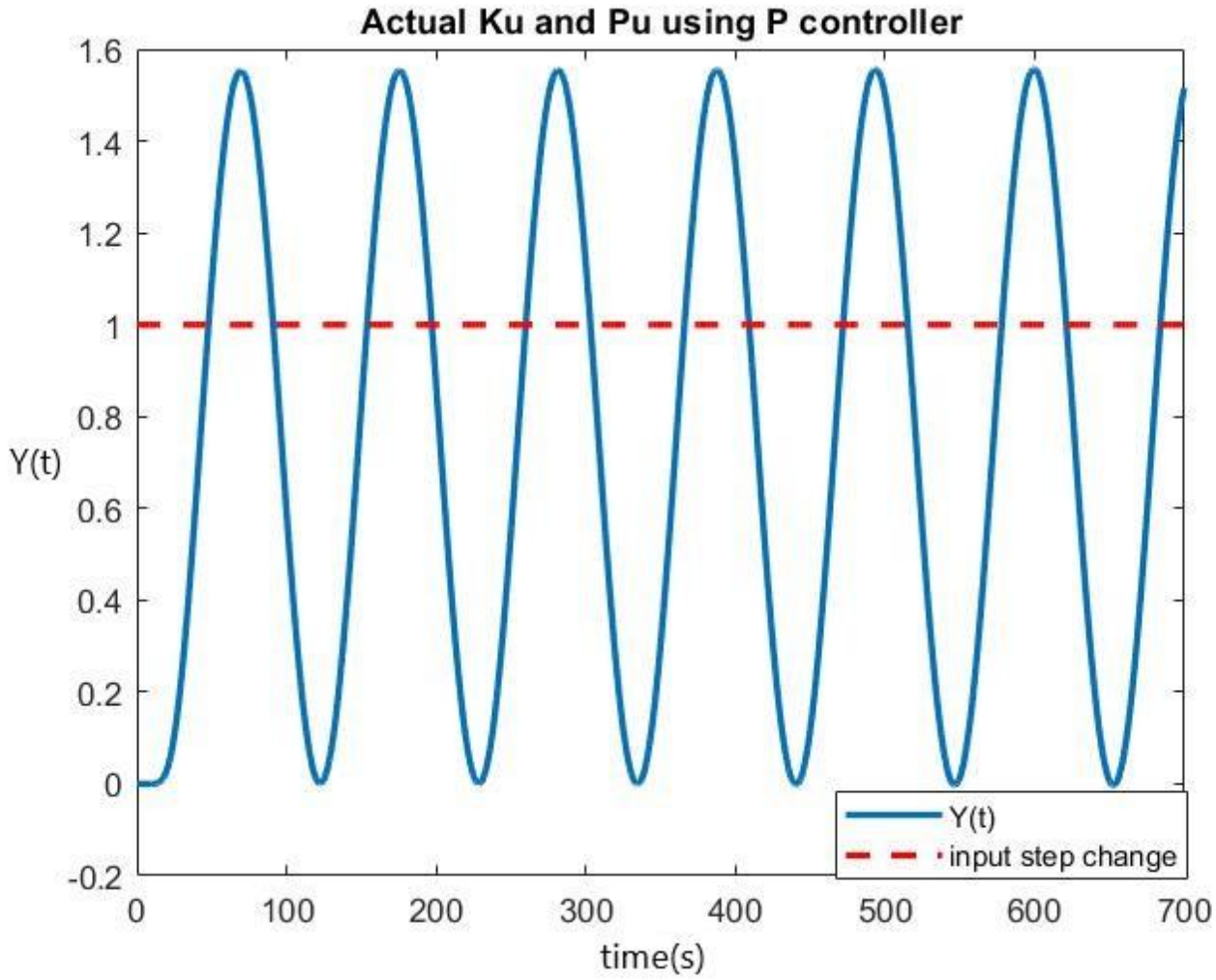
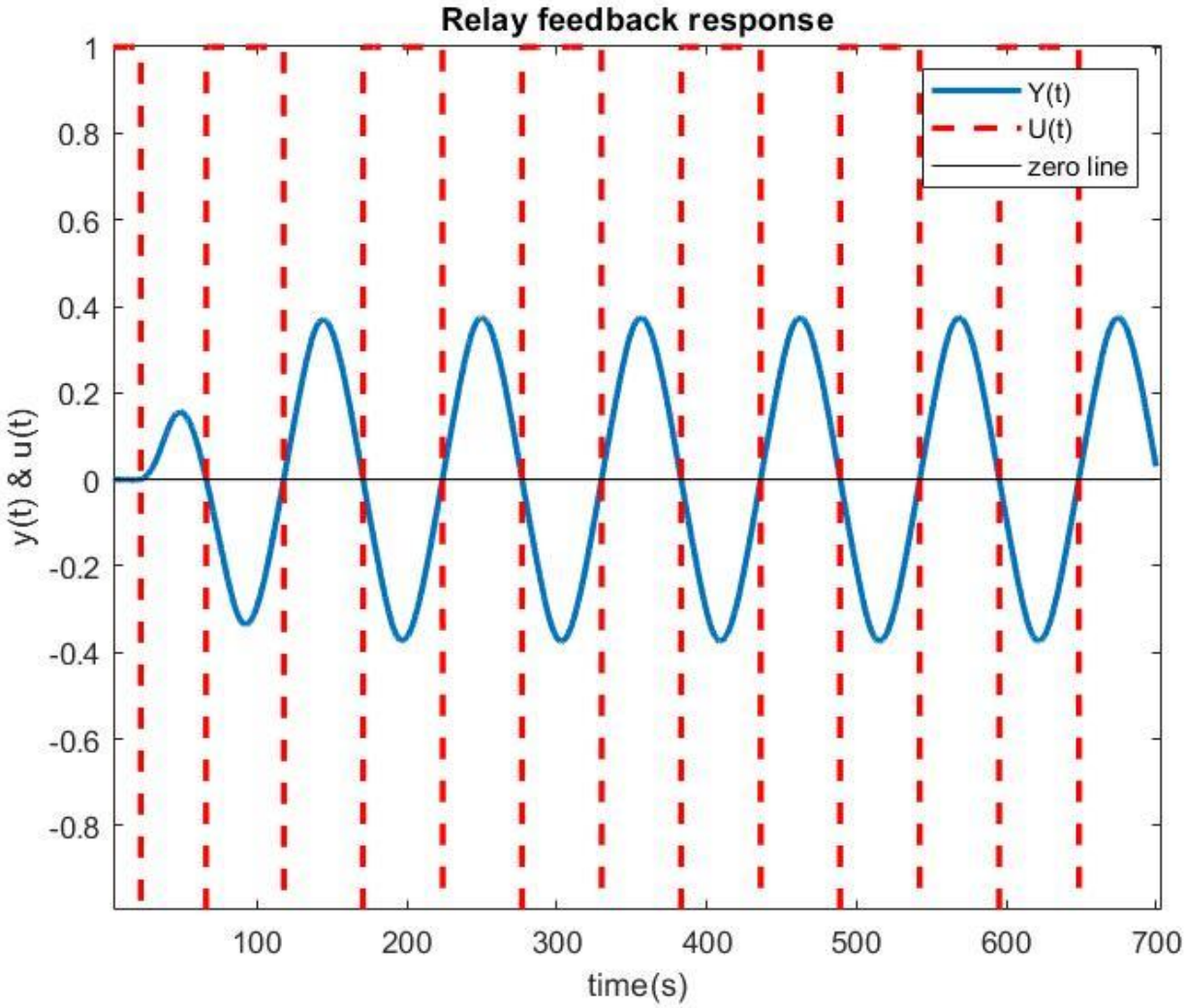
Lab Report 2(170747)

Using P controllers:



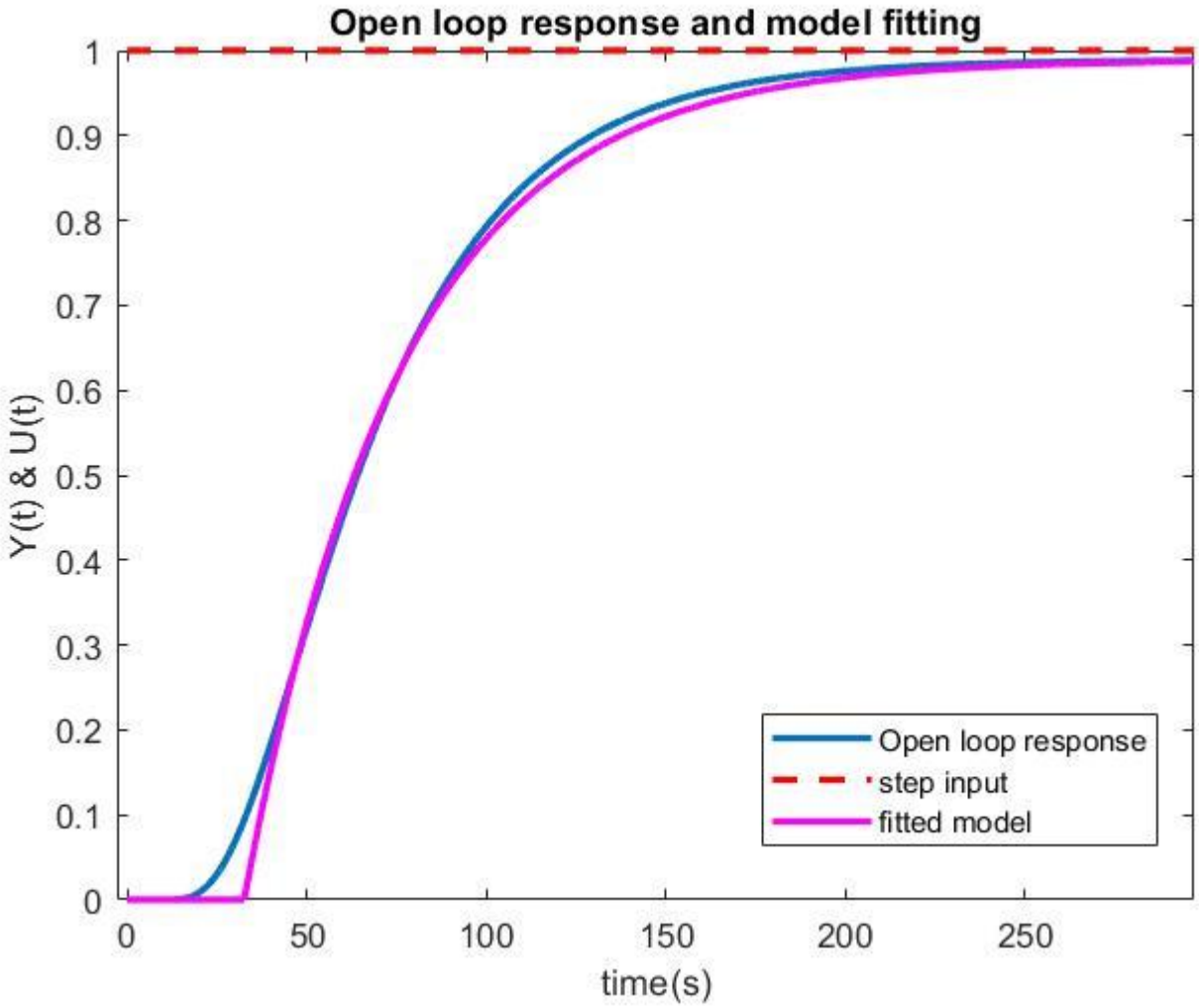
For sustained oscillations **Kc = Ku = 3.53 & Pu =106.2 s**

Using Relay Feedback:



Height of Relay (H) = 1
Amplitude of Signal (A) = .3737
Ku = (4H) / (pi * A) = 3.4071
Pu = 356.6-250.4 = 106.2 sec

USING FIRST ORDER PLUS DEAD TIME MODEL:



Fitting **First Order plus Dead Time** to the Process

Calculations:

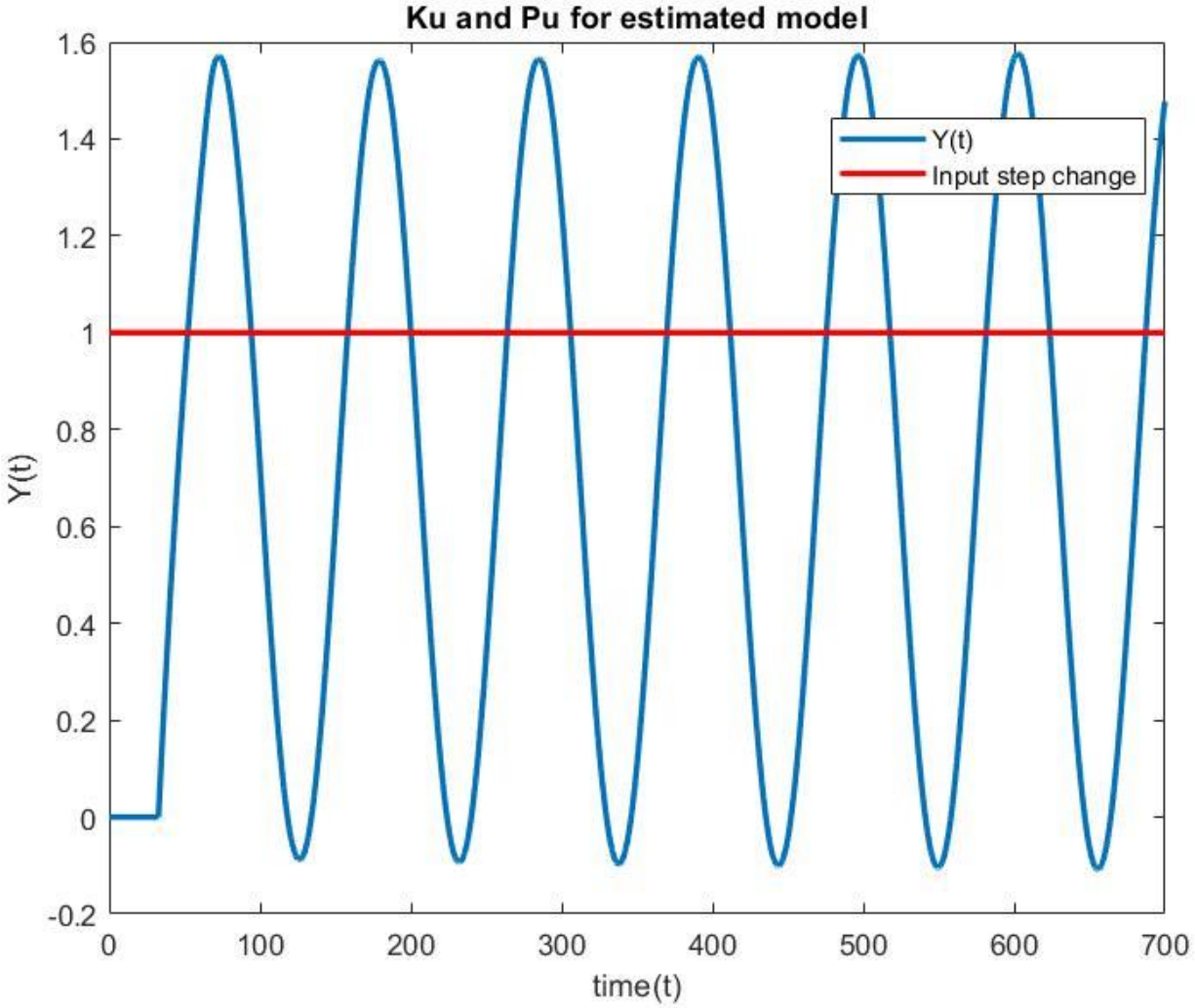
D + T = t63.2

D + T/3 = t28.3

D = 32.6856 s

T = 43.6287 s

Km = .9894



Ku=2.81

Pu=106 s

Plotting Responses at recommended tuning

Using the Ku and Pu obtained from **Relay Feedback Test.**

Ku = 3.4071

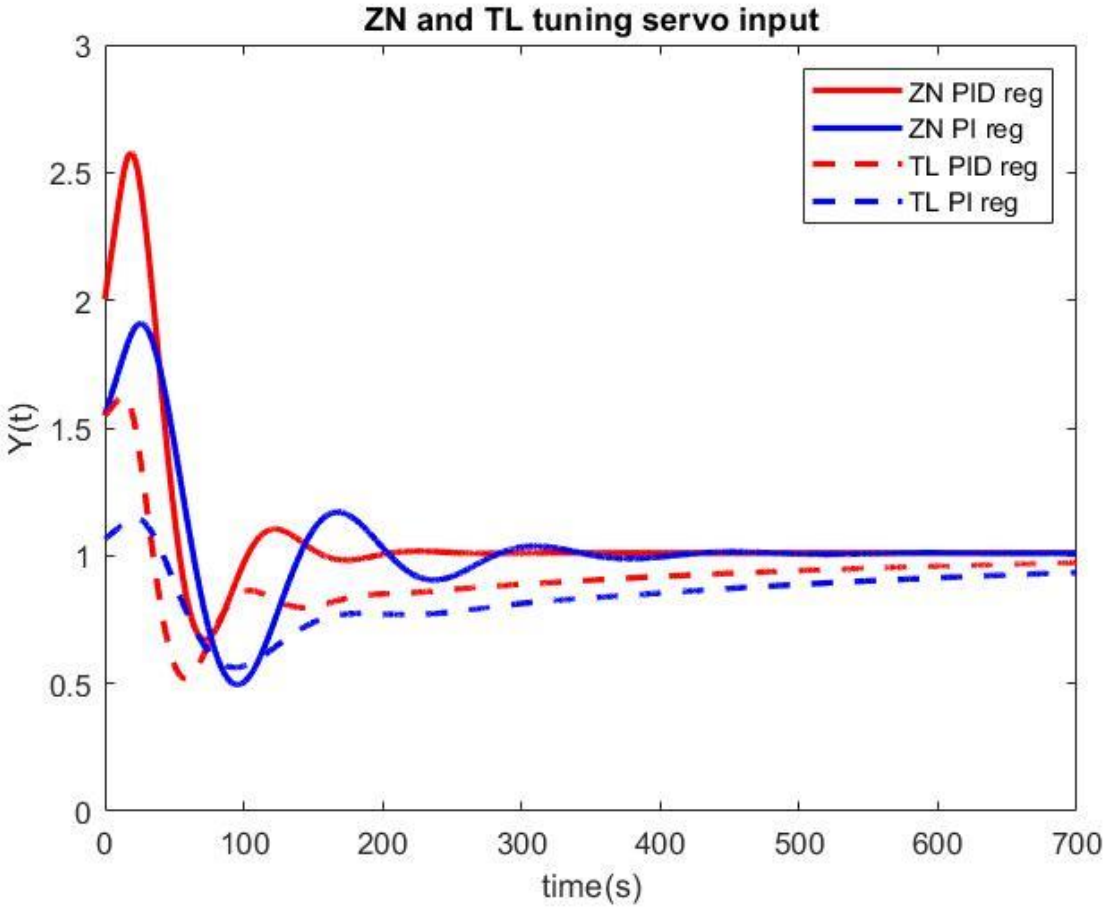
Pu = 106.2 sec

Using Empirical Relations for Tuning:

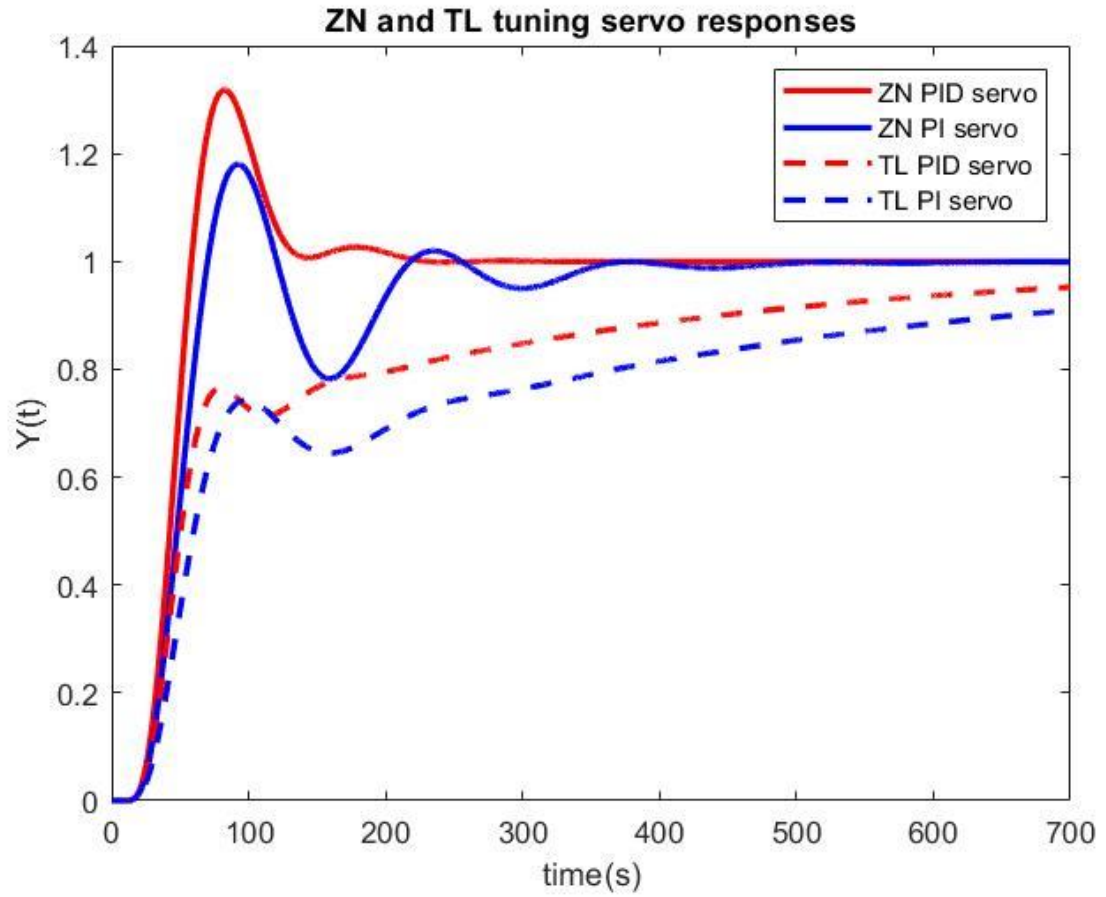
Zeigler Nichols	**Kc**	τ_i	τ_d
P	Ku/2	-	-
PI	Ku/2.2	Pu/1.2	-
PID	Ku/1.7	Pu/2	Pu/8
Tyres Luyben	**Kc**	τ_i	τ_d
P	-	-	-
PI	Ku/3.2	2.2Pu	-
PID	Ku/2.2	2.2Pu	Pu/6.3

Zeigler Nichols	**Kc**	τ_i	τ_d
P	1.70355	-	-
PI	1.54868	88.5	-
PID	2.00417	53.1	13.275
Tyres Luyben	**Kc**	τ_i	τ_d
P	-	-	-
PI	1.0647	233.64	-
PID	1.54868	233.64	16.857

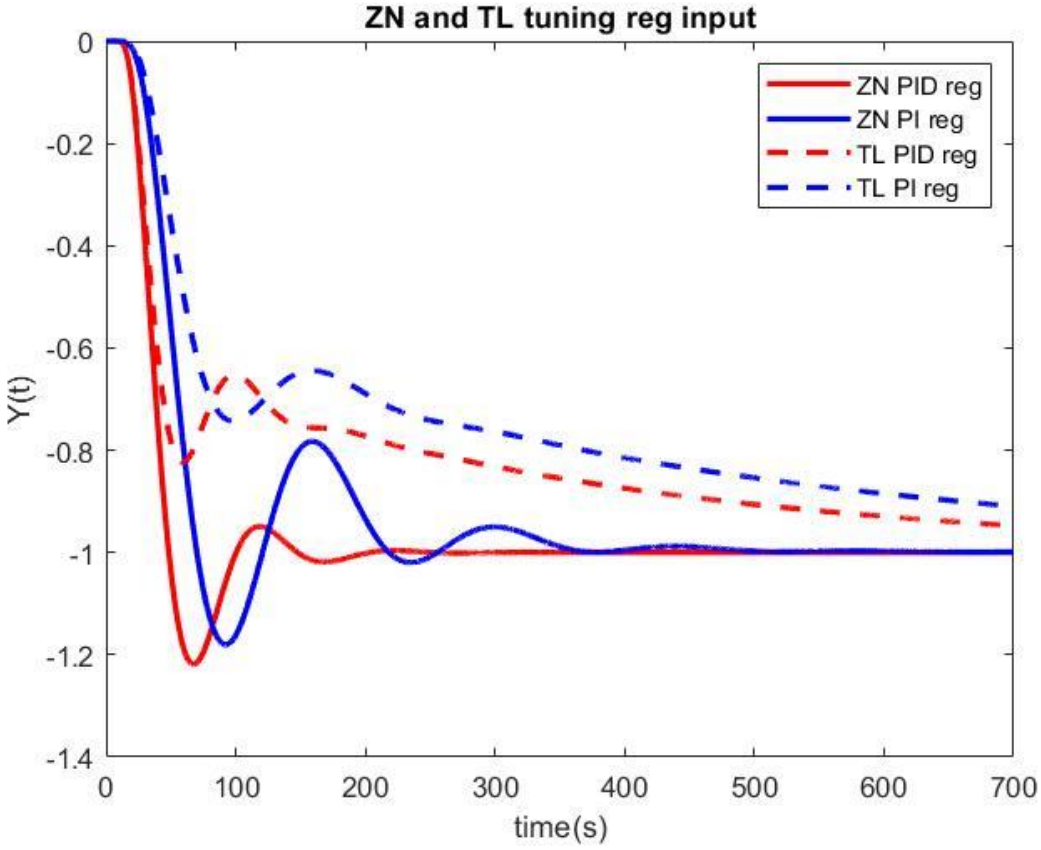
Servo Input



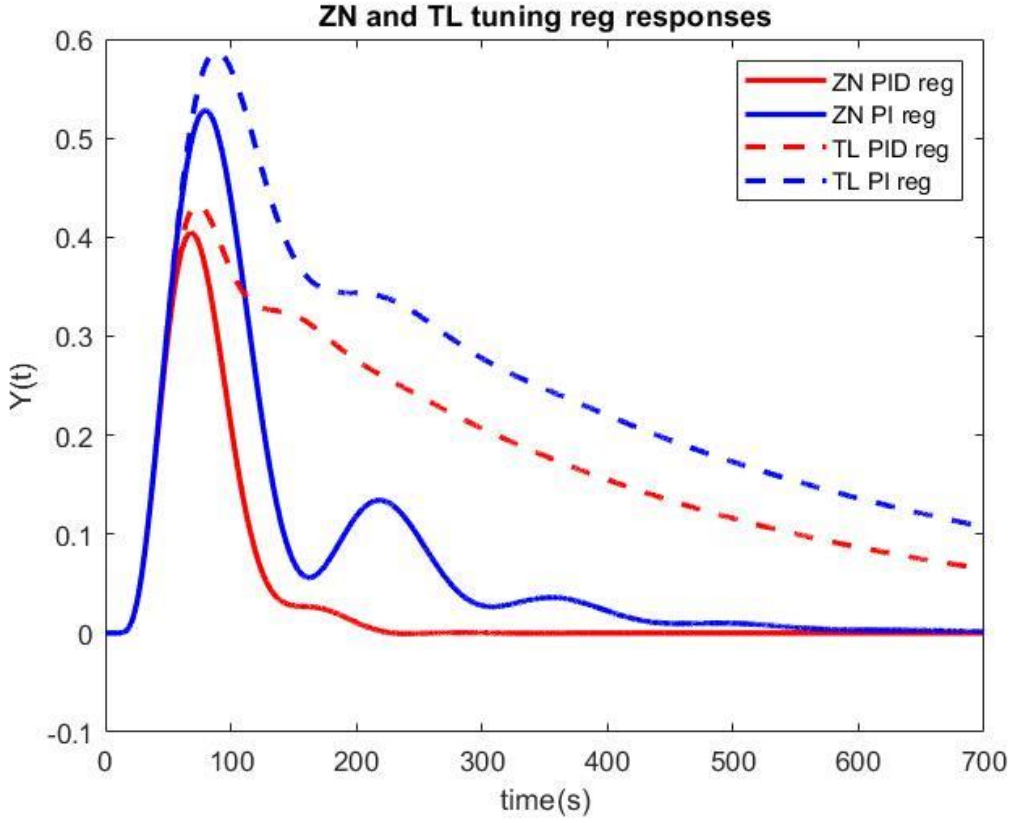
Servo Responses



Regulatory Input



Regulatory Response



Part 2
Anti-Reset Windup

Using the Ku and Pu obtained from **Relay Feedback Test.**

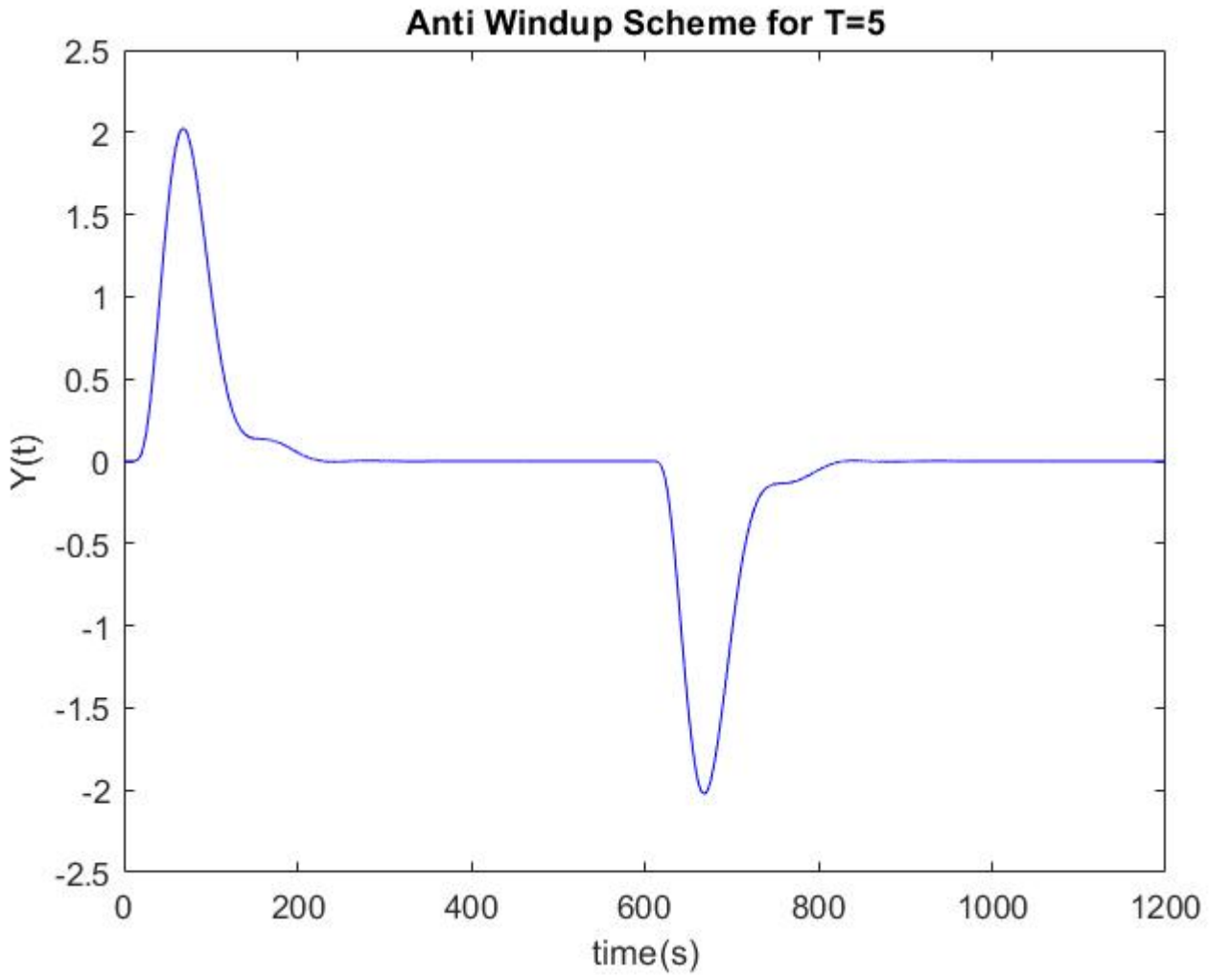
Ku = 3.4071

Pu = 106.2 sec

Operating under zeigler nicholas tuning for PID controller

PID	Ku/1.7	Pu/2	Pu/8
PID	2.00417	53.1	13.275

For small disturbance amplitude of T=5s:



At small disturbance amplitude such as T=5s

- Saturation is not achieved
- U remains equal to Uimp
- All the anti-reset windup schemes give the same output.

For large disturbance amplitude of T=12s: