Workspace

Filter ☐

Name	Class	Dimension	Value	Attribute
G	tf	1x1	...	
G1	tf	1x1	...	
G1_I	tf	1x1	...	
G2	tf	1x1	...	
Gc	tf	1x1	...	
Kd	double	1x1	14	
Ki	double	1x1	6.4000	
Kp	double	1x1	20	
Ku	double	1x1	30.200	
Pu	double	1x1	1.5708	
Ts	double	1x1	4	
Y	double	101x1	[0; 3.5663e-06; 4...	
Y2	double	101x1	[0; 9.3431e-04; 6...	
s	tf	1x1	...	
t	double	1x101	0:0.1:10	
t1	double	101x1	[0; 0.1000; 0.200...	
t2	double	101x1	[0; 0.1000; 0.200...	
u	double	1x101	0:0.1:10	

Command Window

```
Controller gains from Table of Ziegler-Nicholas PI:
Kp = 18.120
Ki = 12.920
Kd = 6.3500
By using Ziegler-Nicholas formulas value obtained are:
Kp = 20
Ki = 6.4000
Kd = 14
Elapsed time is 5.44936 seconds.
```
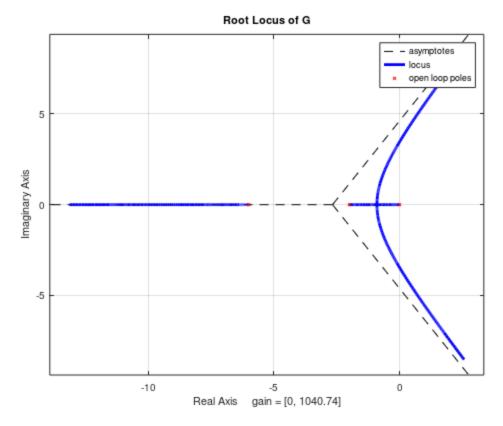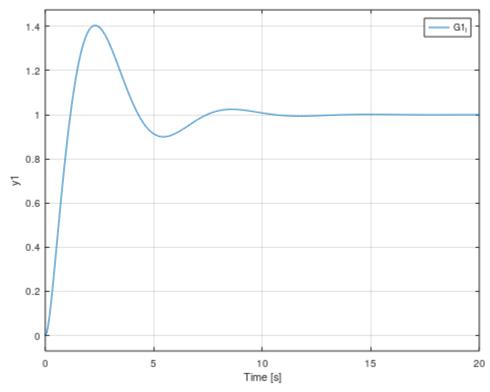
Root Locus of G

Real Axis   gain = [0, 1040.74]

Step Response with PID controller

Respond to unit step change in Disturbance with PID controller

Ramp Input tf

Ramp Input PID

Circuit schematic (top):

V1 = 0
V2 = 1
TD = 1
TR = 1u
TF = 1u
PW = 20
PER = 20

V2 0V

R2 3k   R1 150k   C2 4n   Disturbance EPOLY

E1 EPOLY   C1 100u   U1 OUT OPAMP

V1 = 0
V2 = 1
TD = 1m
TR = 1u
TF = 1u
PW = 20
PER = 20

V1   0

C3 50u   R3 15k   U2 OUT OPAMP

R5 10k   C4 50u   R4 15k   U3 OUT OPAMP

R7 4k   C5 50u   R6 15k   U4 OUT OPAMP

R8 75k   R9 75k   U5 OUT OPAMP

0V (multiple labels throughout)

Plot (bottom):

3.0V
2.0V
1.0V
0V
-1.0V
-2.0V

0s   1s   2s   3s   4s   5s   6s   7s   8s   9s   10s

□ U(V2:+)   ◇ U(V1:+)   ▽ U(E1:2)   △ U(E1:2)

Time

Cursor

Trace Color	Trace Name	Y1	Y2	Y1 - Y2	Y1(Cursor1) - Y2(Cursor2)	-1.0000			
	X Values	860.870m	9.565	-8.7044	Y1 - Y1(Cursor1)	Y2 - Y2(Cursor2)	Max Y	Min Y	Avg Y
CURSOR 1,2	V(V2:+)	0.000	1.0000	-1.0000	0.000	0.000	1.0000	0.000	500.000m
	V(V1:+)	1.0000	1.0000	0.000	1.0000	0.000	1.0000	1.0000	1.0000
	V(E1:2)	-647.746m	-1.1068	459.099m	-647.746m	-2.1068	-647.746m	-1.1068	-877.296m
	V(E1:2)	-647.746m	-1.1068	459.099m	-647.746m	-2.1068	-647.746m	-1.1068	-877.296m