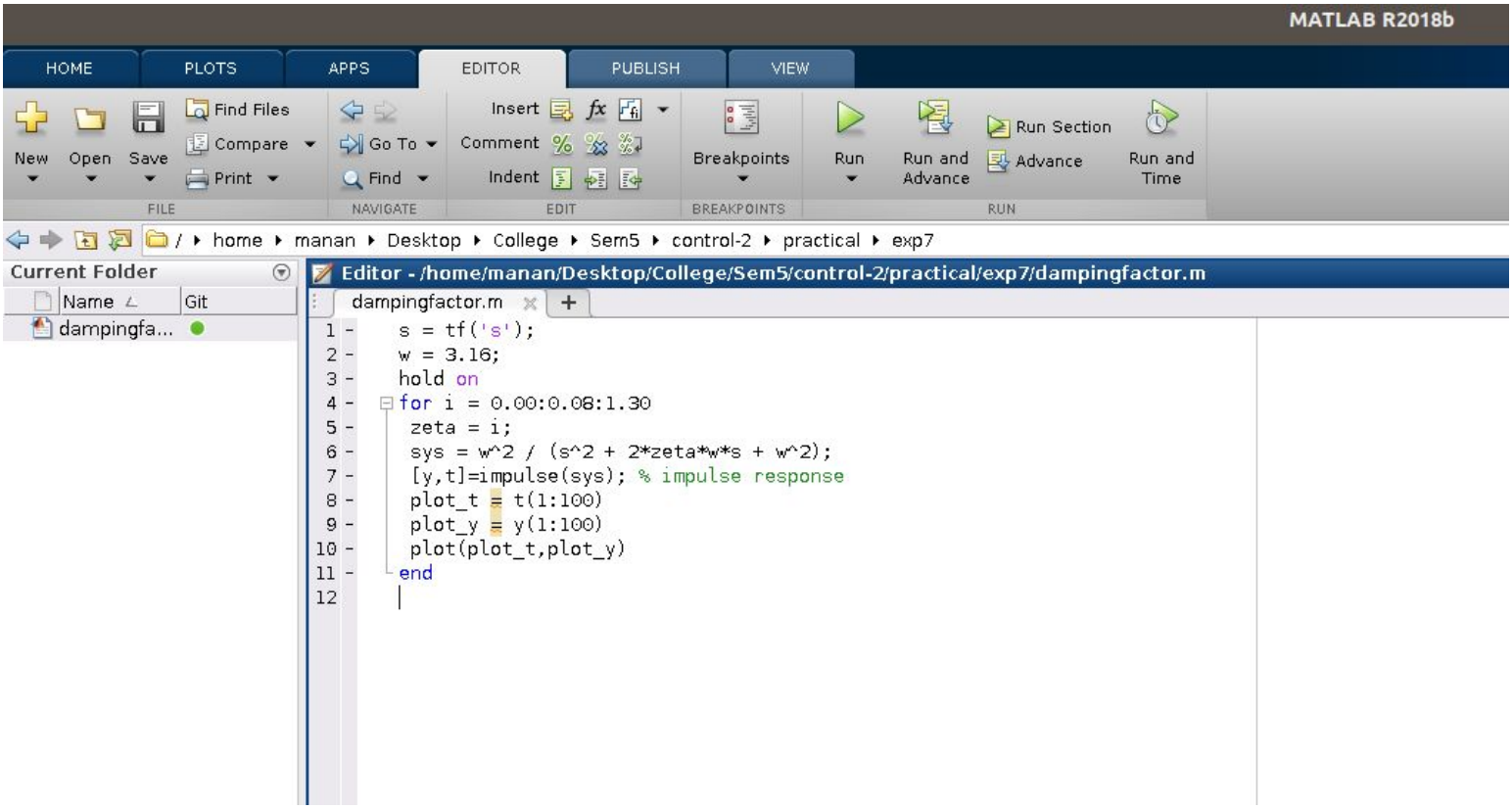


Step response and impulse response of second-order systems for varying damping ratio:

(i) G(s) = $\frac{10}{s^2+2s+10}$

(ii) G(s) = $\frac{25}{s^2+4s+25}$

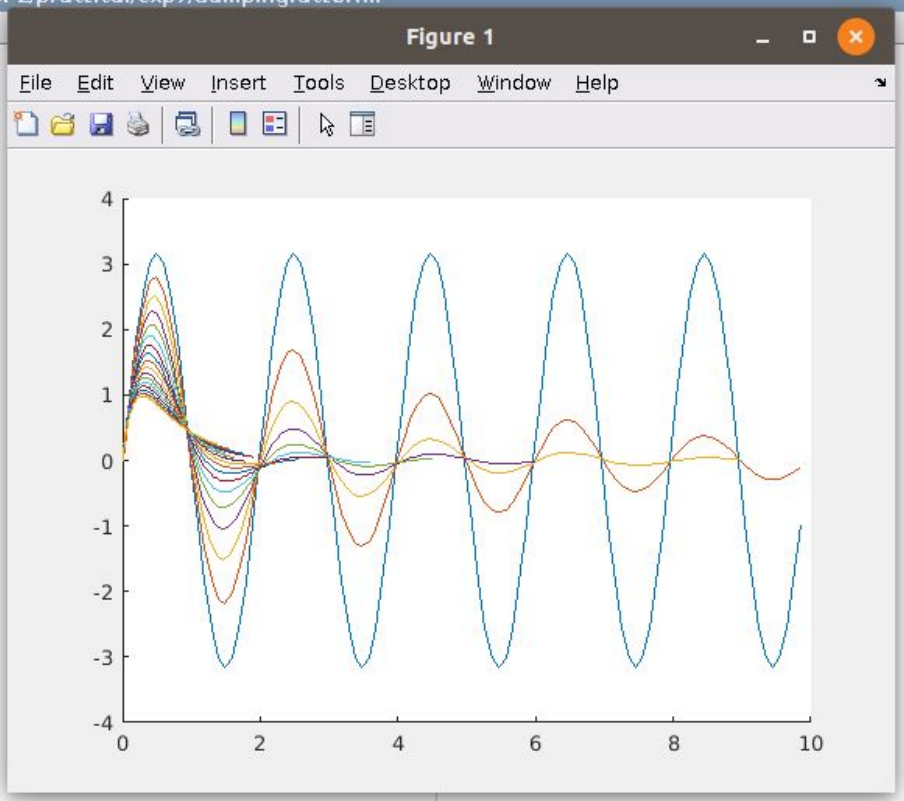
Part 1


MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
FILE
Go To
Find
NAVIGATE
Insert
Comment
Indent
EDIT
Breakpoints
BREAKPOINTS
Run
Run and Advance
Run Section
Advance
Run and Time
RUN
/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ practical ▸ exp7
Current Folder
Name
Git
dampingfa...
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp7/dampingfactor.m
dampingfactor.m
1 - s = tf('s');
2 - w = 3.16;
3 - hold on
4 - for i = 0.00:0.08:1.30
5 - zeta = i;
6 - sys = w^2 / (s^2 + 2*zeta*w*s + w^2);
7 - [y,t]=impulse(sys); % impulse response
8 - plot_t = t(1:100)
9 - plot_y = y(1:100)
10 - plot(plot_t,plot_y)
11 - end
12

Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp7/dampingfactor.m

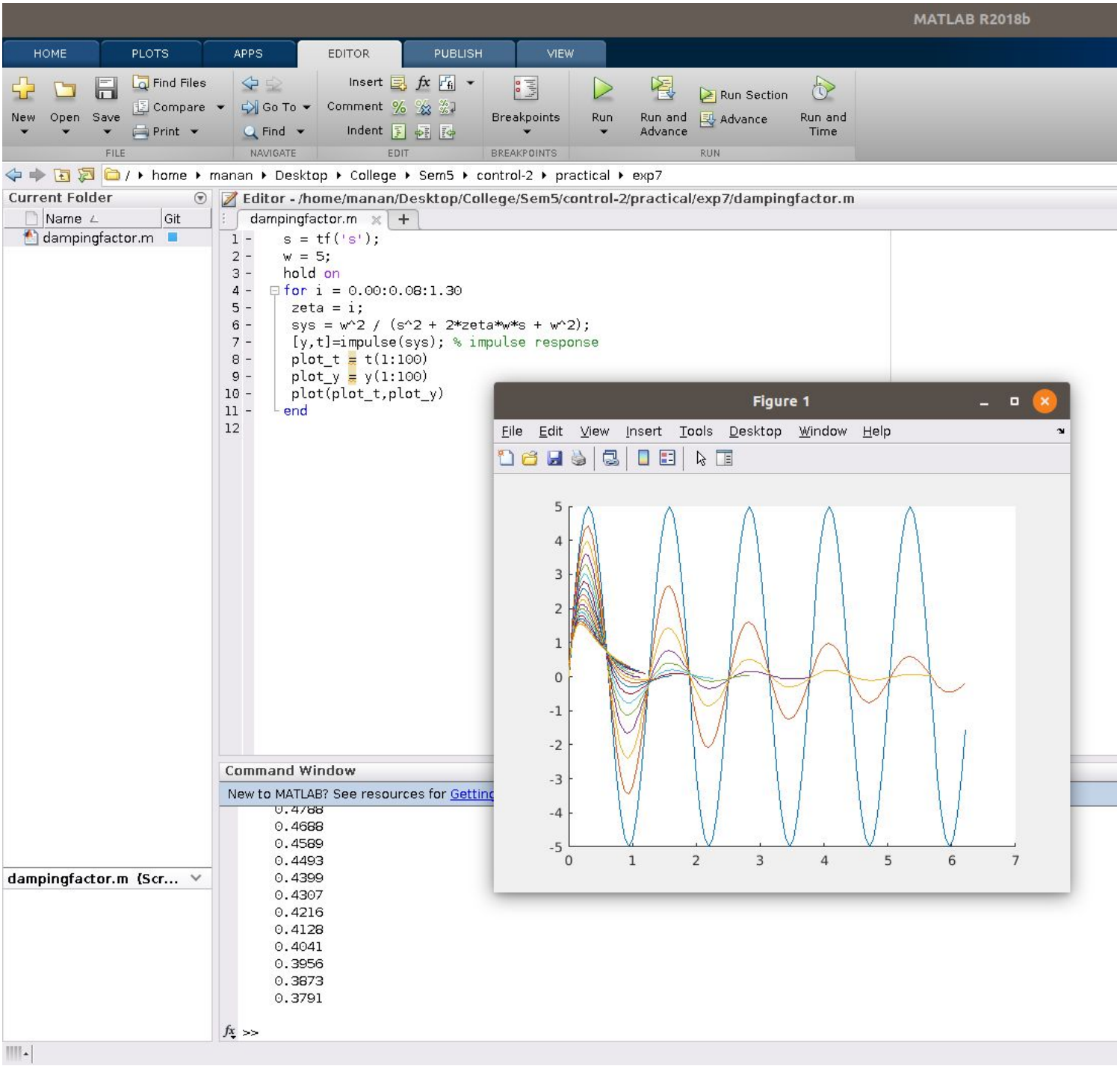
dampingfactor.m

```
1 -    s = tf('s');
2 -    w = 3.16;
3 -    hold on
4 -    for i = 0.00:0.08:1.30
5 -     zeta = i;
6 -     sys = w^2 / (s^2 + 2*zeta*w*s + w^2);
7 -     [y,t]=impulse(sys); % impulse response
8 -     plot_t = t(1:100)
9 -     plot_y = y(1:100)
10 -    plot(plot_t,plot_y)
11 -   end
12
```



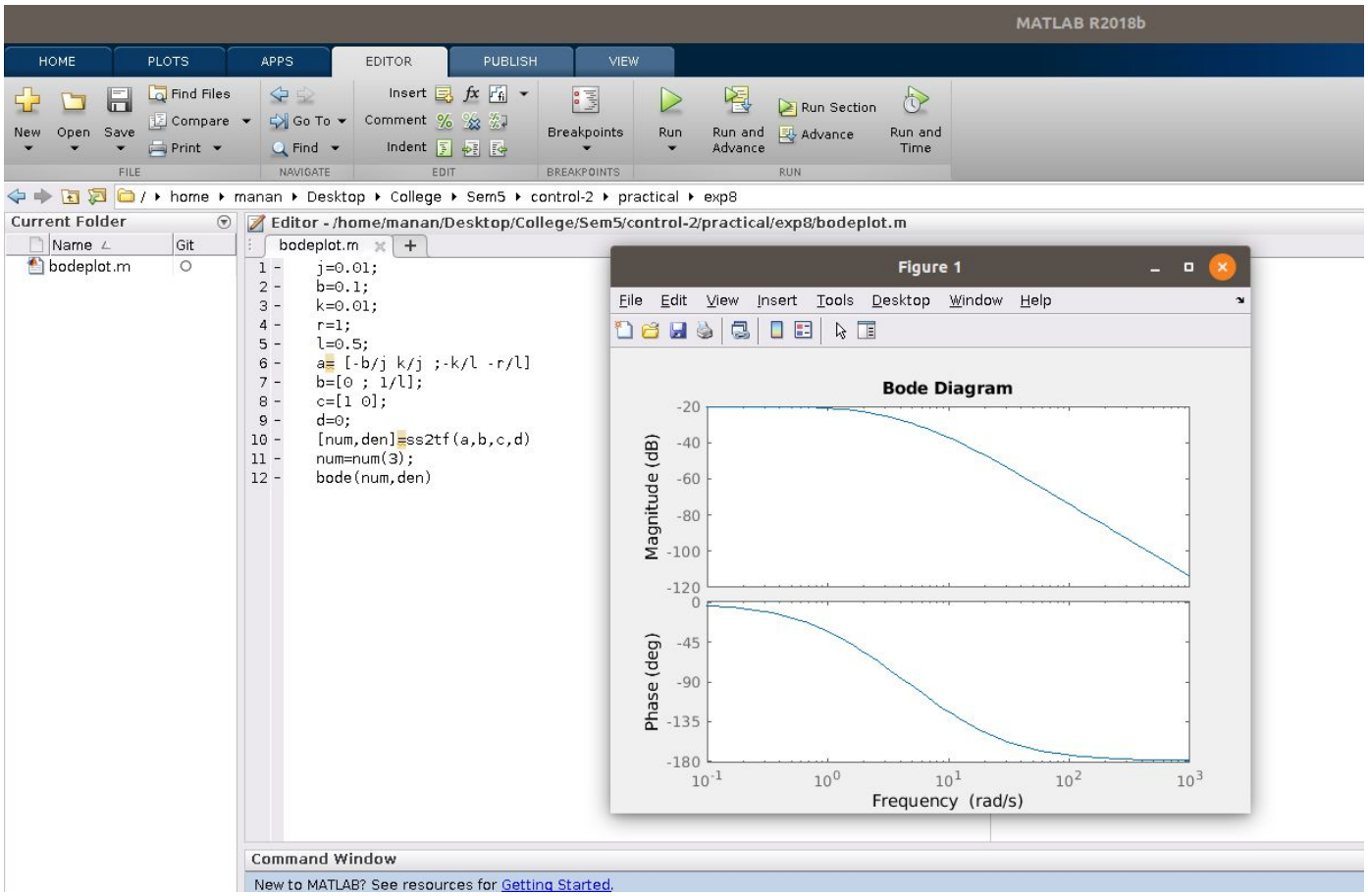
Command Window

Part 2

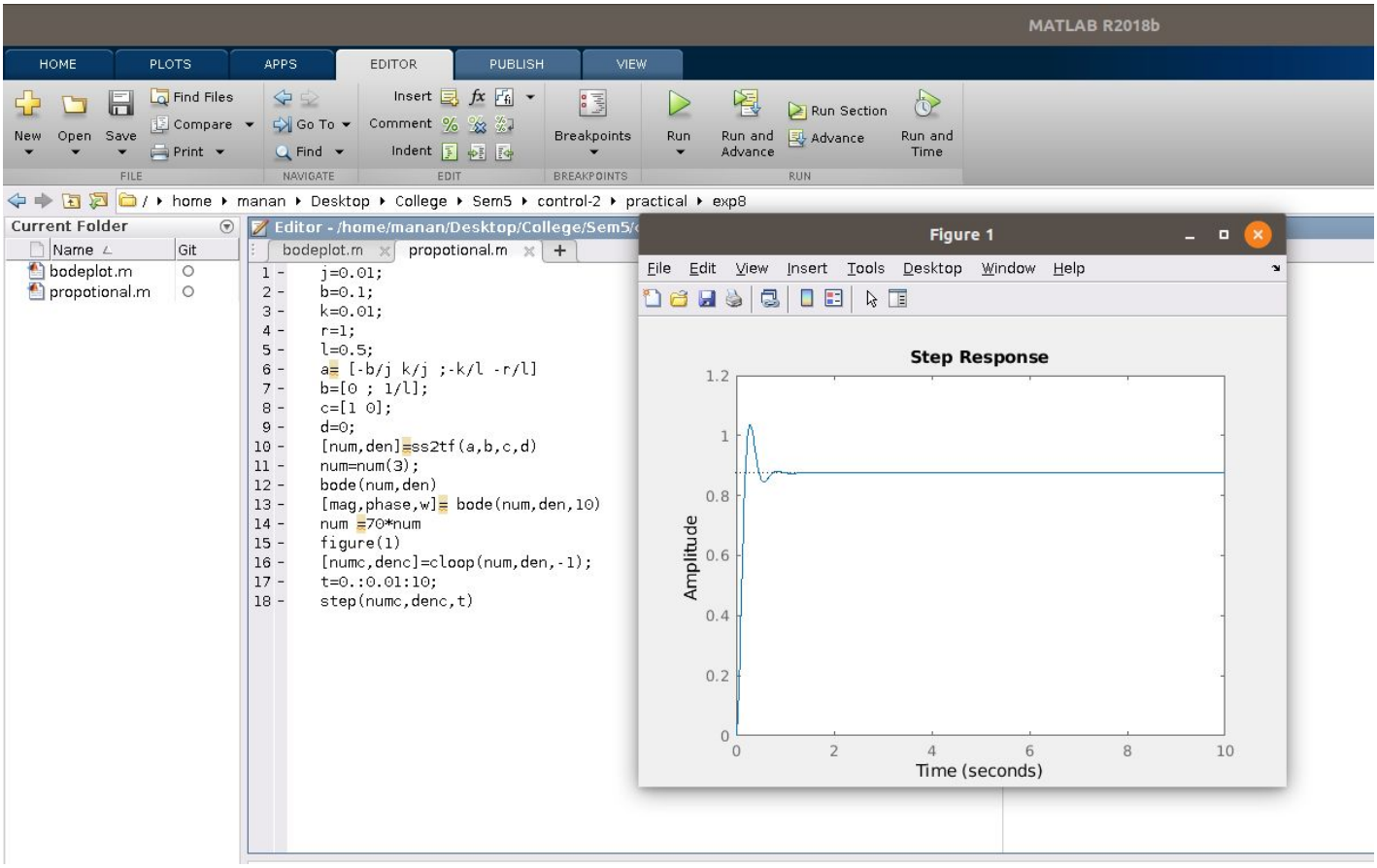

MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ practical ▸ exp7
Current Folder
Name
Git
dampingfactor.m
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp7/dampingfactor.m
dampingfactor.m
1 - s = tf('s');
2 - w = 5;
3 - hold on
4 - for i = 0.00:0.08:1.30
5 - zeta = i;
6 - sys = w^2 / (s^2 + 2*zeta*w*s + w^2);
7 - [y,t]=impulse(sys); % impulse response
8 - plot_t = t(1:100)
9 - plot_y = y(1:100)
10 - plot(plot_t,plot_y)
11 - end
12
Figure 1
File Edit View Insert Tools Desktop Window Help
5
4
3
2
1
0
-1
-2
-3
-4
-5
0 1 2 3 4 5 6 7
Command Window
New to MATLAB? See resources for Getting
0.4788
0.4688
0.4589
0.4493
0.4399
0.4307
0.4216
0.4128
0.4041
0.3956
0.3873
0.3791
dampingfactor.m (Scr...
fx >>

The Frequency design method of DC motor using MATLAB.

- **Bode Plot:**


MATLAB R2018b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ ▸ home ▸ manan ▸ Desktop ▸ College ▸ Sem5 ▸ control-2 ▸ practical ▸ exp8
Current Folder
Name
Git
bodeplot.m
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp8/bodeplot.m
bodeplot.m
1 - j=0.01;
2 - b=0.1;
3 - k=0.01;
4 - r=1;
5 - l=0.5;
6 - a= [-b/j k/j ;-k/l -r/l]
7 - b=[0 ; 1/l];
8 - c=[1 0];
9 - d=0;
10 - [num,den]=ss2tf(a,b,c,d)
11 - num=num(3);
12 - bode(num,den)
Figure 1
File Edit View Insert Tools Desktop Window Help
Bode Diagram
Magnitude (dB)
-20
-40
-60
-80
-100
-120
Phase (deg)
0
-45
-90
-135
-180
10^-1
10^0
10^1
10^2
10^3
Frequency (rad/s)
Command Window
New to MATLAB? See resources for Getting Started.

- **For Proportional Gain:**

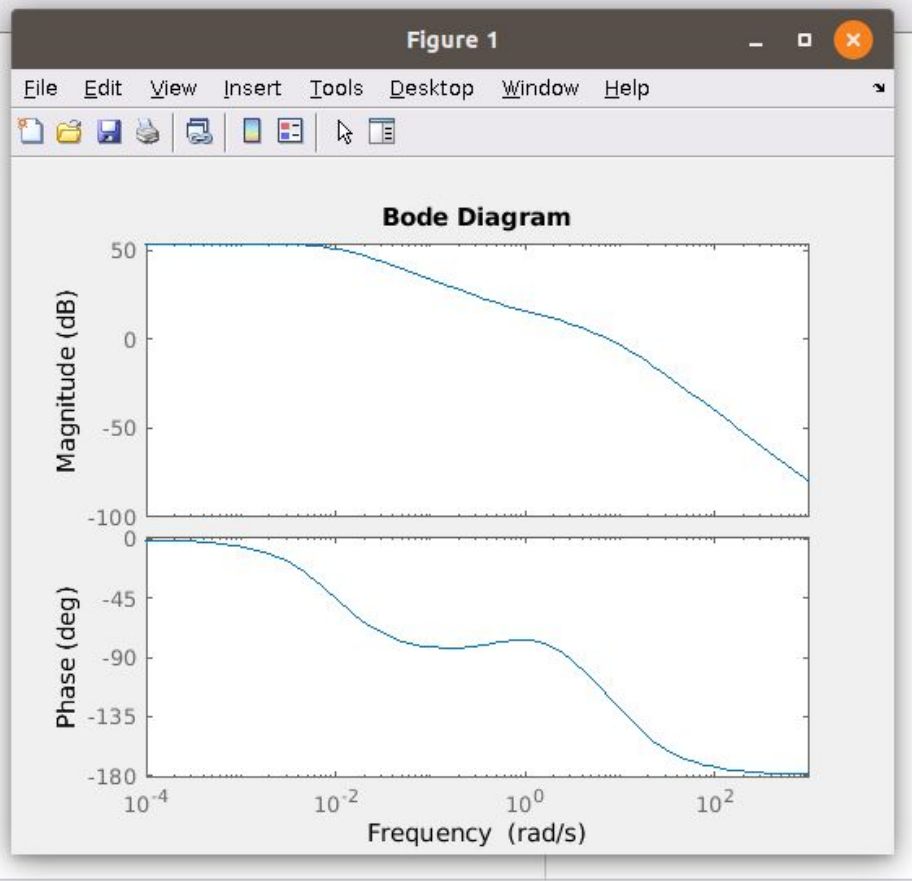


- **For Lag Controller**

Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp8/lagcontroller.m

lagcontroller.m

```
1 -    j=0.01;
2 -    b=0.1;
3 -    k=0.01;
4 -    r=1;
5 -    l=0.5;
6 -    a= [-b/j k/j ;-k/l -r/l];
7 -    b=[0 ; 1/l];
8 -    c=[1 0];
9 -    d=0;
10 -   [num,den]= ss2tf(a,b,c,d);
11 -   num=50*num(3);
12 -   z=1;
13 -   p=0.01;
14 -   numa=[1 z];
15 -   dena=[1 p];
16 -   numb=conv(num,numa)
17 -   denb=conv(den,dena)
18 -   bode(numb,denb)
19 -   figure
20 -   [numc,denc]=cloop(numb,denb,-1);
21 -   t=0.:0.01:10;
22 -   step(numc,denc,t)
```



Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp8/lagcontroller.m

lagcontroller.m

```
1 -    j=0.01;
2 -    b=0.1;
3 -    k=0.01;
4 -    r=1;
5 -    l=0.5;
6 -    a= [-b/j k/j ;-k/l -r/l];
7 -    b=[0 ; 1/l];
8 -    c=[1 0];
9 -    d=0;
10 -   [num,den]= ss2tf(a,b,c,d);
11 -   num=50*num(3);
12 -   z=1;
13 -   p=0.01;
14 -   numa=[1 z];
15 -   dena=[1 p];
16 -   numb=conv(num,numa)
17 -   denb=conv(den,dena)
18 -   bode(numb,denb)
19 -   figure
20 -   [numc,denc]=cloop(numb,denb,-1);
21 -   t=0.:0.01:10;
22 -   step(numc,denc,t)
```