ziegler-nichols 1 and Tyreus-Luben

Disusun Oleh :

Feby Rasyada Zola (19/439107/PA/18930)

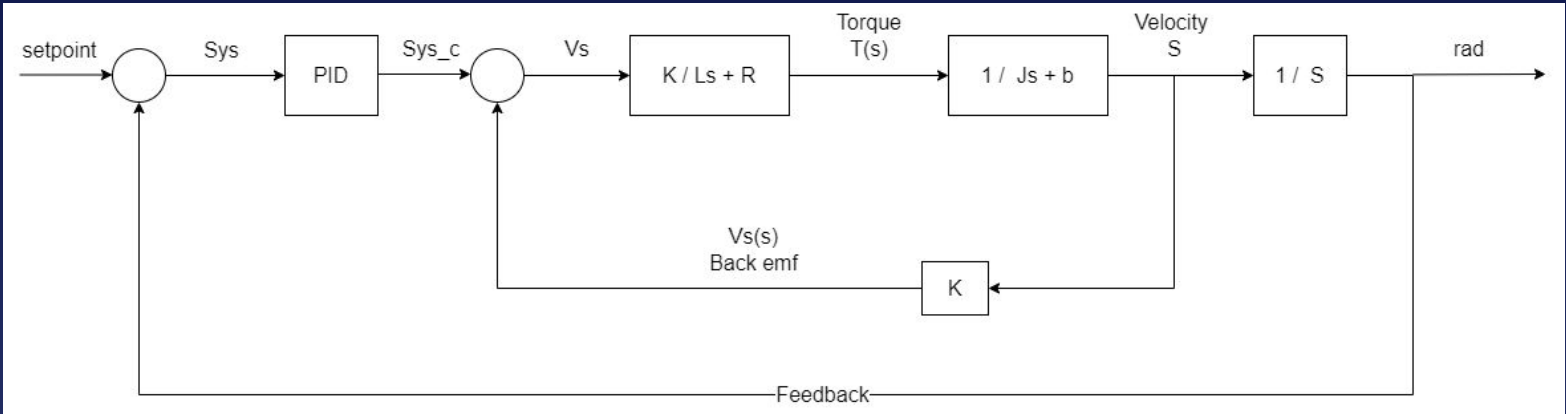
Haikal Abdurrahman(19/445563/PA/19387)

Isnan Firmansyah (19/445567/PA/19391)

Nahda Faiha La’ali (19/445571/PA/19395)

Zaky Nur Ihsan (19/445575/PA/19399)

Digram System



Code Program

```
delay_t = 1;
constant_t = 10;
```

ZN 1

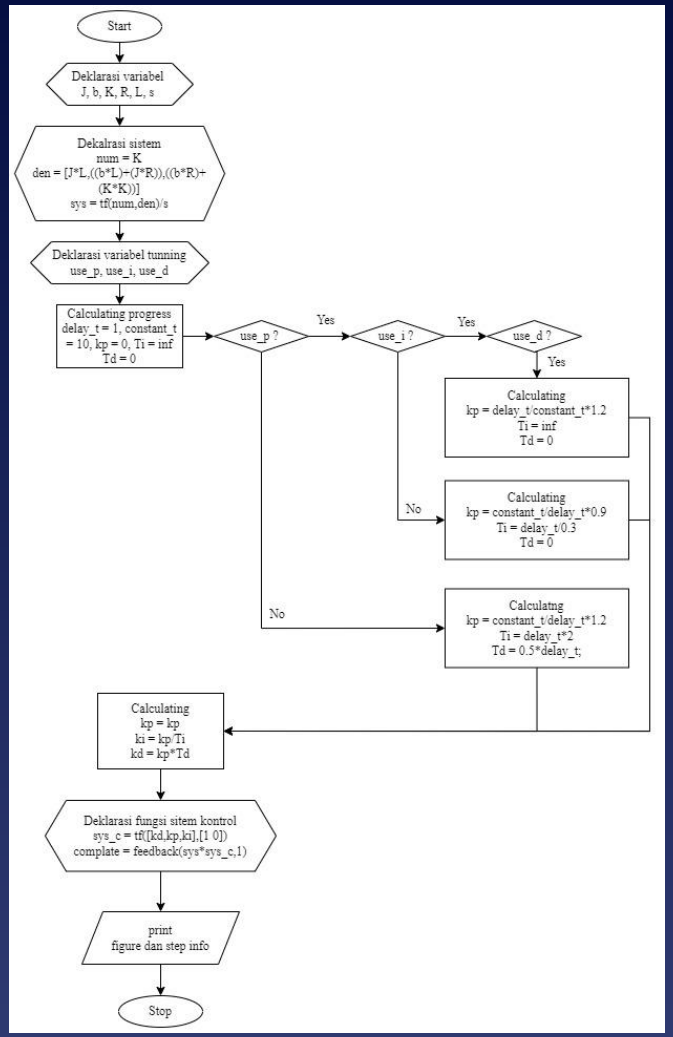
```
kcr = 120.12 ;
pcr =  1.4 ;
```

TL

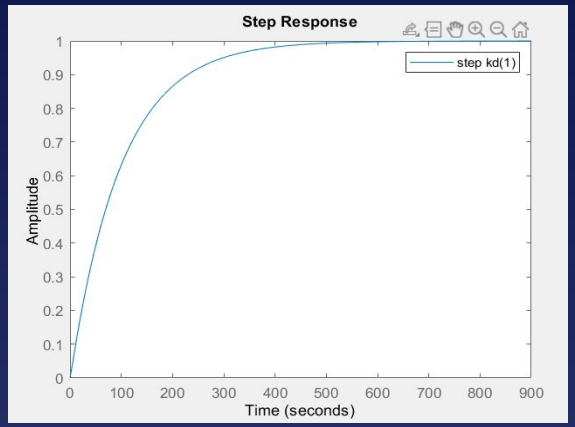
ziegler nichols 1

Type of Controller	K_p	T_i	T_d
P	$0.5K_{cr}$	∞	0
PI	$0.45K_{cr}$	$\frac{1}{1.2}P_{cr}$	0
PID	$0.6K_{cr}$	$0.5P_{cr}$	$0.125P_{cr}$

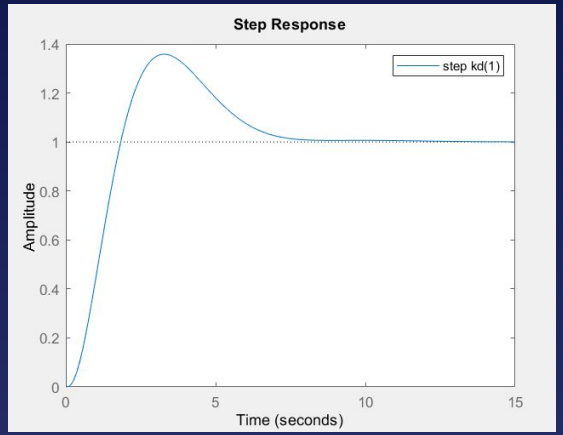
Flowchart
ZN 1



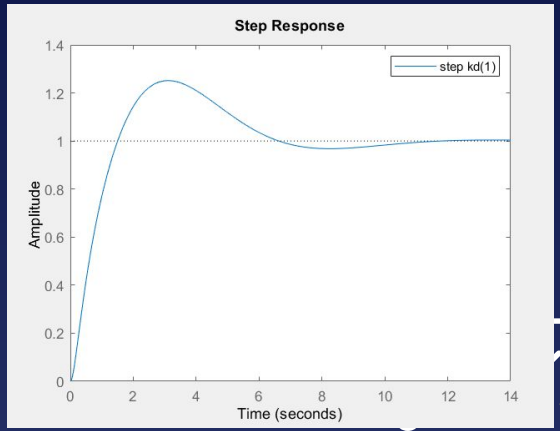
ZN 1 Output



P



P I



P I D

ZN 1

Output

P

$$\frac{0.06\,s^2 + 0.12\,s + 0.06}{0.005\,s^4 + 0.06\,s^3 + 0.1601\,s^2 + 0.12\,s + 0.06}$$

kp = 0.1000

ki = 0

kd = 0

P I

$$\frac{0.09\,s + 0.027}{0.005\,s^4 + 0.06\,s^3 + 0.1001\,s^2 + 0.09\,s + 0.027}$$

kp = 9

ki = 2.7000

kd = 0

P I D

$$\frac{0.001\,s}{0.005\,s^4 + 0.06\,s^3 + 0.1001\,s^2 + 0.001\,s}$$

kp = 12

ki = 6

kd = 6

ZN 1 Karakteristik Respon

	RiseTime	SettlingTime	Overshoot
P	218.6047	389.8481	0
P I	1.2011	7.1717	35.8356
P I D	1.0918	9.7383	25.1299

Tyreus- Luben

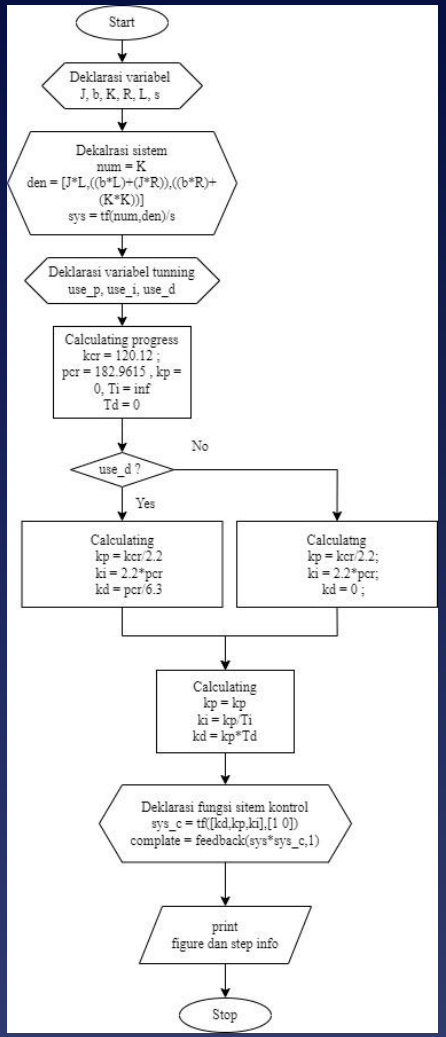
	KP	KI	KD
PI	Kc / 3.2	2.2Pc	-
PID	Kc/3.2	2.2Pc	Pc/6.3

Tyreus-Luben

Routh Table

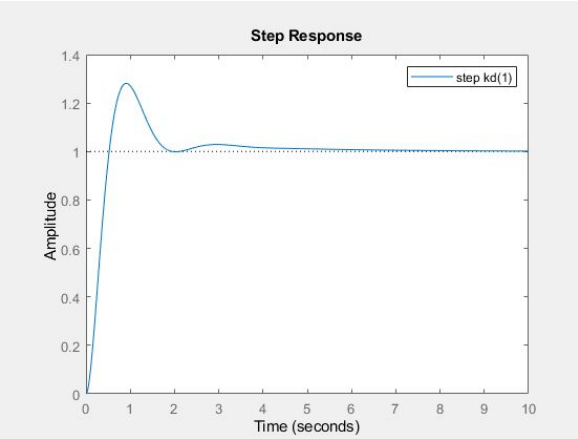
W1	0.005	0.1001
W2	0.06	0.01KP
W3	1.2012-0.01 KP	0
W4	-(1/600)KP^2+(1001/5000)KP	

Flowchart
Tyreus-Luben



Tyreus - luben

PID




```
ans =

  struct with fields:

       RiseTime: 0.3625
   SettlingTime: 3.6082
    SettlingMin: 0.9180
    SettlingMax: 1.2810
      Overshoot: 28.1031
     Undershoot: 0
           Peak: 1.2810
       PeakTime: 0.9049
```

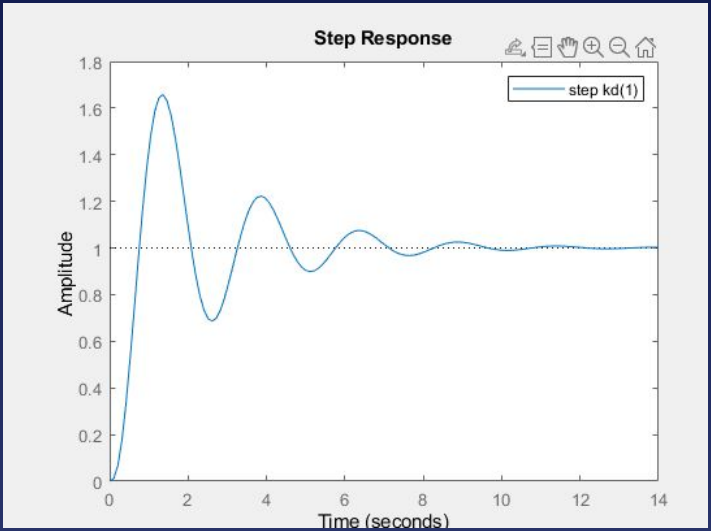
```
kp =

   54.6000


kd =

   12.1333


ki =

   17.7273
```

$$\frac{0.1213\,s^2 + 0.546\,s + 0.1773}{0.005\,s^4 + 0.06\,s^3 + 0.2214\,s^2 + 0.546\,s + 0.1773}$$

Complete

Tyreus - Luben

PI




```
ans =

  struct with fields:

        RiseTime: 0.4650
    SettlingTime: 9.1726
     SettlingMin: 0.6860
     SettlingMax: 1.6583
       Overshoot: 65.8250
      Undershoot: 0
            Peak: 1.6583
        PeakTime: 1.3600
```

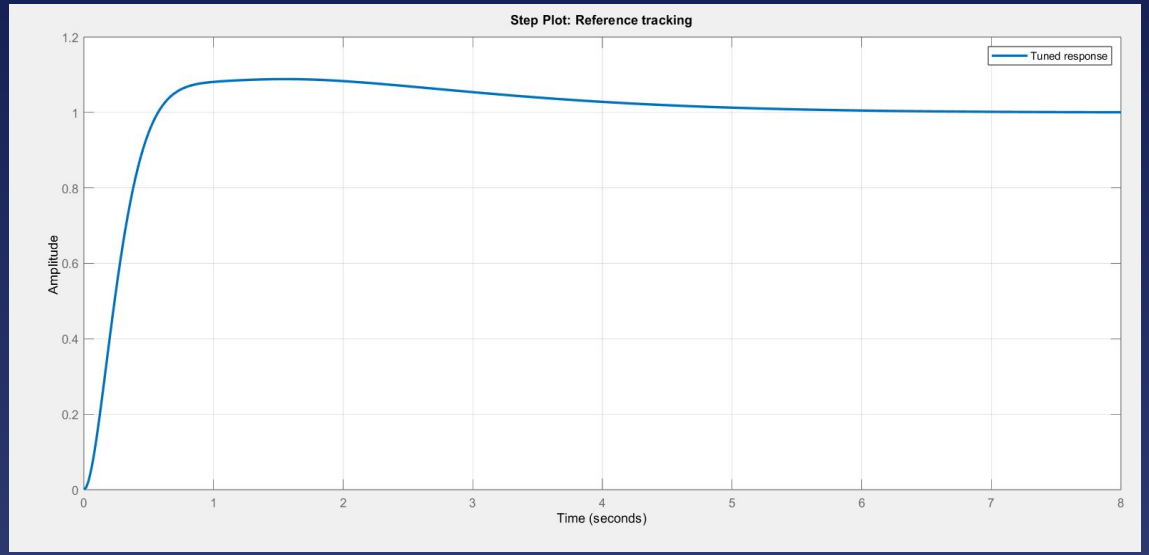
```
kp =

   37.5375

kd =

    0

ki =

   12.1875
```

$$\frac{0.3754\,s + 0.1219}{0.005\,s^4 + 0.06\,s^3 + 0.1001\,s^2 + 0.3754\,s + 0.1219}$$

Complete

PIDtune Matlab

Output



Controller Parameters

	Tuned
Kp	39.3278
Ki	17.3434
Kd	19.9295
Tf	n/a

Performance and Robustness

	Tuned
Rise time	0.373 seconds
Settling time	4.45 seconds
Overshoot	8.84 %
Peak	1.09
Gain margin	-Inf dB @ 0 rad/s
Phase margin	69 deg @ 3.55 rad/s
Closed-loop stability	Stable