Experiment No. 3

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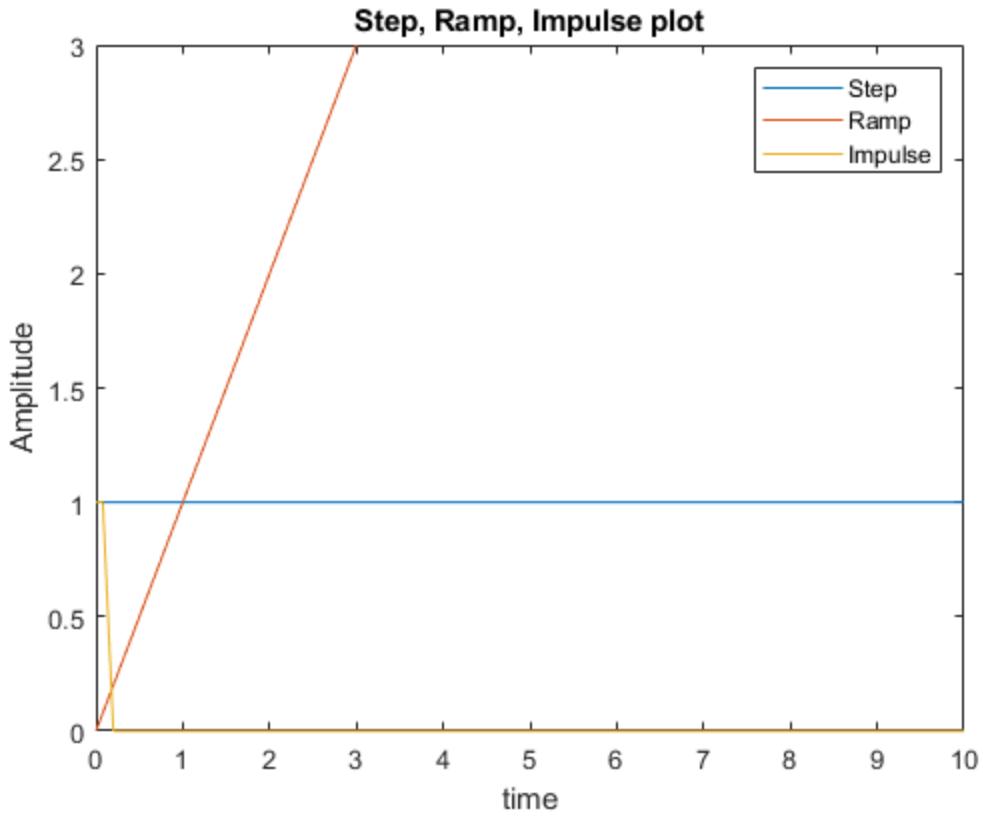
Aim

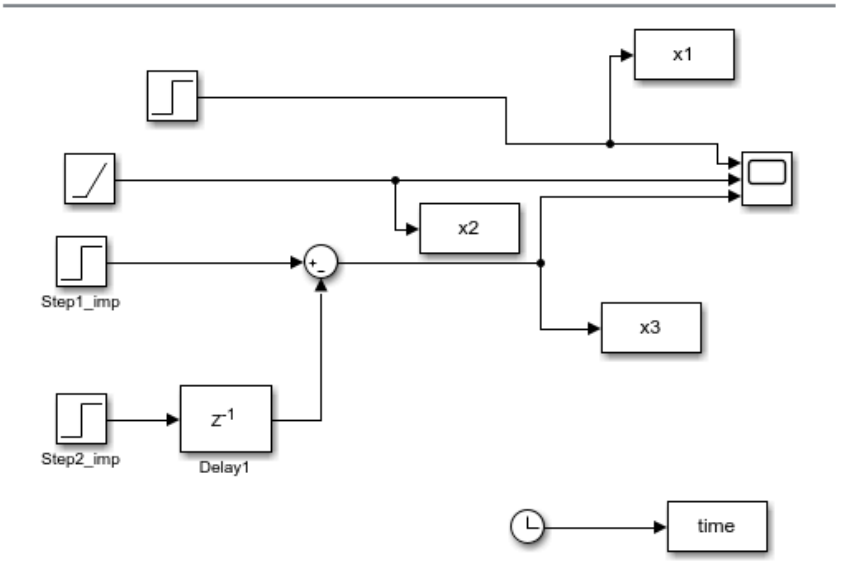
Title: Visualization of response of system described by transfer function. Objectives: 1. To learn how to write transfer function of a system in SIMULINK. 2. To learn how to generate an impulse signal from two step signals. 3. To visualize impulse, step and ramp responses for the systems in SIMULINK and MATLAB.

Q1

Visualize an impulse signal on scope using two step signals in SIMULINK.

```
figure(1)
plot(time,x1)
hold on
plot(time,x2)
hold on
plot(time,x3)
legend('Step','Ramp','Impulse');
xlabel('time');
ylabel('Amplitude');
title('Step, Ramp, Impulse plot');
ylim([0 3])
figure()
ss1=imread('ss1.png');
imshow(ss1);
```


Step, Ramp, Impulse plot
Step
Ramp
Impulse
Amplitude
time
0
0.5
1
1.5
2
2.5
3
0
1
2
3
4
5
6
7
8
9
10

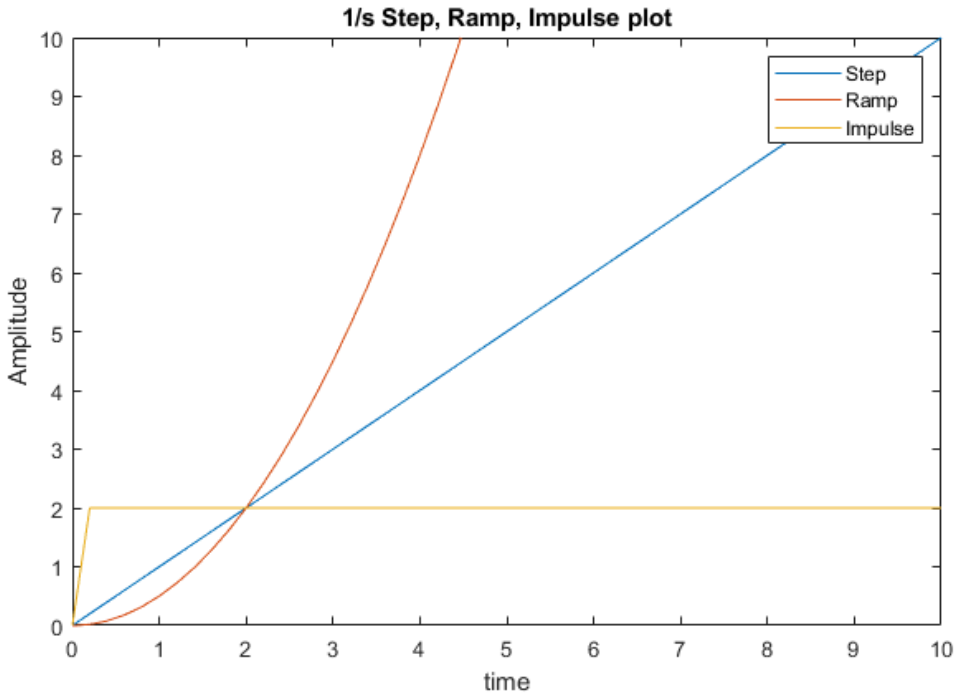

x1
x2
x3
Step1_imp
Step2_imp
z-1
Delay1
time

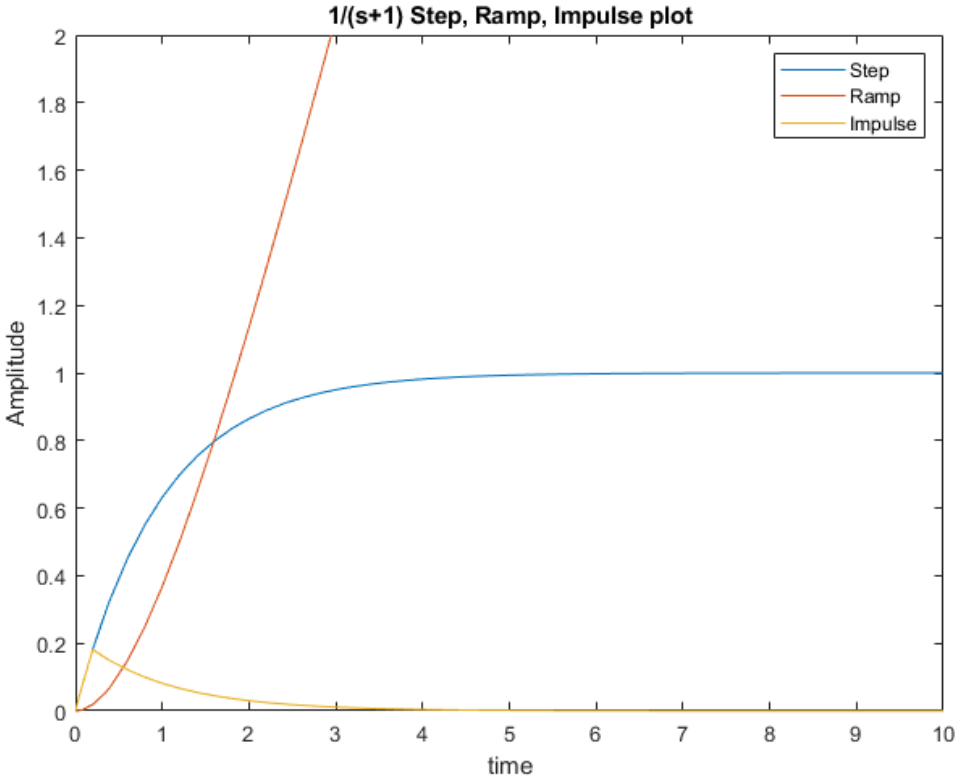
Q2

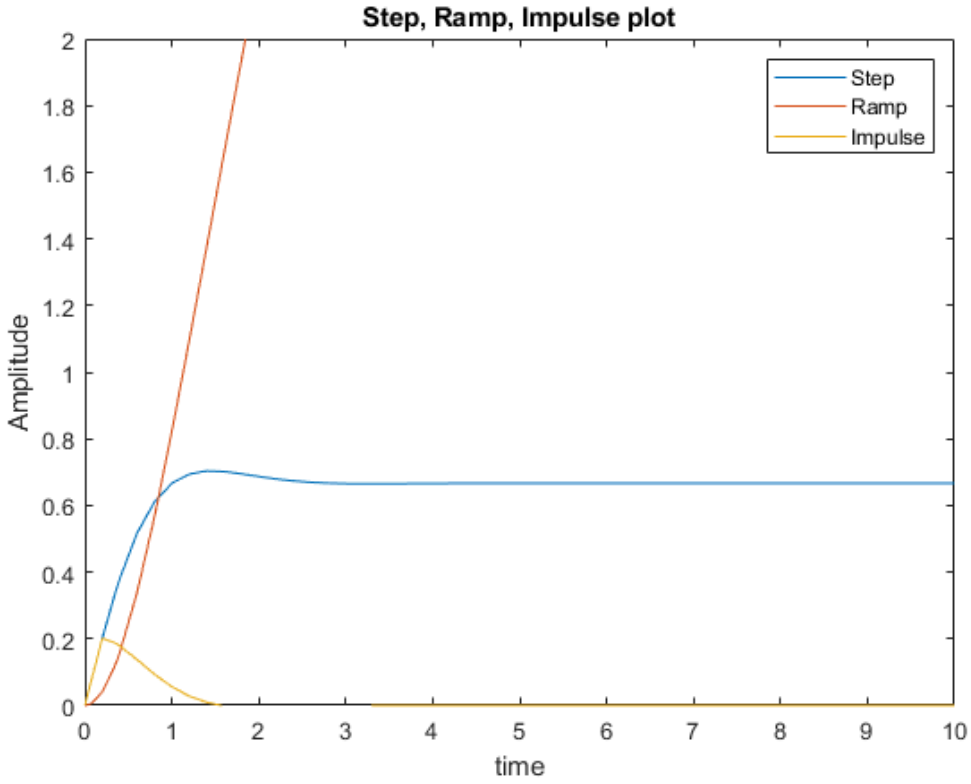
Visualize impulse, step and ramp responses on scope for the following systems

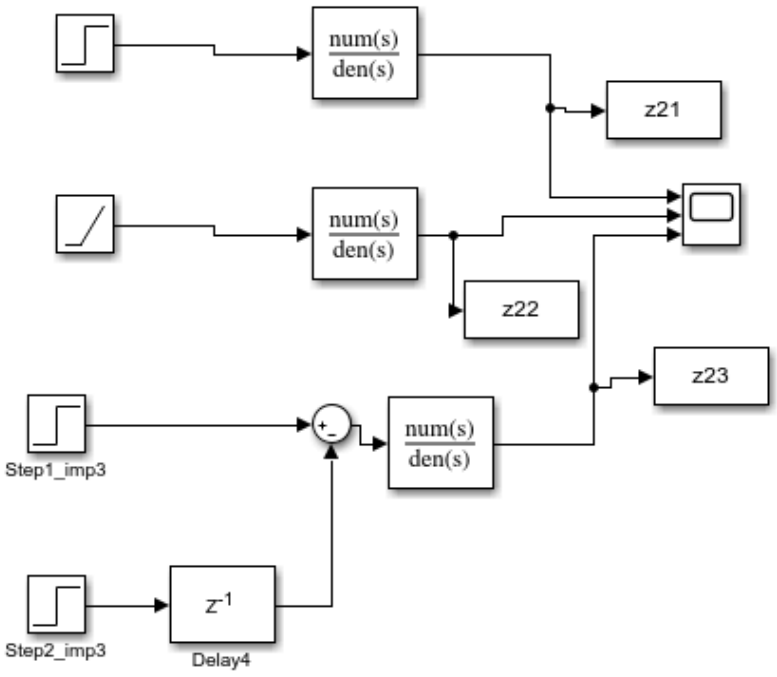
```
%described by transfer functions.
%  1
%  -
%  s
figure(2)
plot(time,x21)
hold on
plot(time,x22)
hold on
plot(time,x23)
legend('Step','Ramp','Impulse');
xlabel('time');
ylabel('Amplitude');
title('1/s Step, Ramp, Impulse plot');
ylim([0 10])
figure()
ss3=imread('ss3.png');
imshow(ss3);
%  1
% ---
% s+1
figure(3)
plot(time,y21)
hold on
plot(time,y22)
hold on
plot(time,y23)
legend('Step','Ramp','Impulse');
xlabel('time');
ylabel('Amplitude');
title('1/(s+1) Step, Ramp, Impulse plot');
ylim([0 2])
figure()
ss2=imread('ss2.png');
imshow(ss2);
% (s+4)/(s^2+3.5s+6)
figure(4)
plot(time,z21)
hold on
plot(time,z22)
hold on
plot(time,z23)
legend('Step','Ramp','Impulse');
xlabel('time');
ylabel('Amplitude');
title('Step, Ramp, Impulse plot');
ylim([0 2])
figure()
ss5=imread('ss5.png');
```

```
imshow(ss5);
```


1/s Step, Ramp, Impulse plot
Step
Ramp
Impulse
Amplitude
time
0
1
2
3
4
5
6
7
8
9
10

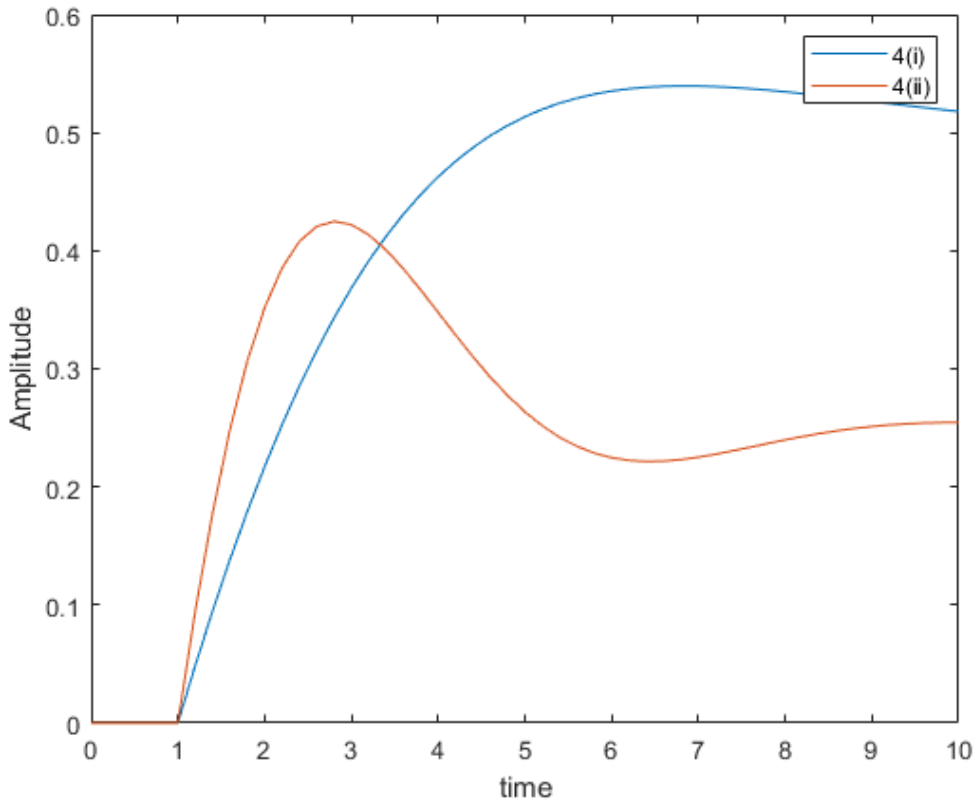

1/(s+1) Step, Ramp, Impulse plot
Step
Ramp
Impulse
Amplitude
time
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
1
2
3
4
5
6
7
8
9
10

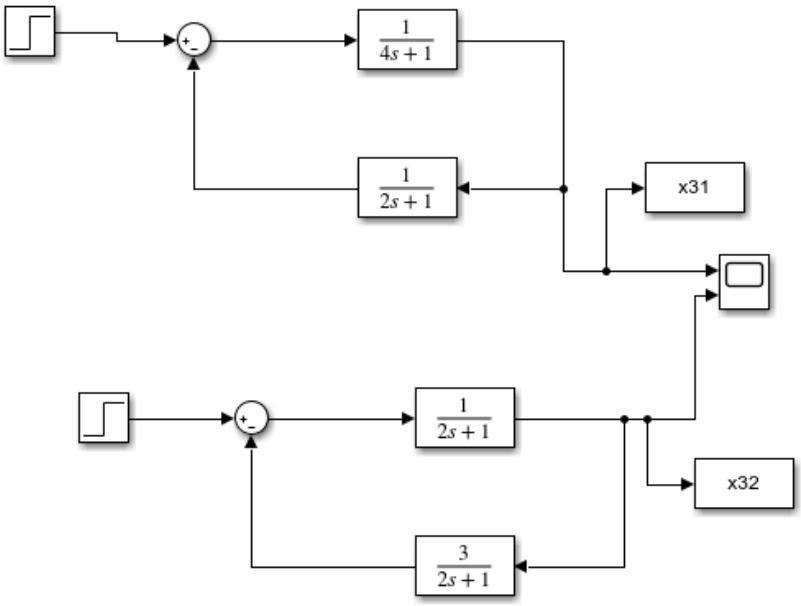

Step, Ramp, Impulse plot
Step
Ramp
Impulse
Amplitude
time
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
1
2
3
4
5
6
7
8
9
10


num(s)
den(s)
z21
num(s)
den(s)
z22
z23
Step1_imp3
num(s)
den(s)
Step2_imp3
z-1
Delay4

Q3.

```
figure(5)
plot(time,x31)
hold on
plot(time,x32)
legend('4(i)','4(ii)');
xlabel('time');
ylabel('Amplitude');
figure()
ss4=imread('ss4.png');
imshow(ss4);
```





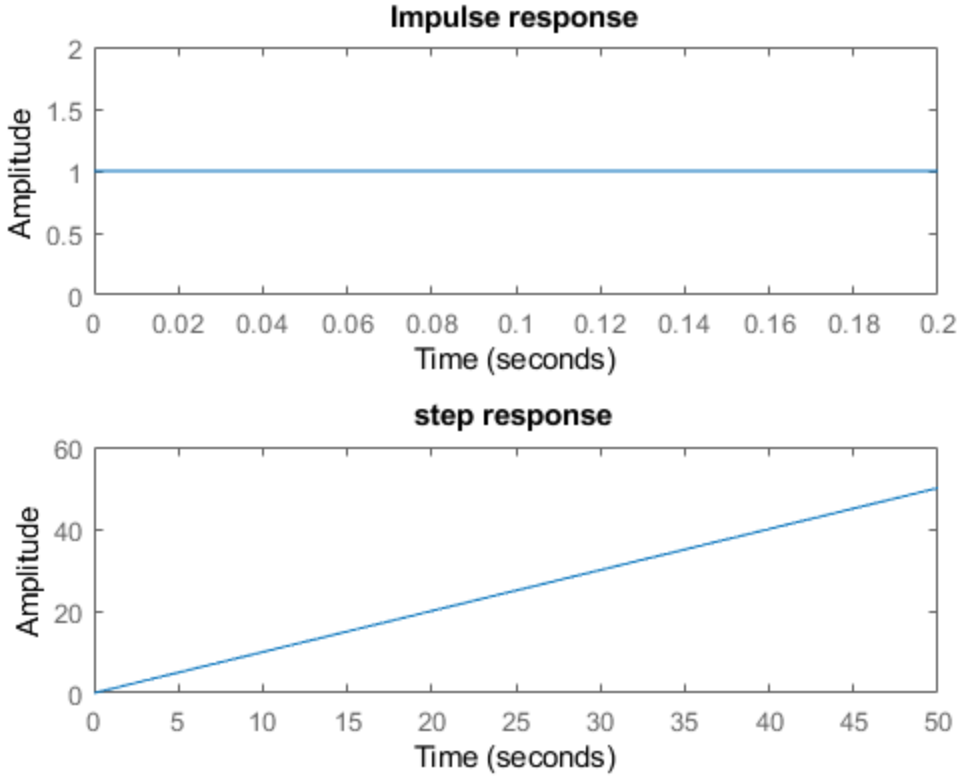
Q4

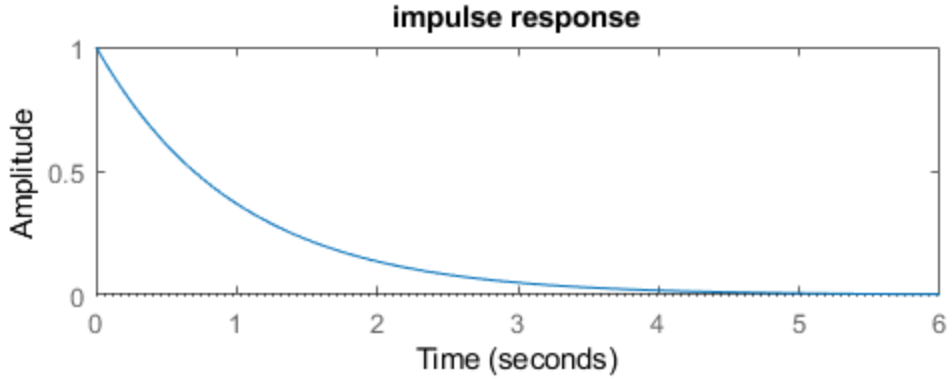
(i)

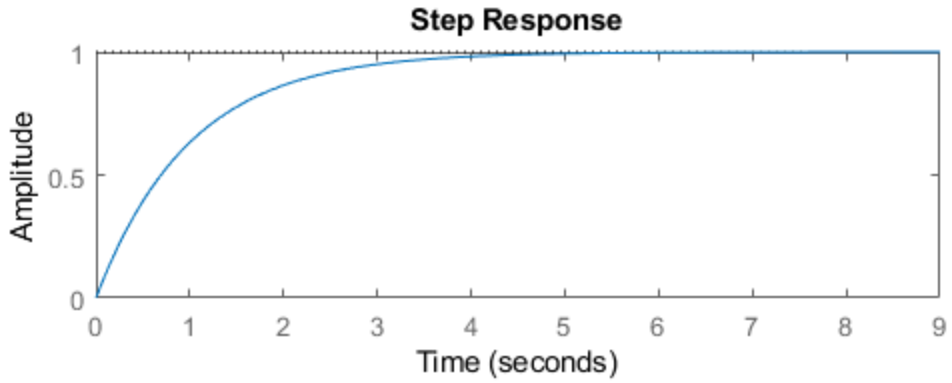
```
n1=[0 1];
d1=[1 0];
a=tf(n1,d1);
figure()
subplot(211)
impulse(a)
title('Impulse response');
subplot(212)
step(a)
title('step response');
% (ii)
n2=[0 1];
d2=[1 1];
b=tf(n2,d2)
figure()
subplot(211)
impulse(b)
title('impulse response');
subplot(212)
step(b)
% (iii)
n3=[0 1 4];
d3=[1 3.5 6];
```

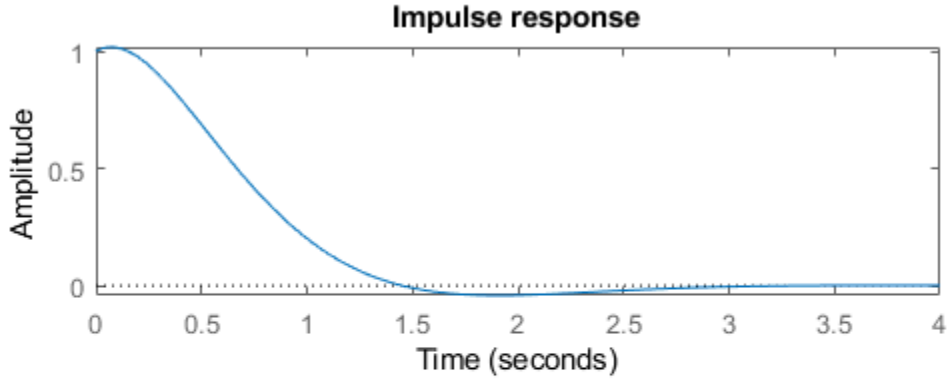
```
c=tf(n3,d3);
figure()
subplot(211)
impulse(c)
title('Impulse response');
subplot(212)
step(c)
title('step response');
```

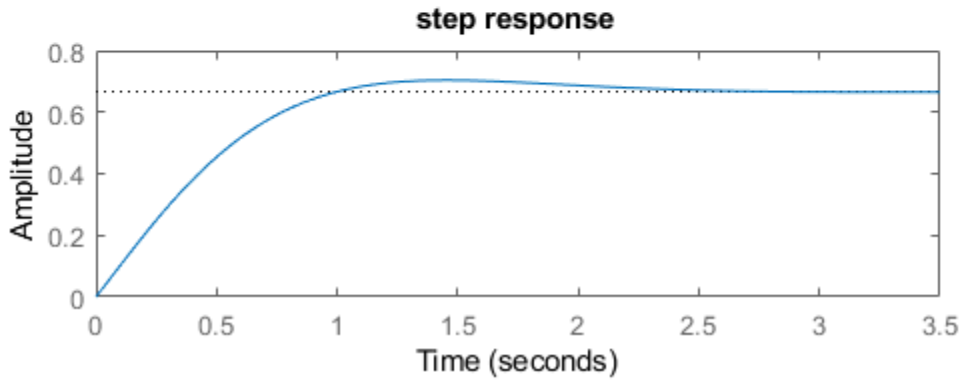
```
b =

    1
  -----
  s + 1

Continuous-time transfer function.
```




impulse response
Amplitude
Time (seconds)
0
0.5
1
0
1
2
3
4
5
6


Step Response
Amplitude
Time (seconds)
0
0.5
1
0
1
2
3
4
5
6
7
8
9


Impulse response
Amplitude
Time (seconds)
0
0.5
1
0
0.5
1
1.5
2
2.5
3
3.5
4


step response
Amplitude
Time (seconds)
0
0.2
0.4
0.6
0.8
0
0.5
1
1.5
2
2.5
3
3.5

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