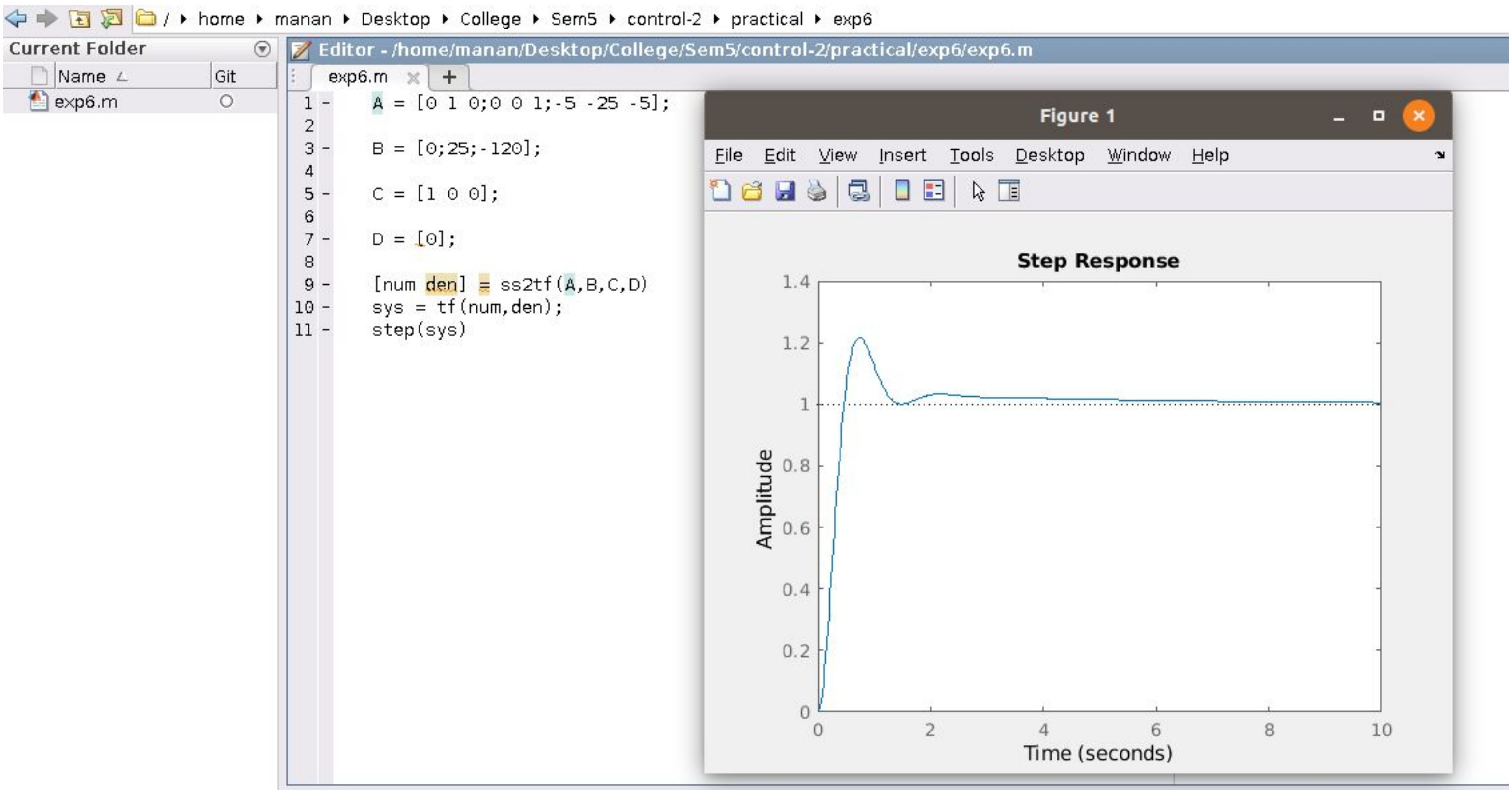
Obtain the transfer function of the system-defined by the following state-space equations:

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

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


/ home manan Desktop College Sem5 control-2 practical exp6
Current Folder
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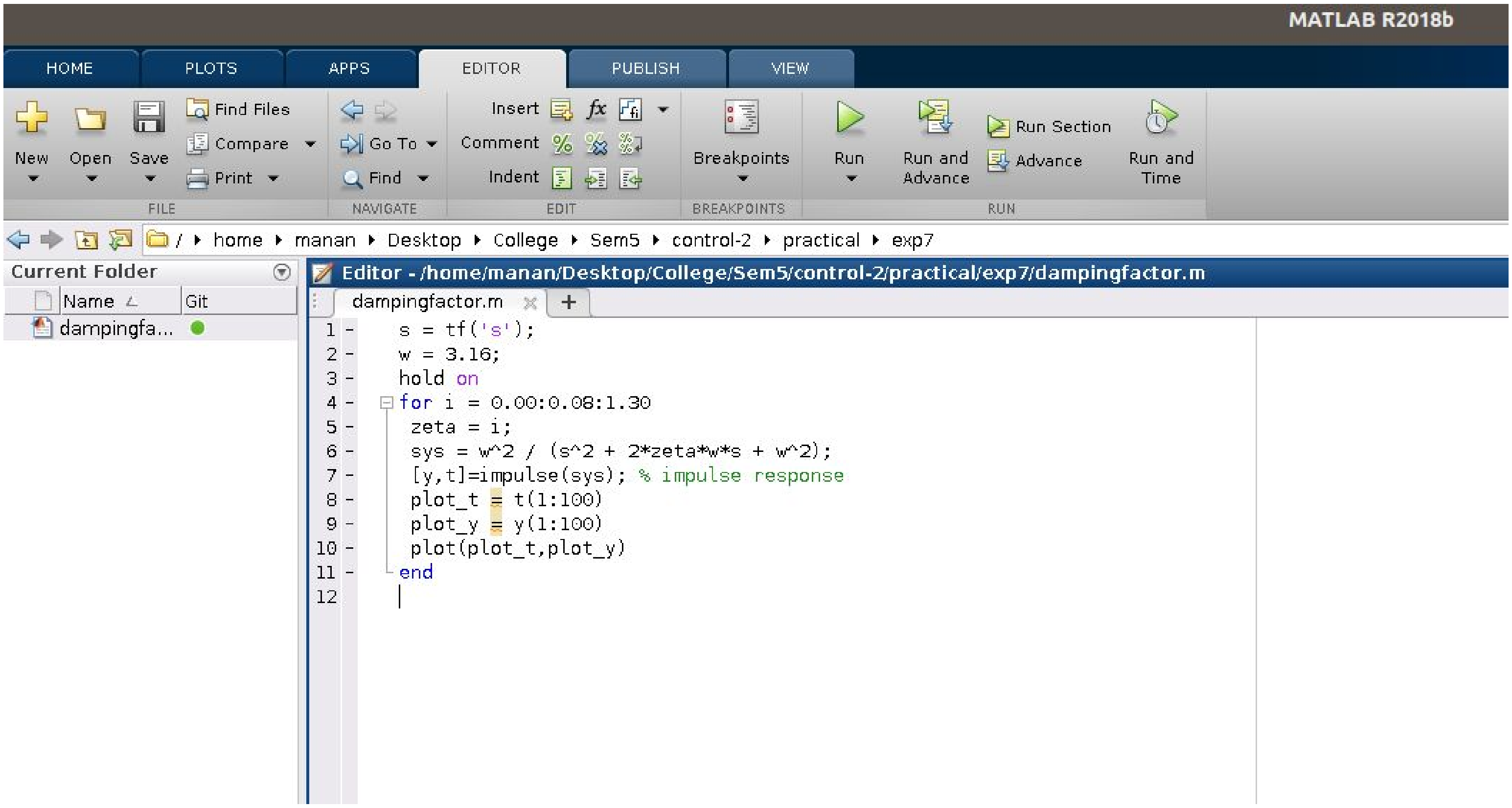
exp6.m
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp6/exp6.m
exp6.m
A = [0 1 0;0 0 1;-5 -25 -5];
B = [0;25;-120];
C = [1 0 0];
D = [0];
[num den] = ss2tf(A,B,C,D)
sys = tf(num,den);
step(sys)
Figure 1
File Edit View Insert Tools Desktop Window Help
Step Response
Amplitude
Time (seconds)
0 0.2 0.4 0.6 0.8 1 1.2 1.4
0 2 4 6 8 10

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
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Run and Advance
Run Section
Advance
Run and Time
RUN
/ home manan Desktop College Sem5 control-2 practical exp7
Current Folder
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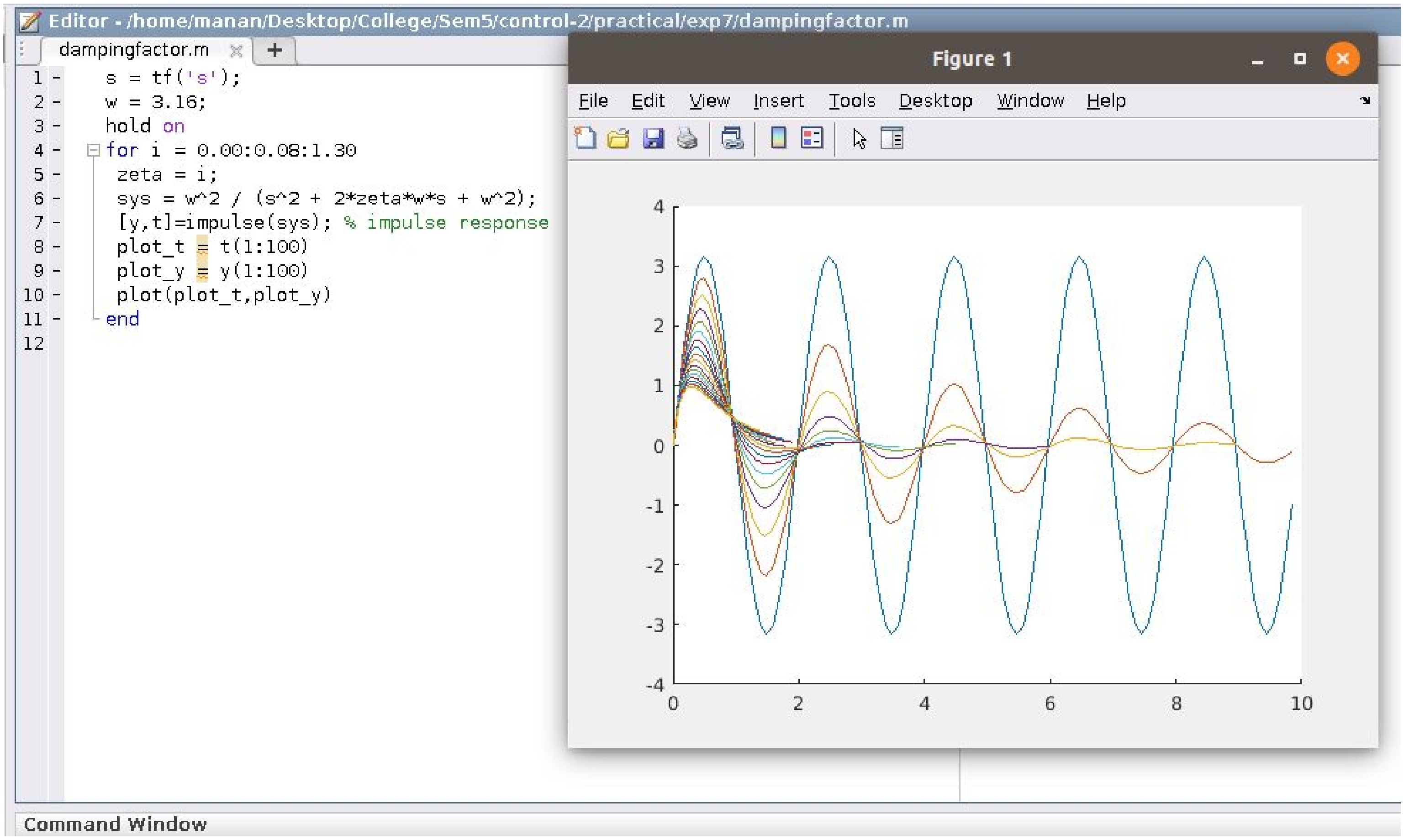
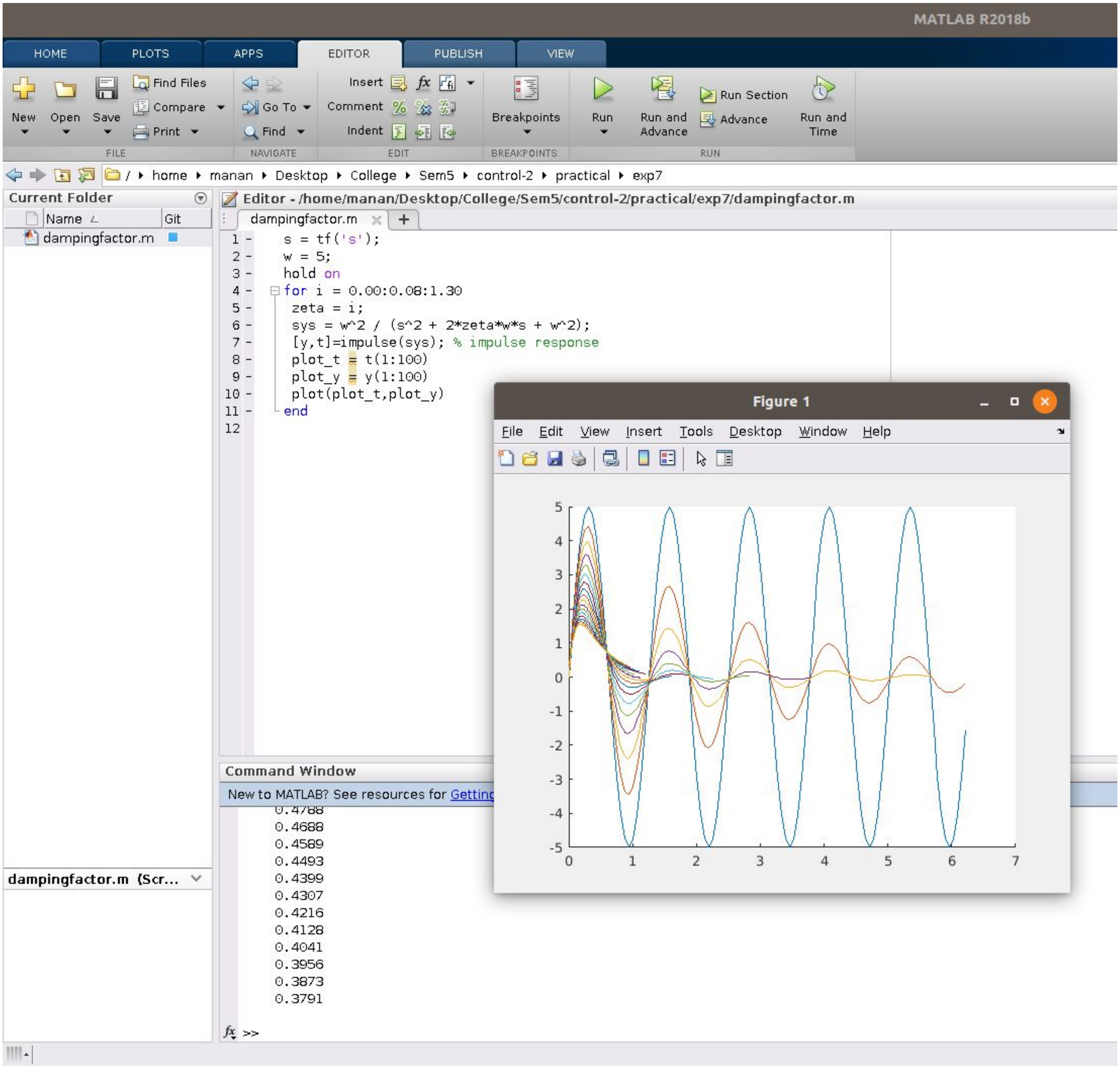
dampingfa...
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp7/dampingfactor.m
dampingfactor.m
s = tf('s');
w = 3.16;
hold on
for i = 0.00:0.08:1.30
zeta = i;
sys = w^2 / (s^2 + 2*zeta*w*s + w^2);
[y,t]=impulse(sys); % impulse response
plot_t = t(1:100)
plot_y = y(1:100)
plot(plot_t,plot_y)
end


Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp7/dampingfactor.m
dampingfactor.m
s = tf('s');
w = 3.16;
hold on
for i = 0.00:0.08:1.30
zeta = i;
sys = w^2 / (s^2 + 2*zeta*w*s + w^2);
[y,t]=impulse(sys); % impulse response
plot_t = t(1:100)
plot_y = y(1:100)
plot(plot_t,plot_y)
end
Figure 1
File Edit View Insert Tools Desktop Window Help
4
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
Command Window

Part 2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Name
Git
dampingfactor.m
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp7/dampingfactor.m
dampingfactor.m
s = tf('s');
w = 5;
hold on
for i = 0.00:0.08:1.30
zeta = i;
sys = w^2 / (s^2 + 2*zeta*w*s + w^2);
[y,t]=impulse(sys); % impulse response
plot_t = t(1:100)
plot_y = y(1:100)
plot(plot_t,plot_y)
end
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...
Figure 1
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Help
5
4
3
2
1
0
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-2
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-5
0
1
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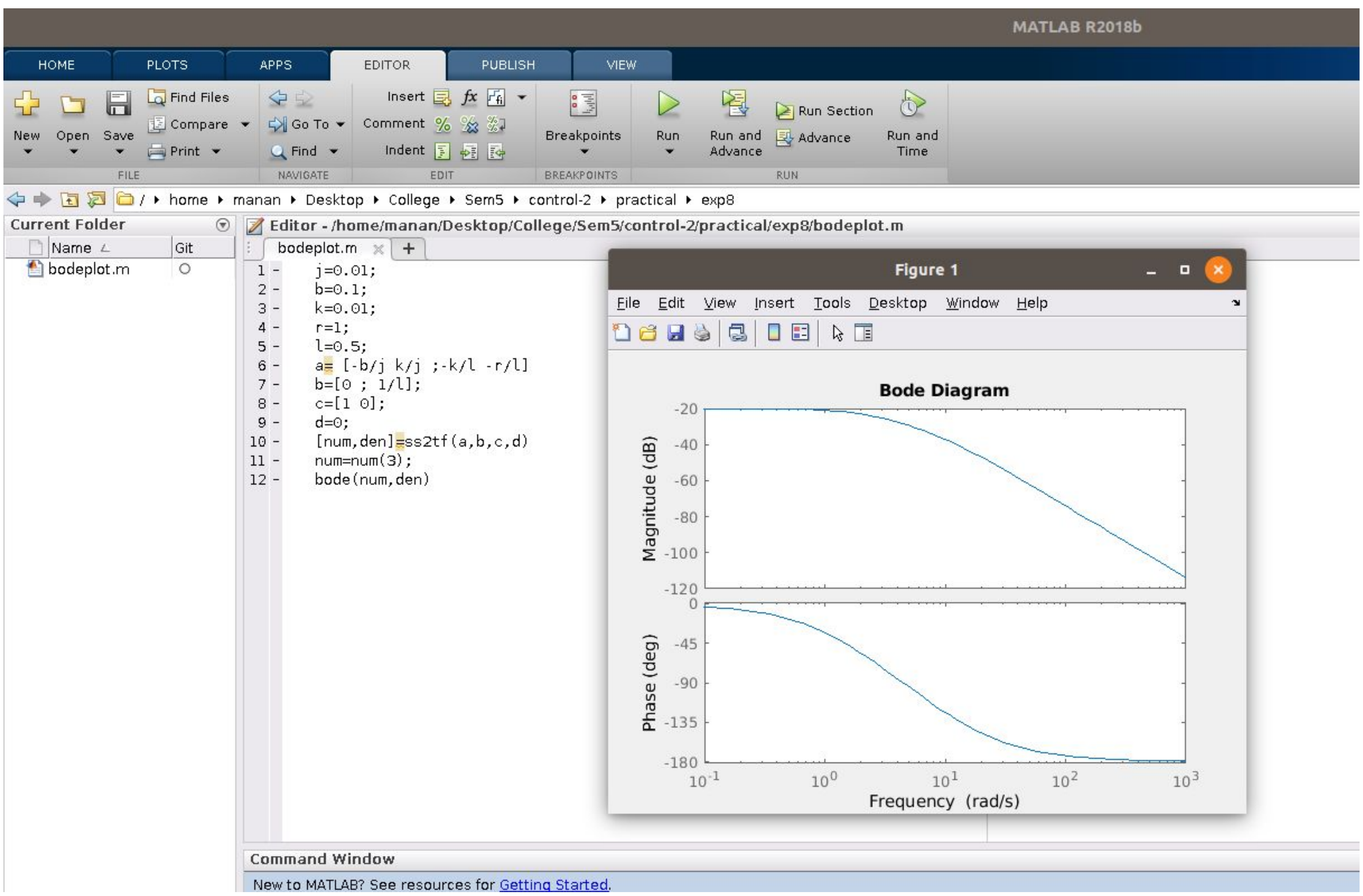
4
5
6
7

The Frequency design method of DC motor using MATLAB.

- Bode Plot: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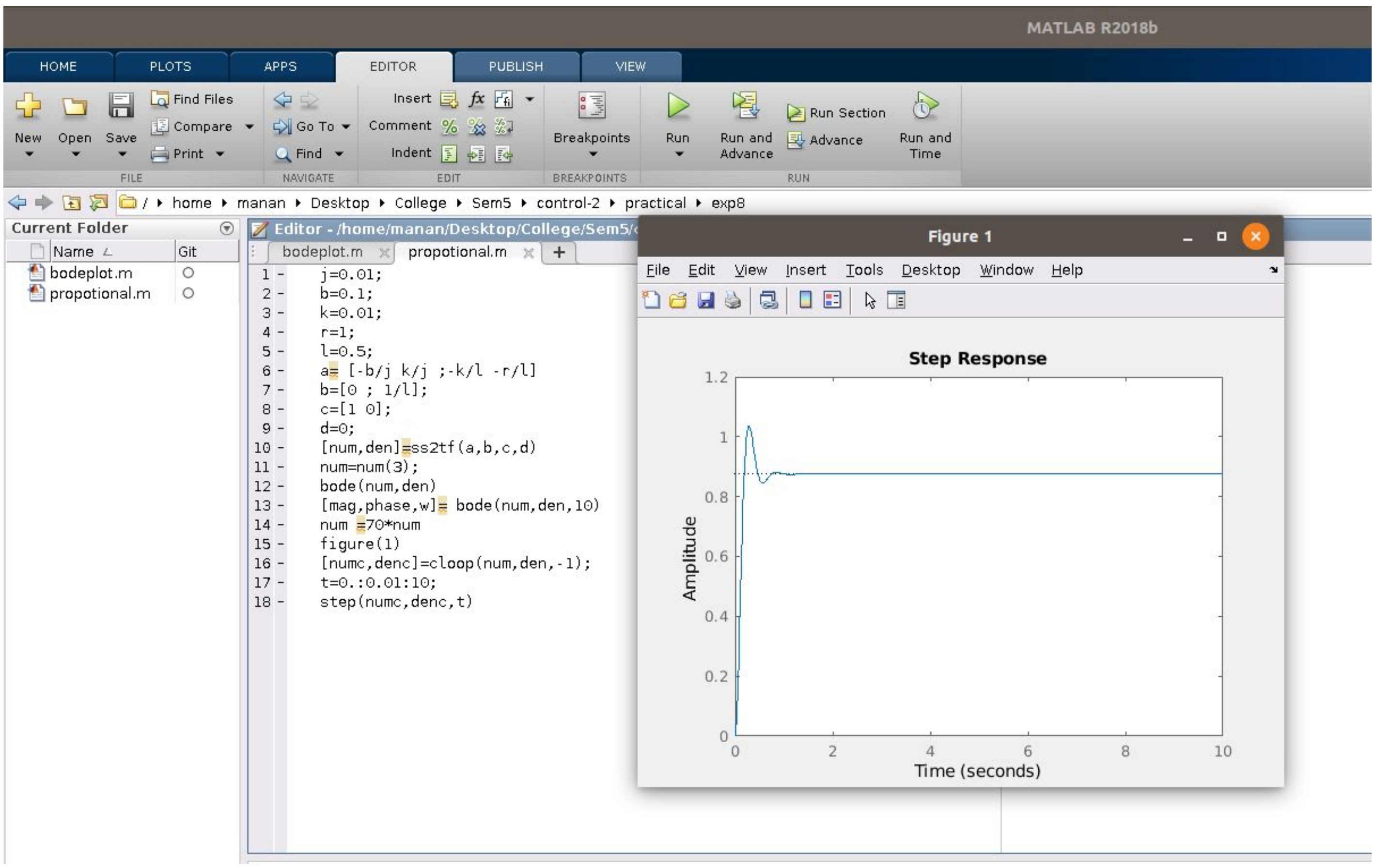
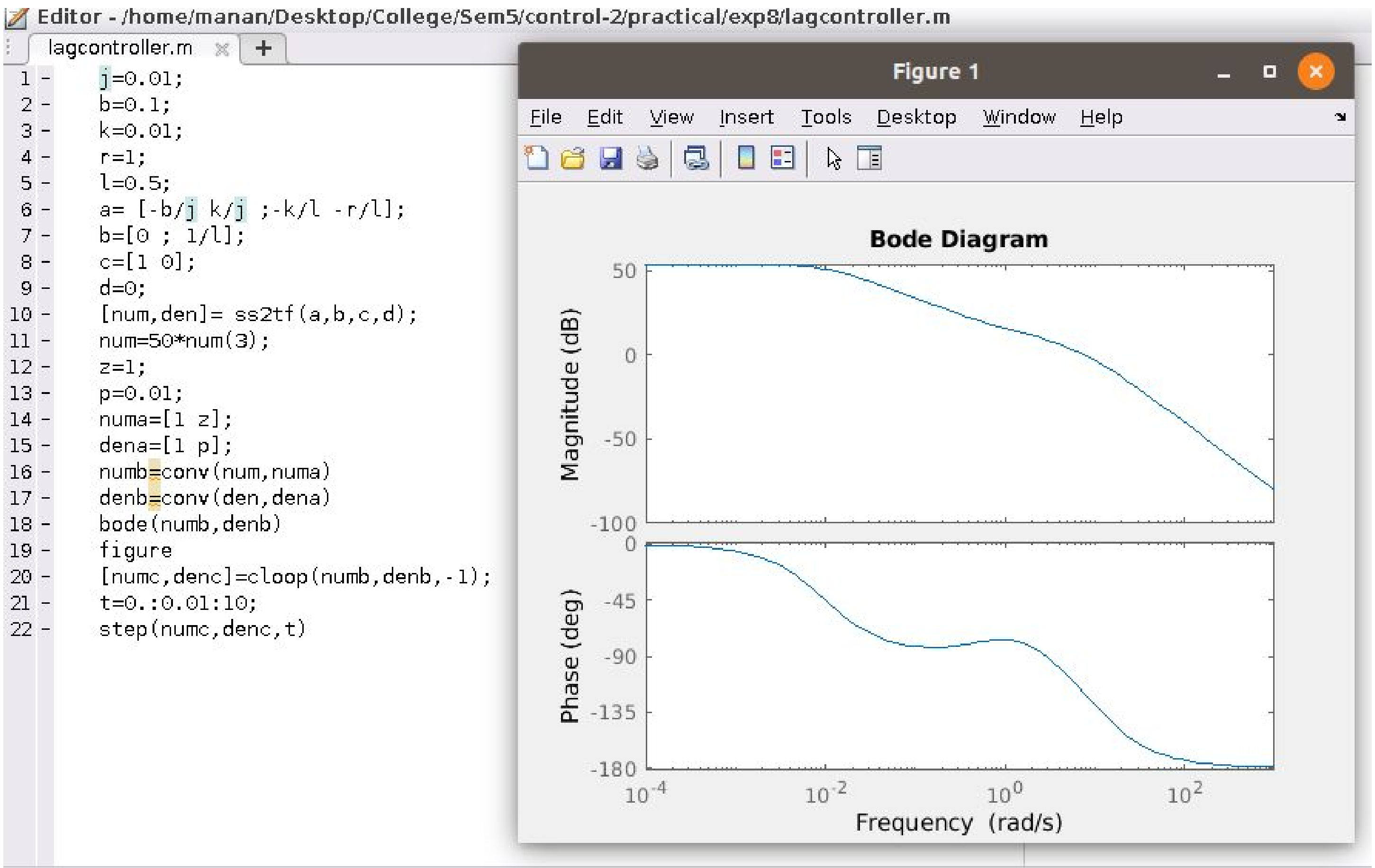
Run and Advance
Run Section
Advance
Run and Time
RUN
/ home manan Desktop College Sem5 control-2 practical exp8
Current Folder
Name
Git
bodeplot.m
Editor - /home/manan/Desktop/College/Sem5/control-2/practical/exp8/bodeplot.m
bodeplot.m
j=0.01;
b=0.1;
k=0.01;
r=1;
l=0.5;
a= [-b/j k/j ;-k/l -r/l]
b=[0 ; 1/l];
c=[1 0];
d=0;
[num,den]=ss2tf(a,b,c,d)
num=num(3);
bode(num,den)
Figure 1
File Edit View Insert Tools Desktop Window Help
Bode Diagram
Magnitude (dB)
Phase (deg)
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

```
j=0.01;
b=0.1;
k=0.01;
r=1;
l=0.5;
a= [-b/j k/j ;-k/l -r/l];
b=[0 ; 1/l];
c=[1 0];
d=0;
[num,den]= ss2tf(a,b,c,d);
num=50*num(3);
z=1;
p=0.01;
numa=[1 z];
dena=[1 p];
numb=conv(num,numa)
denb=conv(den,dena)
bode(numb,denb)
figure
[numc,denc]=cloop(numb,denb,-1);
t=0.:0.01:10;
step(numc,denc,t)
```