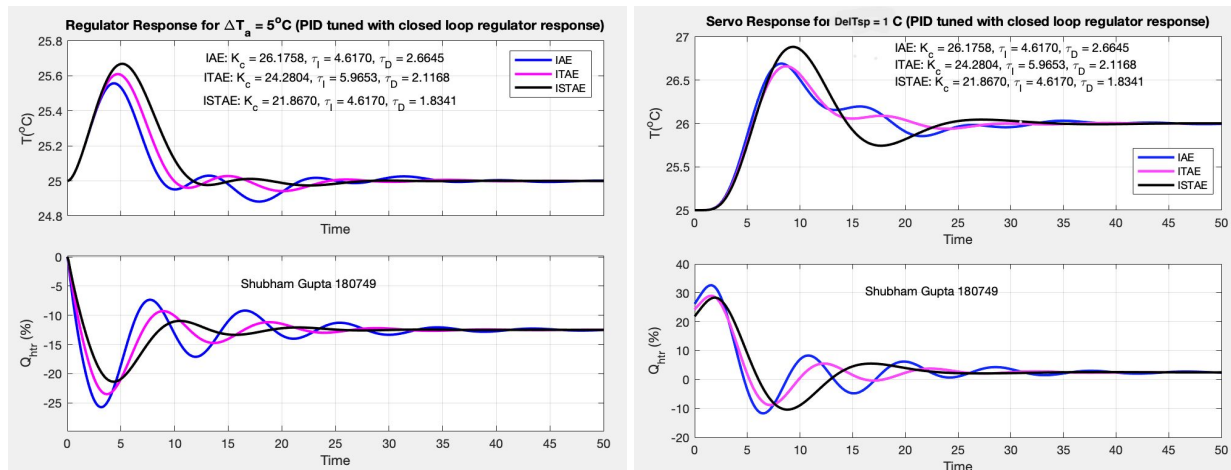


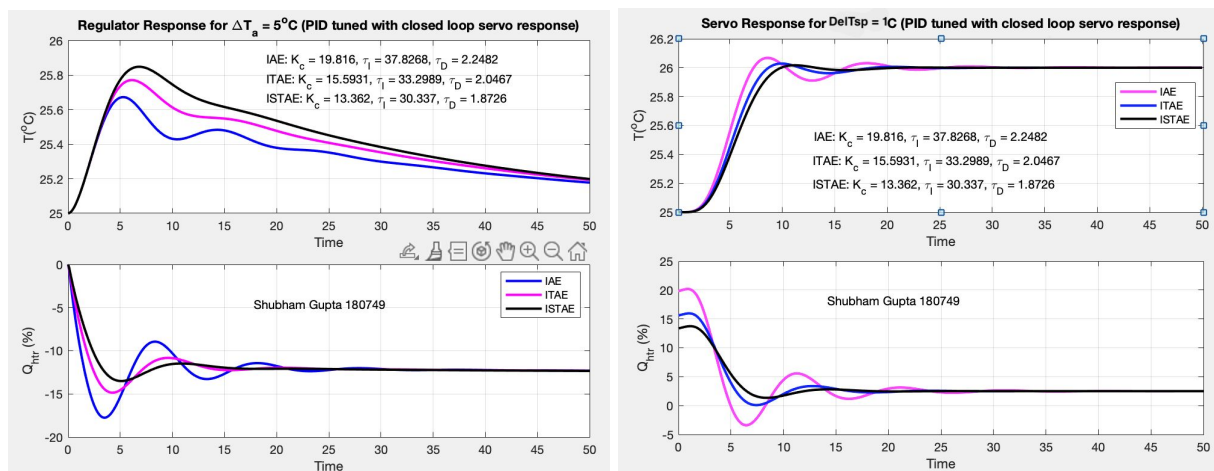
PID control tuned with closed-loop Regulator Response

- I ran fmincon with regulator response setting for PID control and obtained these graphs.



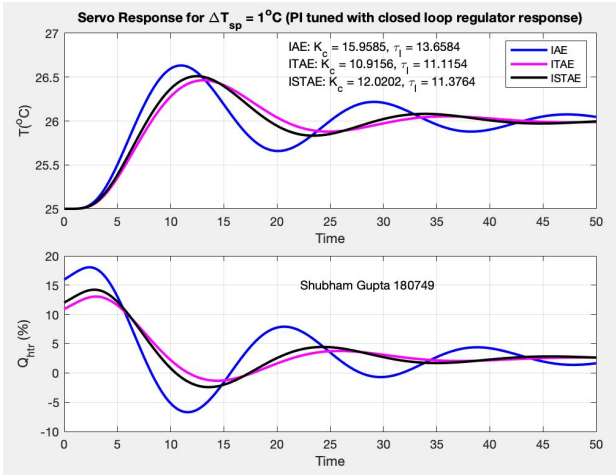
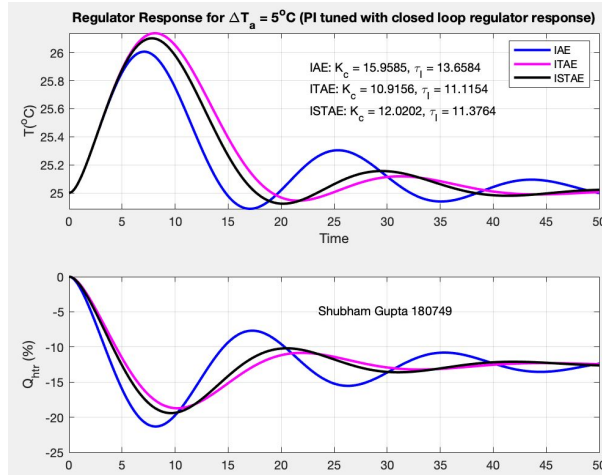
PID control tuned with closed-loop Servo Response

- I ran fmincon with servo response setting for PID control and obtained these graphs.



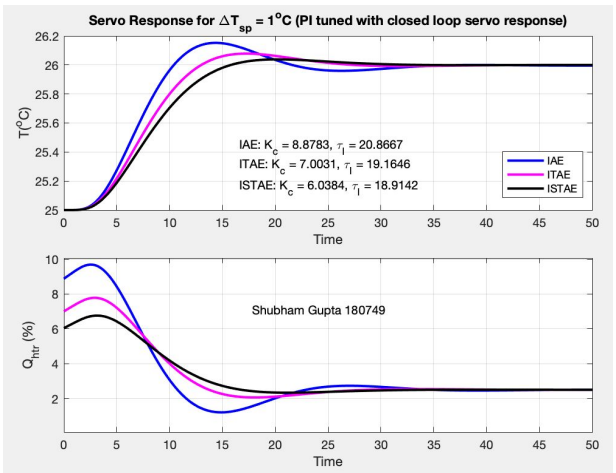
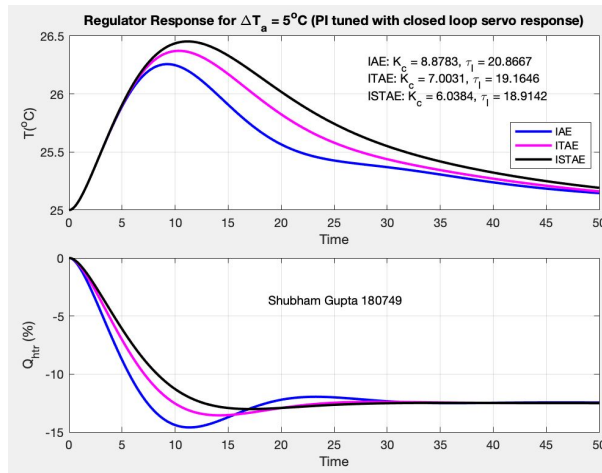
PI control tuned with closed-loop Regulator Response

- I ran fmincon with regulator response setting for PI control and obtained these graphs.



PI control tuned with closed-loop Servo Response

- I ran fmincon with servo response setting for PI control and obtained these graphs.



IAE: Integral Absolute Error

ITAE: Integral Time Absolute Error

ISTAE: Integral Square Time Absolute Error

Conclusion

- We used fmincon to optimise our absolute error to obtain optimum K_c , τ_i , and τ_d values which we did manually in lab 1. We used 3 functions for this; IAE, ITAE, ISTAE.
- PID optimization worked better than PI optimisation as it reached equilibrium faster with fewer oscillations.
- Comparing IAE, ITAE, ISTAE, we see that ISTAE and ITAE outperform IAE and the two give us almost similar results with little deviations.