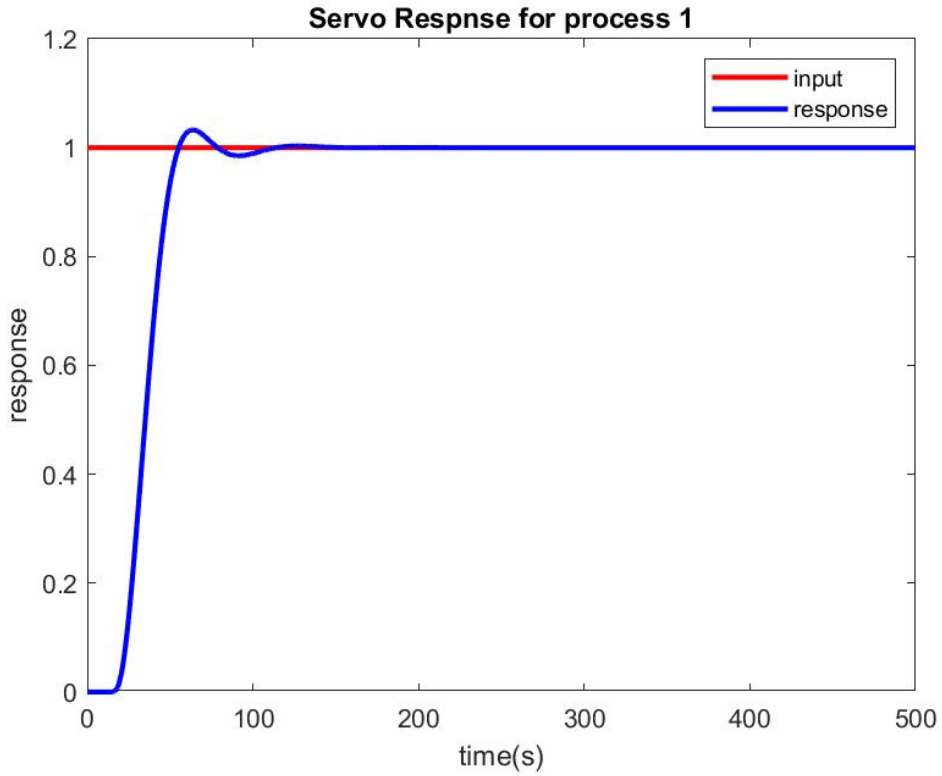
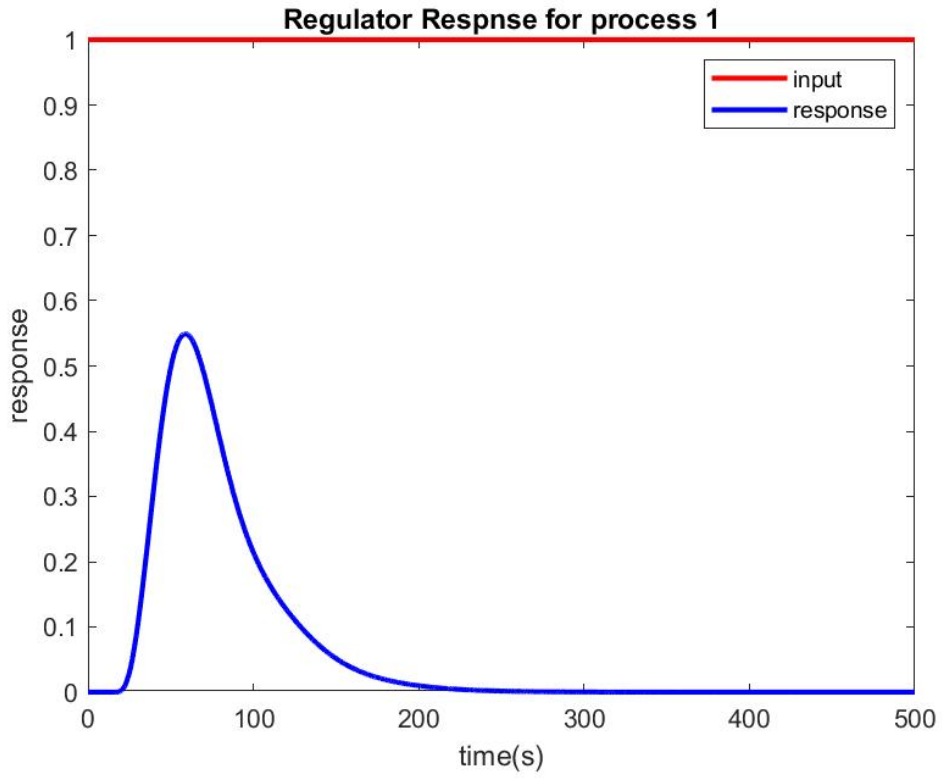
Lab Report7 (170747)

Tuning conventional PID controllers: -

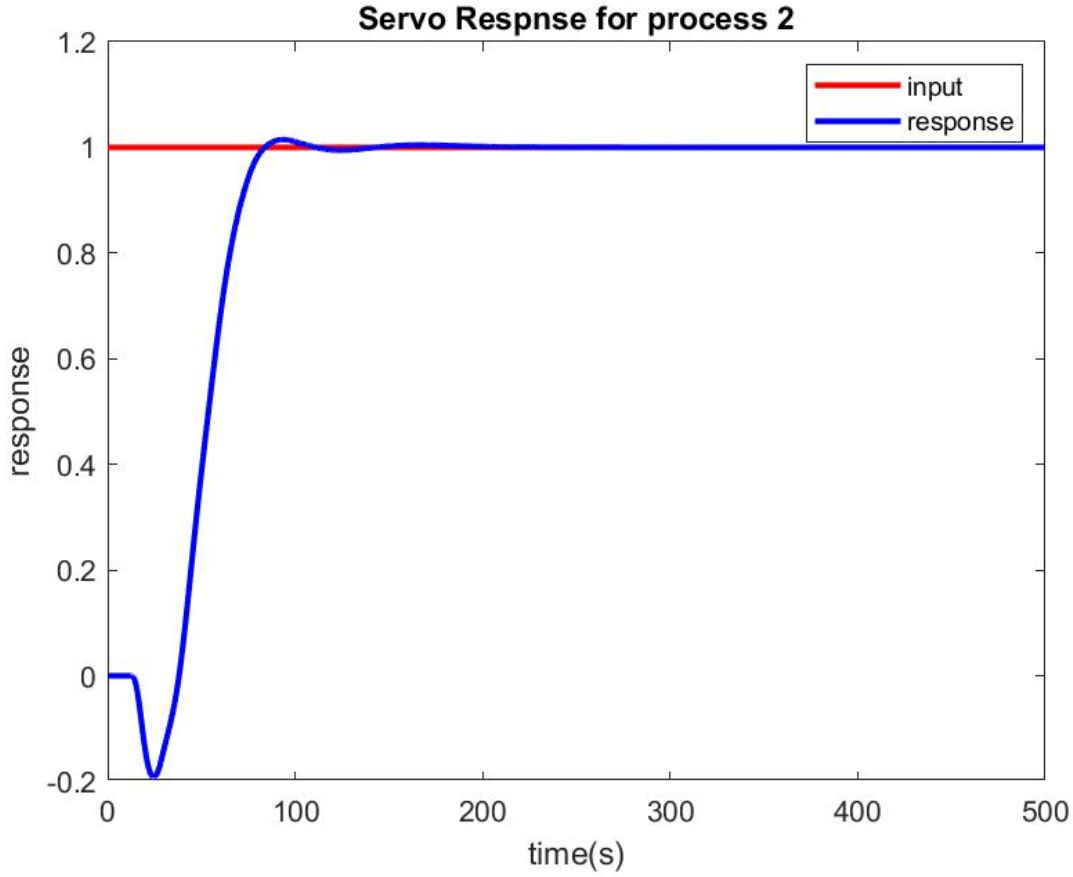
The tuning parameters are chosen for which ITAE is minimized using fmincon for the unit step servo response.

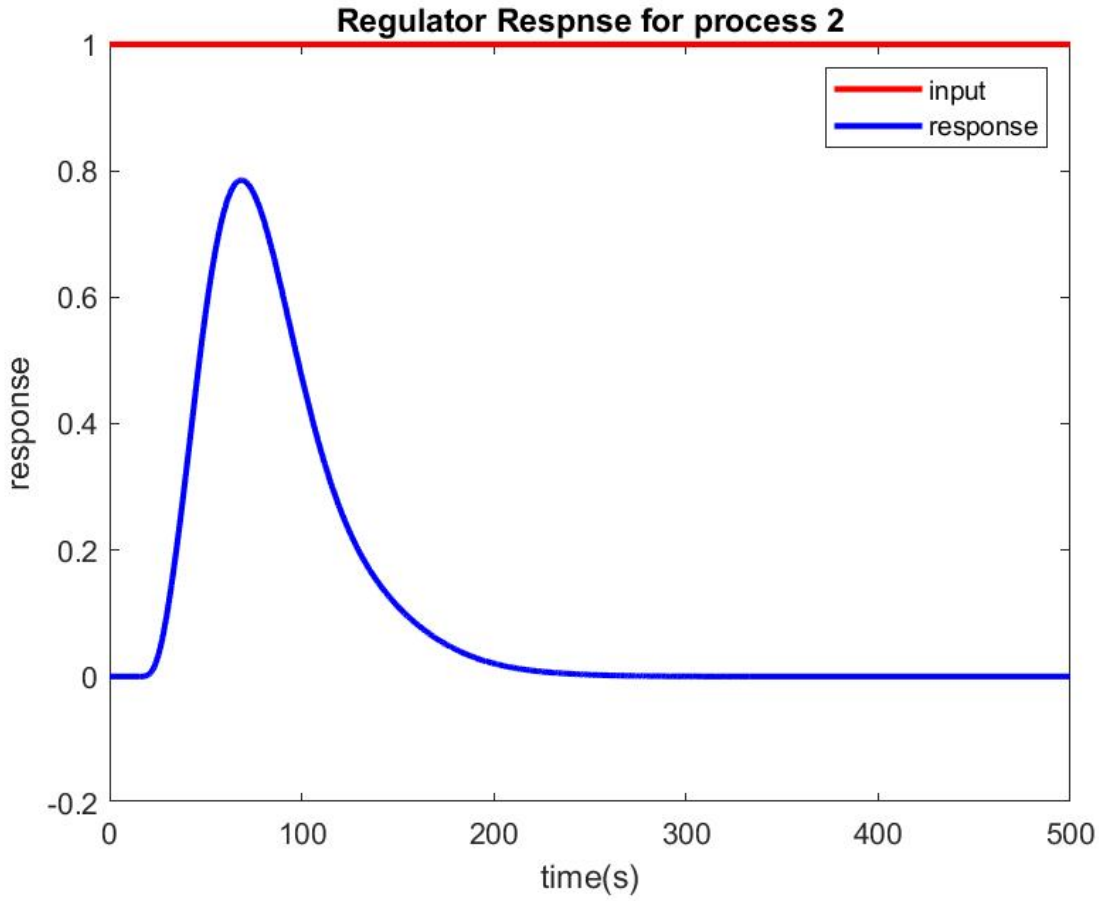
For process 1: Kc=0.40944 , Ti=28.6604s, Td=7.2797s





For process 2: Kc=0.49027, Ti= 28.186s, Td= 8.228s





Model Fitting

For process 1 the model fitted is a FODT model

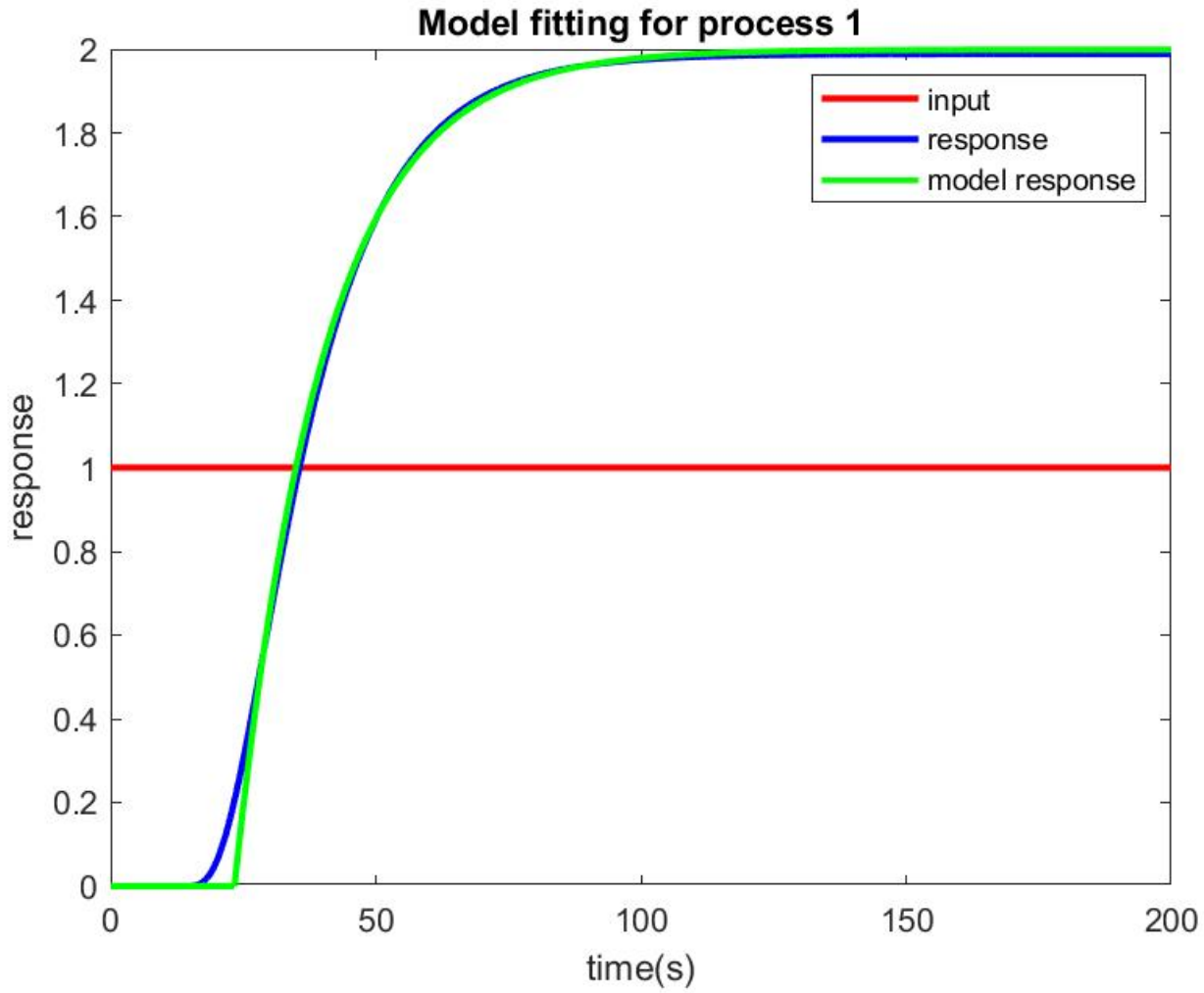
The parameters are obtained using minimizing the ITAE using fmincon

The parameters obtained are:-

Km= 1.9991

Tm= 16.6899 s

D= 23.3484 s



For process 2 the model fitted is:-

$$\frac{y}{u} = \frac{K(-as+1)e^{-Ds}}{(T_1 s+1)(T_2 s+1)}$$

The parameters are obtained using minimizing the ITAE using fmincon

The parameters obtained are:-

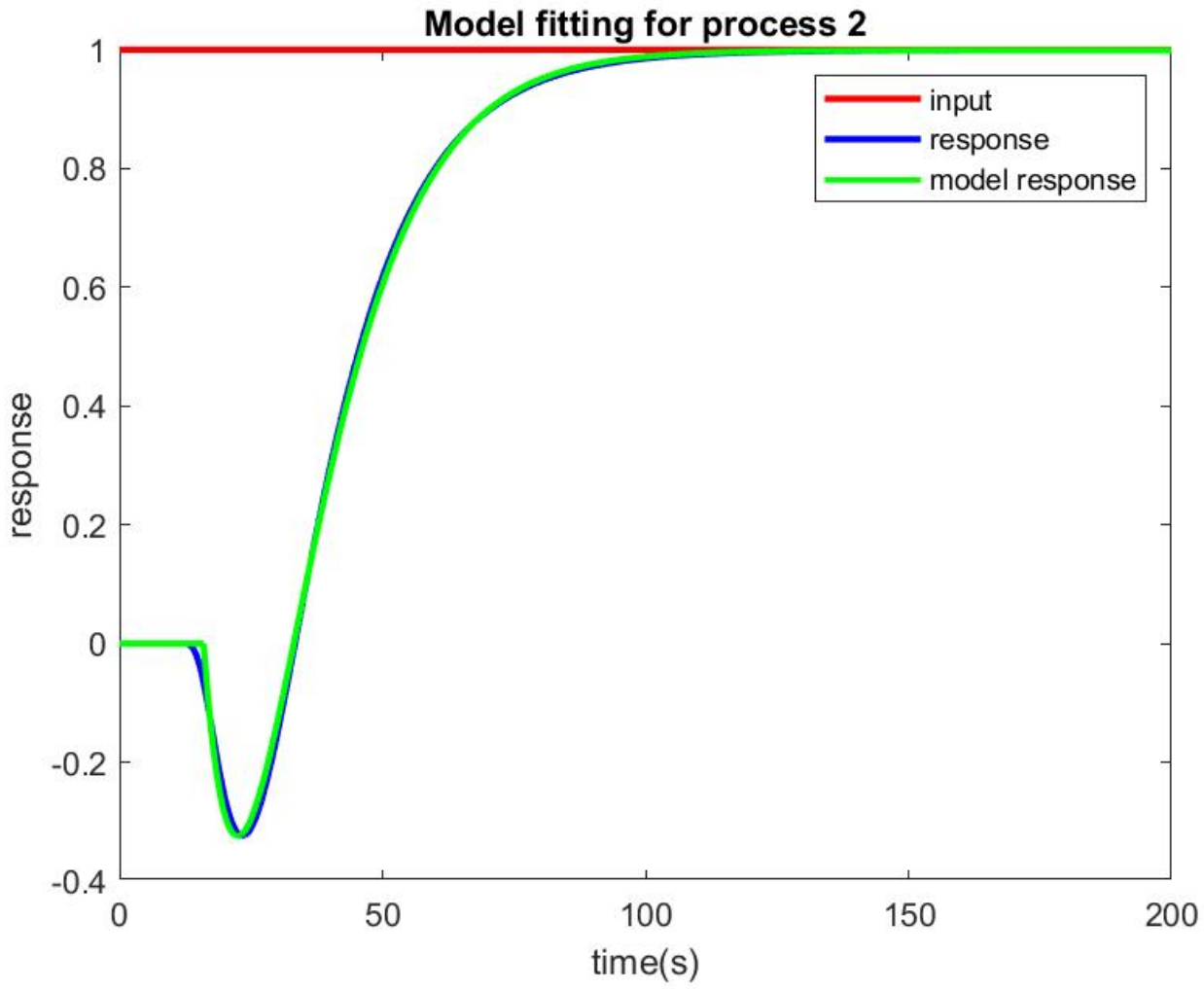
K= 0.9992

T1= 11.25 s

T2= 11.25 s

a = 15.25 s

D= 16 s



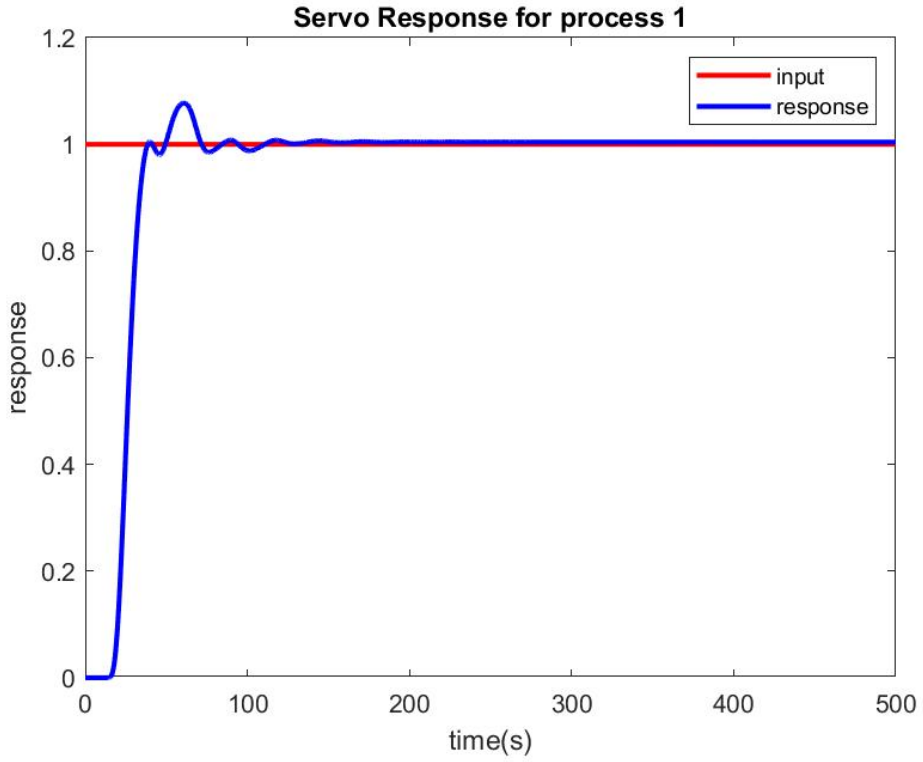
Smith Predictor

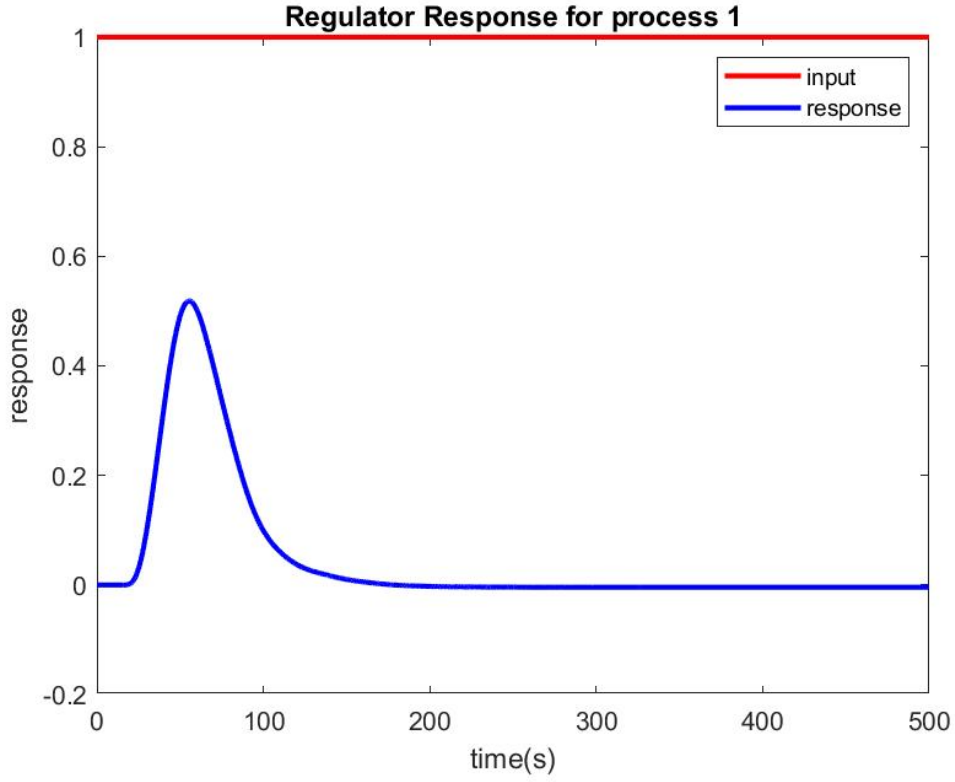
The controller used in smith predictor is PI

The PI controller in the Smith predictor is tuned to minimize the unit step servo response ITAE

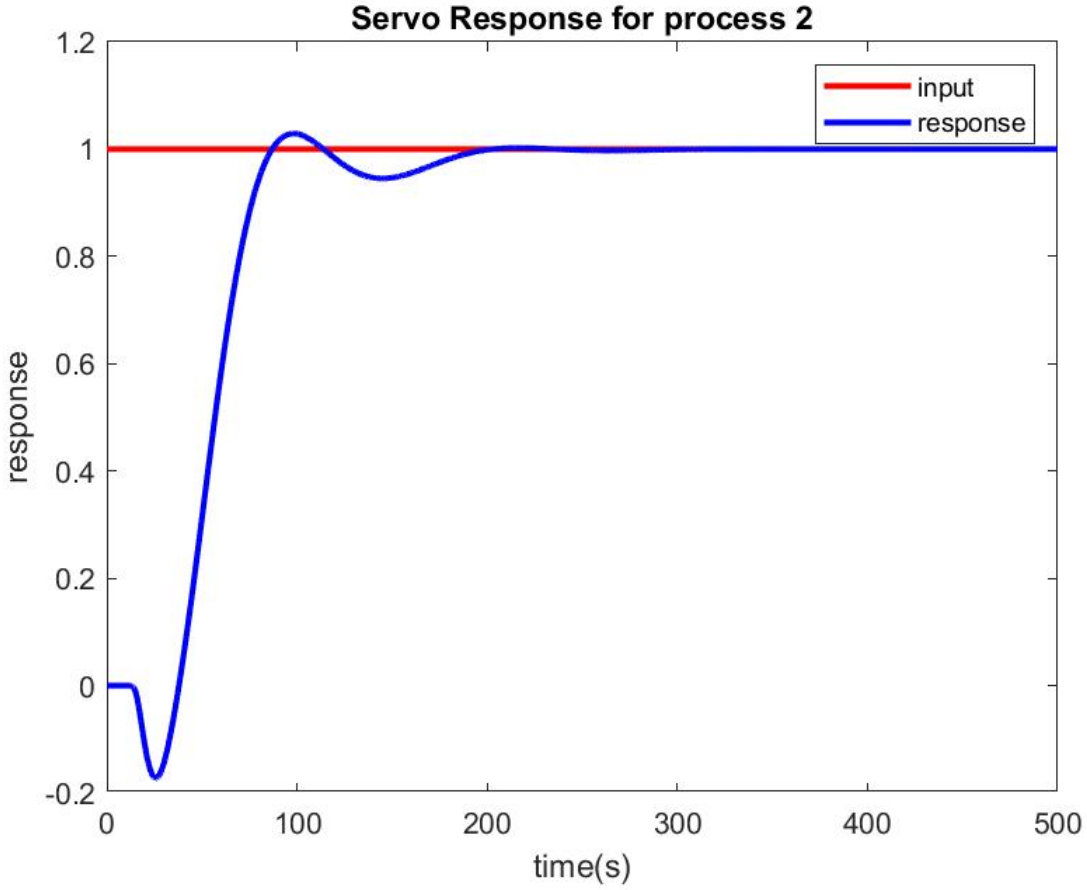
Thus, using fmincon the tunings are obtained

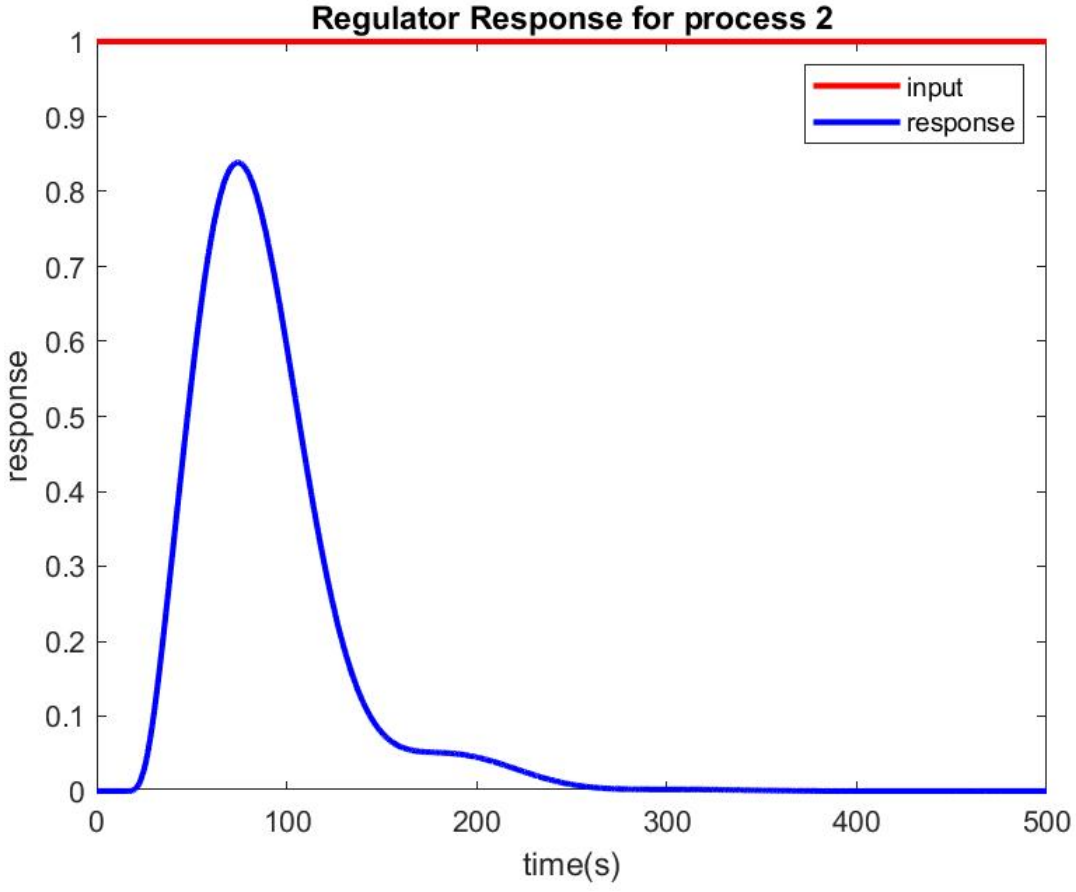
For process 1: Kc= 2.0000 Ti=10.3560s



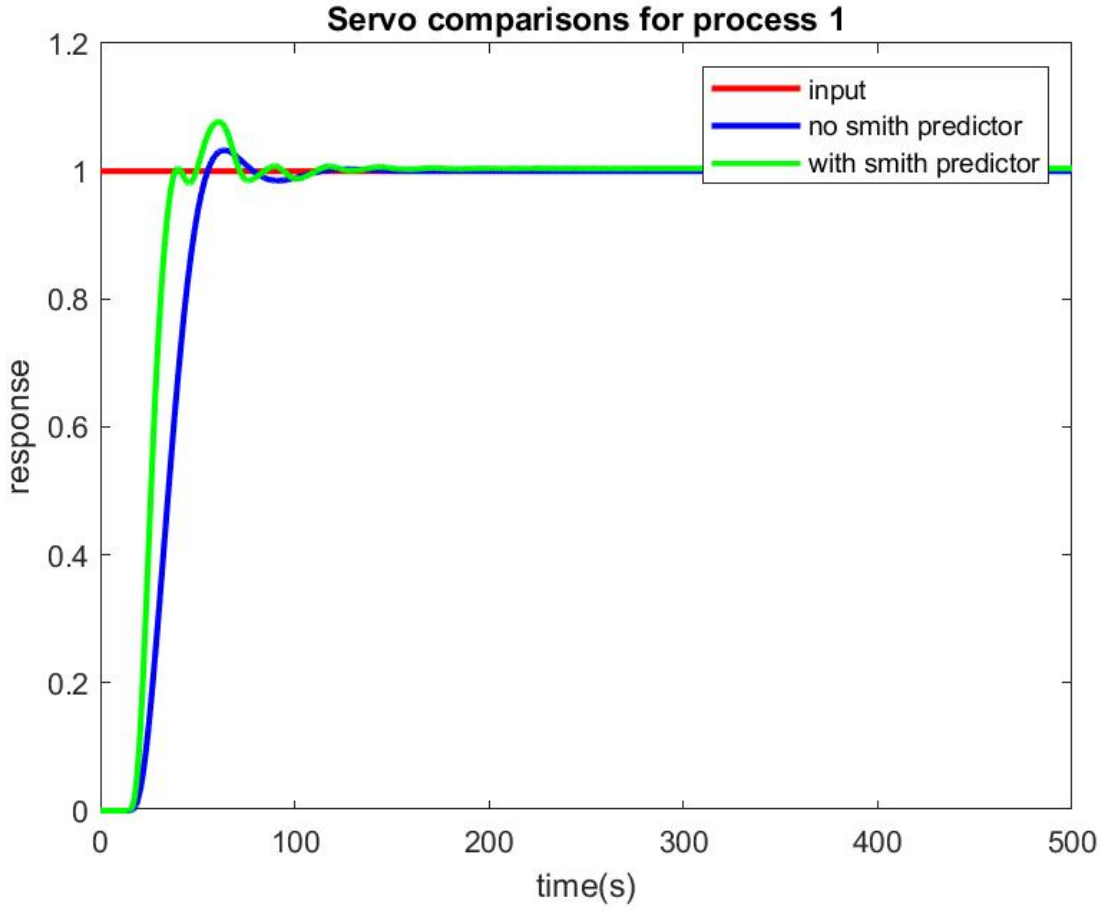


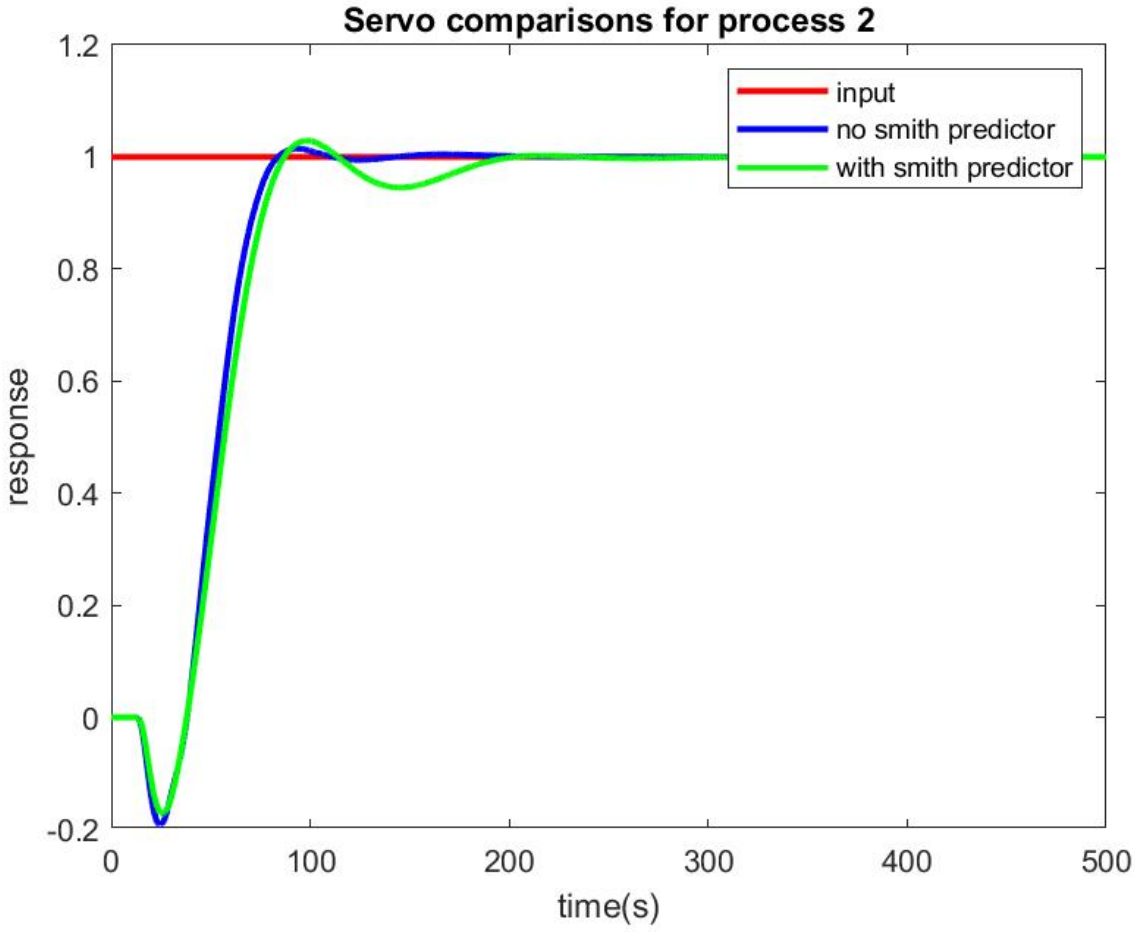
For process 2: Kc=0.3505 Ti=16.3966s



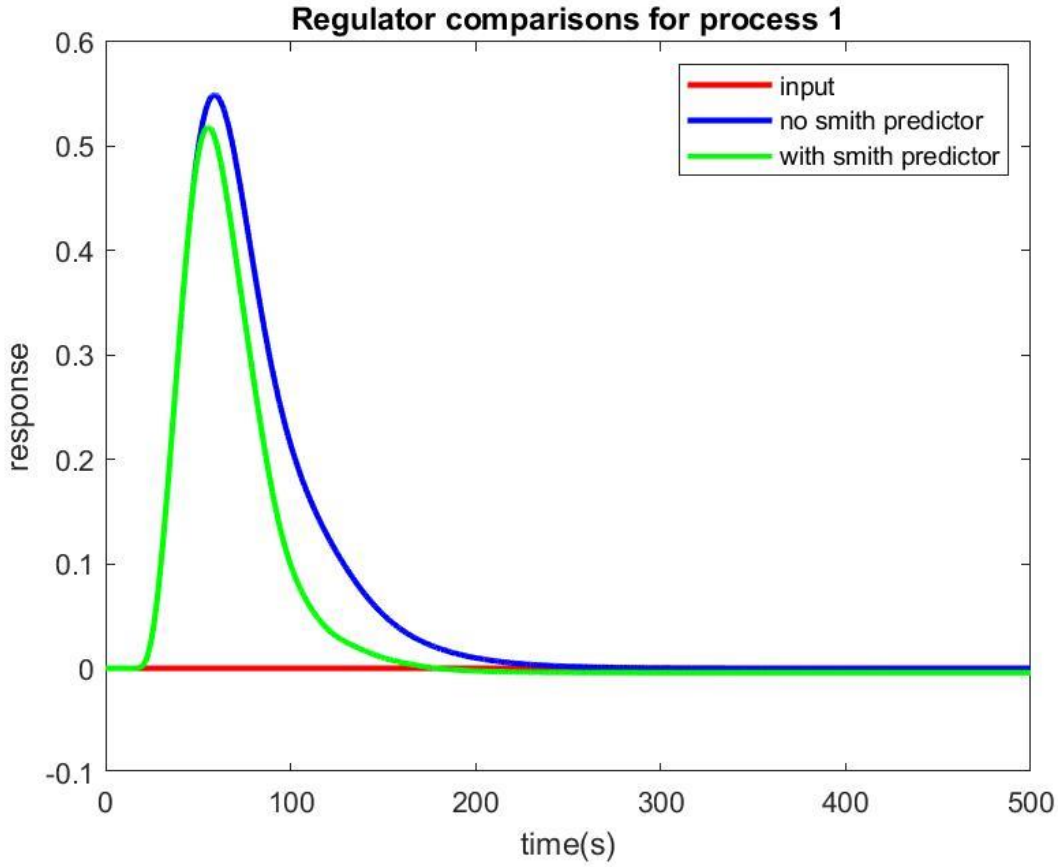


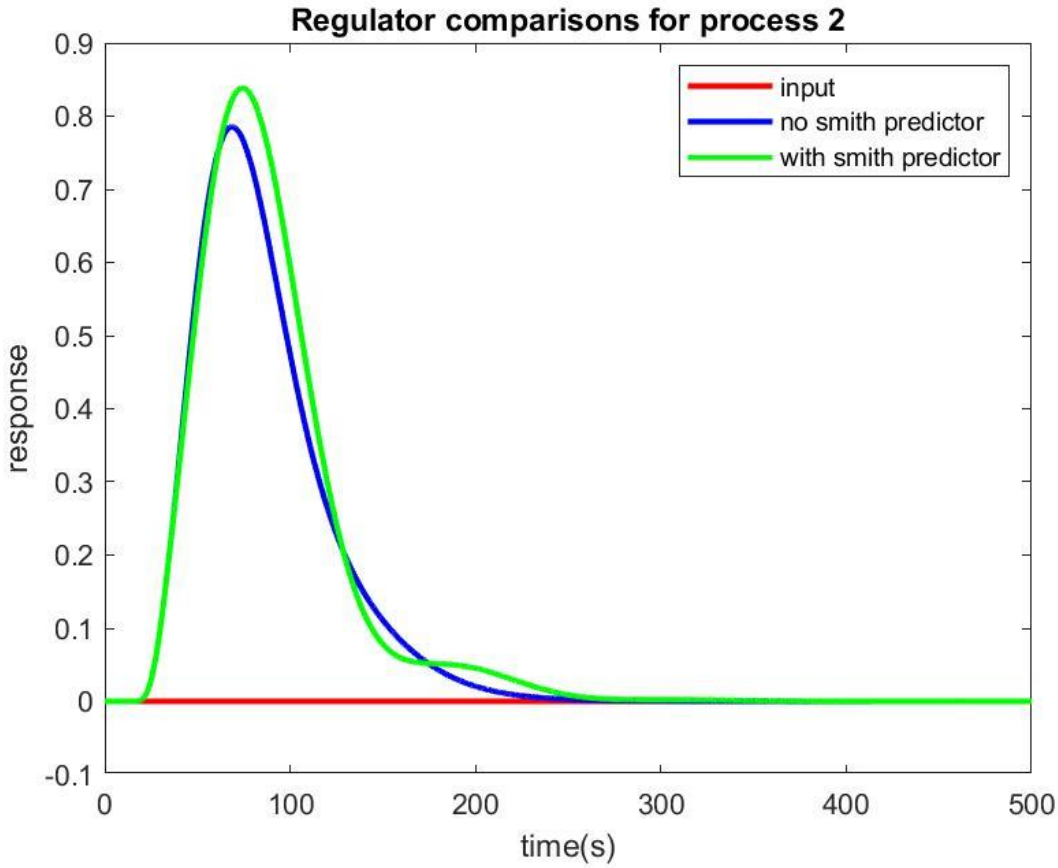
Servo comparisons





Regulator comparisons





Conclusion:- Smith predictor gives tighter control in process 1 but does not provide tighter control in process 2 because of inverse response