Contents

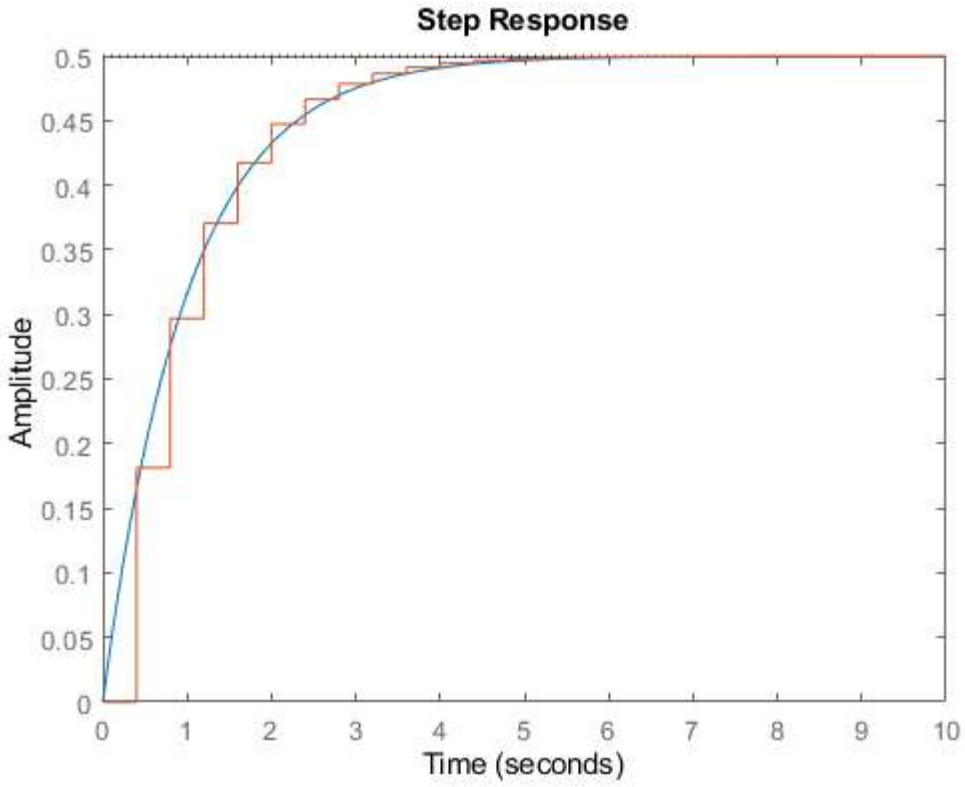

```
clear; close all; clc;
```

Problem 1

```
figure(1);
Ts = 0.4;

Gs = tf(0.5, [1 0.5])
Gscl = feedback(Gs,1)

Gz = c2d(Gs, Ts)
Gzcl = feedback(Gz, 1)
hold on;
step(Gscl);
step(Gzcl);

hold off;
```

```
Gs =

    0.5
  -------
  s + 0.5

Continuous-time transfer function.


Gscl =

   0.5
  -----
  s + 1

Continuous-time transfer function.


Gz =

    0.1813
  ----------
  z - 0.8187

Sample time: 0.4 seconds
Discrete-time transfer function.
```

```
Gzcl =

    0.1813
  ----------
  z - 0.6375

Sample time: 0.4 seconds
Discrete-time transfer function.
```

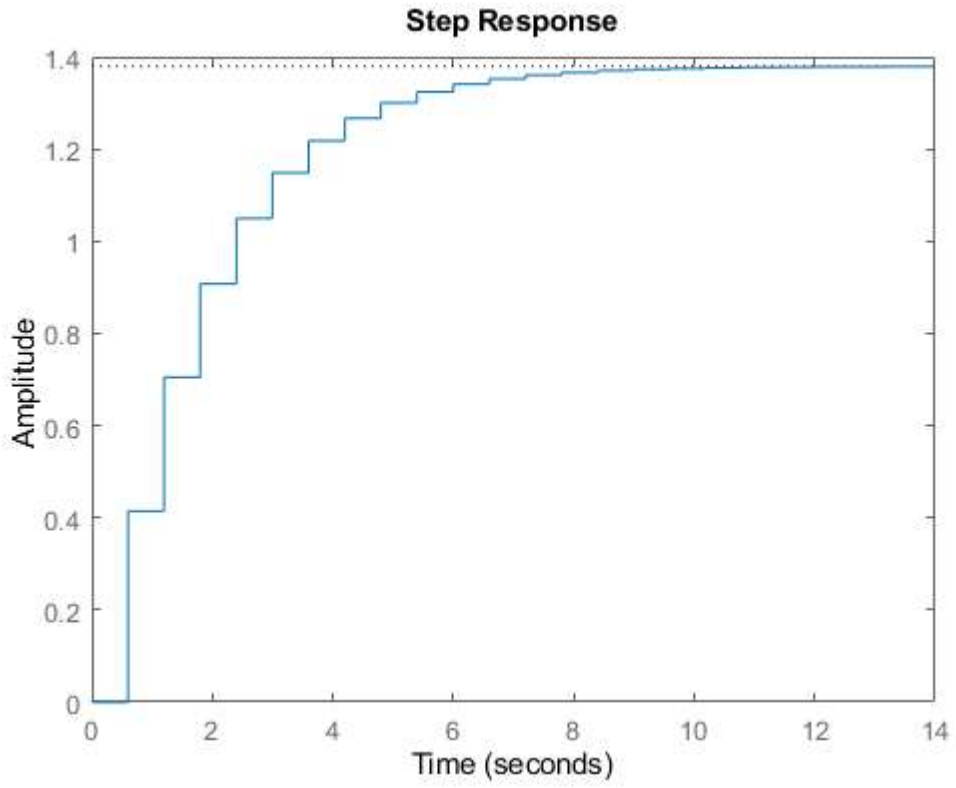


problem 2

```
figure(2);
Ts = 0.6;

Gs = tf(2,[1 0.5])
Gz = c2d(Gs, Ts)
Gzcl = feedback(Gz, 0.04)

hold on;
step(0.4*Gzcl)
hold off;
```

```
Gs =

     2
  -------
  s + 0.5

Continuous-time transfer function.
```

```
Gz =

    1.037
  ----------
  z - 0.7408

Sample time: 0.6 seconds
Discrete-time transfer function.


Gzcl =

    1.037
  ----------
  z - 0.6993

Sample time: 0.6 seconds
Discrete-time transfer function.
```



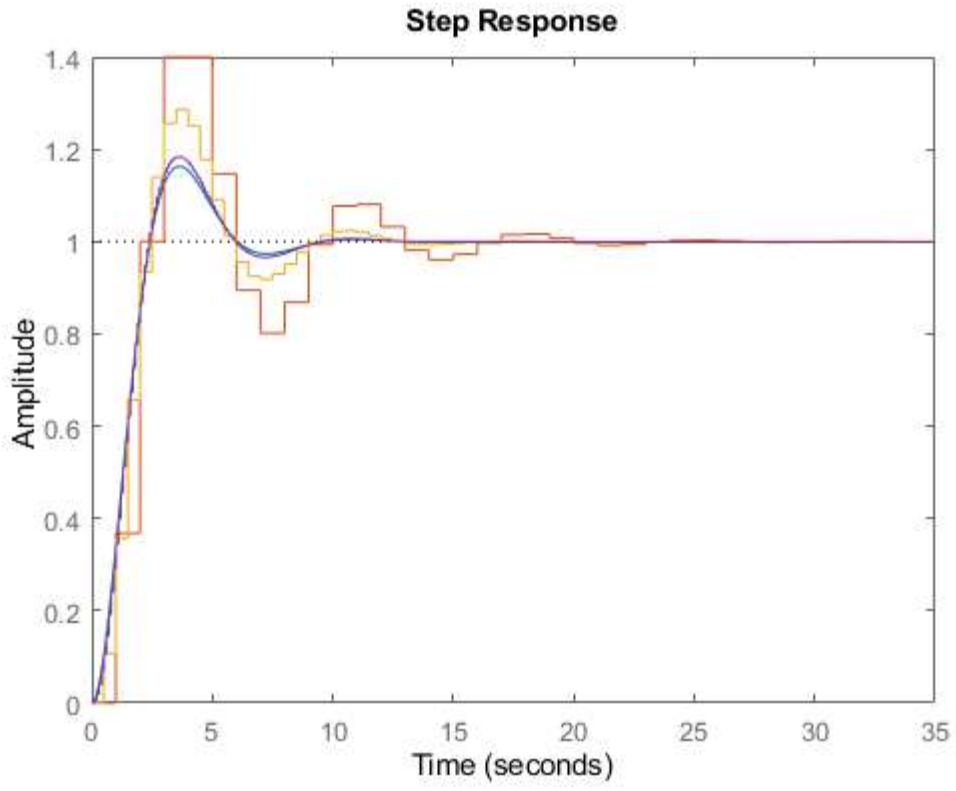
problem 3

```
figure(3);
hold on;


Gs = tf(1, [1 1 0])
Gscl = feedback(Gs, 1)
step(Gscl);
```

```
% T = 1s
Ts = 1;
Gz = c2d(Gs, Ts);
Gzcl = feedback(Gz, 1)
log(pole(Gzcl))/Ts
step(Gzcl);

% T = 0.5s
Ts = 0.5;
Gz = c2d(Gs, Ts);
Gzcl = feedback(Gz, 1)
log(pole(Gzcl))/Ts
step(Gzcl);

% T = 0.1s
Ts = 0.1;
Gz = c2d(Gs, Ts);
Gzcl = feedback(Gz, 1)
log(pole(Gzcl))/Ts
step(Gzcl);
hold off;
```

```
Gs =

     1
  -------
  s^2 + s

Continuous-time transfer function.


Gscl =

       1
  -----------
  s^2 + s + 1

Continuous-time transfer function.


Gzcl =

  0.3679 z + 0.2642
  -----------------
  z^2 - z + 0.6321

Sample time: 1 seconds
Discrete-time transfer function.

ans =
  -0.2293 + 0.8907i
  -0.2293 - 0.8907i

Gzcl =

   0.1065 z + 0.0902
  --------------------
  z^2 - 1.5 z + 0.6967
```

```
Sample time: 0.5 seconds
Discrete-time transfer function.

ans =
  -0.3614 + 0.9088i
  -0.3614 - 0.9088i

Gzcl =

  0.004837 z + 0.004679
  ---------------------
  z^2 - 1.9 z + 0.9095

Sample time: 0.1 seconds
Discrete-time transfer function.

ans =
  -0.4742 + 0.8794i
  -0.4742 - 0.8794i
```



problem 4

```
hold on;
Gs = tf(1, [1 1]);
Ts = 1;
Gz = c2d(Gs, Ts)

hold off;
```

```
Gz =

    0.6321
  ----------
  z - 0.3679

Sample time: 1 seconds
Discrete-time transfer function.
```

Problem 5

```
syms z
C = (z-0.9)*(z-0.8)*(z^2-1.9*z+1);
expand(C)
roots([1 -3.6 4.95 -3.068 0.72])
```

```
ans =
z^4 - (18*z^3)/5 + (99*z^2)/20 - (767*z)/250 + 18/25
ans =
   0.9500 + 0.3122i
   0.9500 - 0.3122i
   0.9000 + 0.0000i
   0.8000 + 0.0000i
```

Published with MATLAB® R2022a