Table of Contents

Title:Control System-First Order System: Analysis by poles and parameters

```
%Author:ShivaKumar Naga Vankadhara
%PS No:99003727
%Date:10/04/2021
%Version:1.7
```

This Document has equation for motion differential system

```
%Equation:mdv/dt+bv=u
```

Math analysis

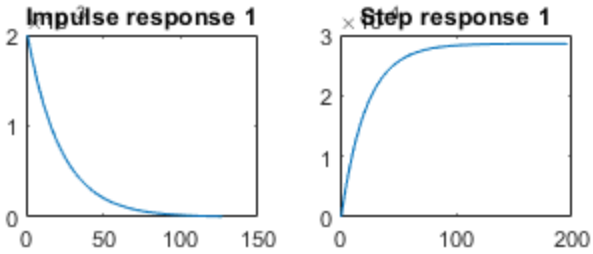
```
%dependent variables:v
%independent variables:t,u
%constant:m,b
%Root:-b/m
```

IVT

```
%for impulse is 1/m=0.002
%for step is 0
%%FVT
%for impulse is 0;
%for step is 1/b=0.00028

m1=500;
b1=3500;
Tau=m1/b1;
TF=tf([0,1/b1],[Tau,1])
T_R=4*Tau
subplot(3,3,1),plot(impulse(TF))
```

```
title("Impulse response 1")
subplot(3,3,2),plot(step(TF))
title("Step response 1")
S = stepinfo(TF)
```

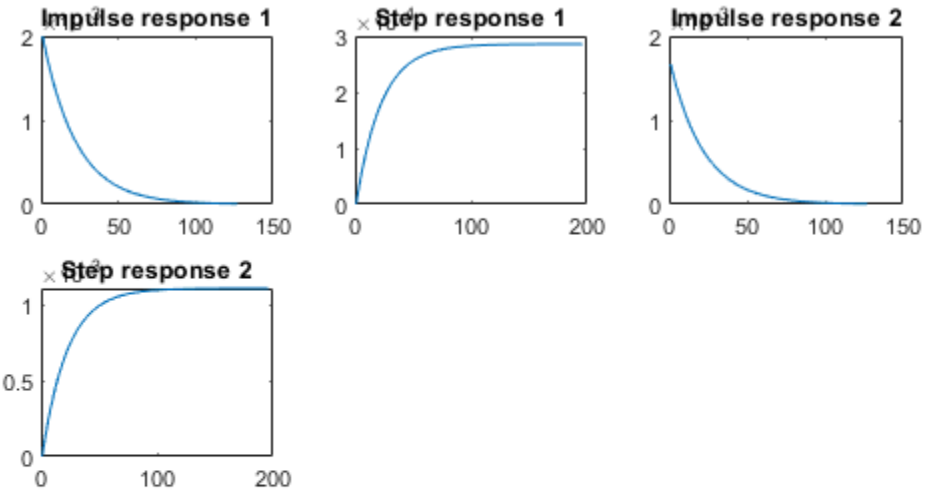
```
TF =

   0.0002857
  ------------
  0.1429 s + 1

Continuous-time transfer function.


T_R =

    0.5714


S =

  struct with fields:

        RiseTime: 0.3139
    SettlingTime: 0.5589
     SettlingMin: 2.5843e-04
     SettlingMax: 2.8571e-04
       Overshoot: 0
      Undershoot: 0
            Peak: 2.8571e-04
        PeakTime: 1.5065
```



IVT

```
%for impulse is 1/m=0.00166
%for step is 0
%%FVT
%for impulse is 0;
%for step is 1/b=0.001111

m2=600;
b2=900;
Tau=m2/b2;
T_R=4*Tau
TF=tf([0,1/b2],[Tau,1])
subplot(3,3,3),plot(impulse(TF))
title("Impulse response 2")
subplot(3,3,4),plot(step(TF))
title("Step response 2")
S = stepinfo(TF)


T_R =

    2.6667


TF =
```

```
    0.001111
  ------------
  0.6667 s + 1

Continuous-time transfer function.


S =

  struct with fields:

        RiseTime: 1.4647
    SettlingTime: 2.6080
     SettlingMin: 0.0010
     SettlingMax: 0.0011
       Overshoot: 0
      Undershoot: 0
            Peak: 0.0011
        PeakTime: 7.0306
```

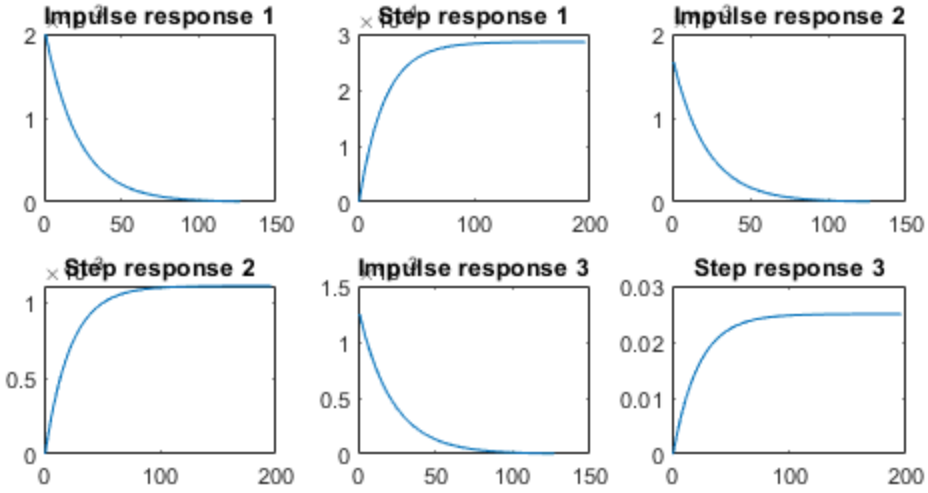


IVT

```
%for impulse is 1/m=0.00125
%for step is 0
```

```
%%FVT
%for impulse is 0;
%for step is 1/b=0.025

m3=800;
b3=40;
Tau=m3/b3;
T_R=4*Tau
TF=tf([0,1/b3],[Tau,1])
subplot(3,3,5),plot(impulse(TF))
title("Impulse response 3")
subplot(3,3,6),plot(step(TF))
title("Step response 3")
S = stepinfo(TF)
```

```
T_R =

    80


TF =

   0.025
  --------
  20 s + 1

Continuous-time transfer function.


S =

  struct with fields:

        RiseTime: 43.9401
    SettlingTime: 78.2415
     SettlingMin: 0.0226
     SettlingMax: 0.0250
       Overshoot: 0
      Undershoot: 0
            Peak: 0.0250
        PeakTime: 210.9168
```

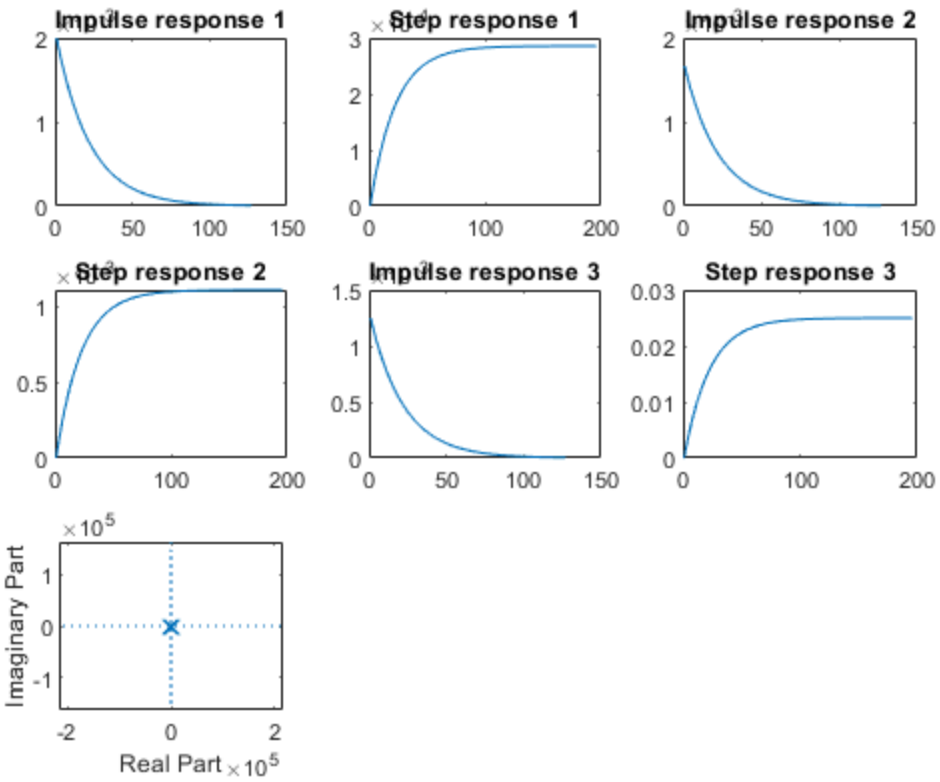


Poles plotting

```
hold on

subplot(3,3,7)
[z1,p1,k1]= tf2zp([0,1/b1],[m1/b1,1])
zplane(z1,p1)

hold on

subplot(3,3,7)
[z2,p2,k2]= tf2zp([0,1/b2],[m2/b2,1])
zplane(z2,p2)

hold on
subplot(3,3,7)
[z3,p3,k3]= tf2zp([0,1/b3],[m3/b3,1])
zplane(z3,p3)
```

```
z1 =

  0×1 empty double column vector


p1 =
```

```
    -7

k1 =

    0.0020

z2 =

  0×1 empty double column vector

p2 =

   -1.5000

k2 =

    0.0017

z3 =

  0×1 empty double column vector

p3 =

   -0.0500

k3 =

    0.0013
```



Response analysis (SAS)

Rise time

```
%T1=0.3139
%T2=1.4647
%T3=43.9401
%System 1 has the least rise time so the speed of system is greatest
%System 3 has the greatest rise time so the speed of system is least

% Settling time
%S1=0.5589
%S2=2.6080
%S3=78.2415
%System 1 is taking least time to get settled so the system is
 accurate
%System 3 is taking most time to get settled so the system is least
 accurate

% Pole position
%P1=-7.0
%P2=-1.5000
%P3=-0.0500
% system 1 pole is farthest away from pole:best stabilty among 3
% system 1 pole is farthest away from pole:worst stablity among 3
```

Published with MATLAB® R2021a