Shubham Gupta   CHE381 Lab:4
180749

Our aim is to implement Shinskey's PID_θ controller and Seborg's PID_β for the room temperature control example.

We will tune PI_θ and PID_θ controllers to minimize the IAE using fmincon for the regulator response and tune a PI_β and PID_β controller for the regulator response using fmincon to minimize IAE. Later, we will also obtain and compare servo and regulator responses for the optimized tuning with corresponding PID and PI controllers.
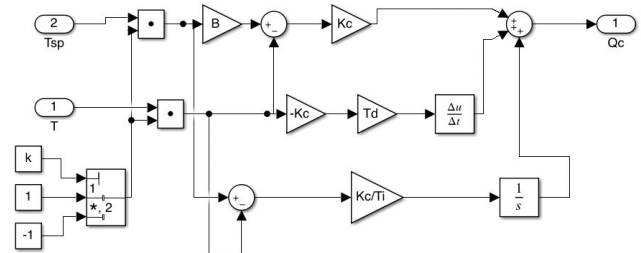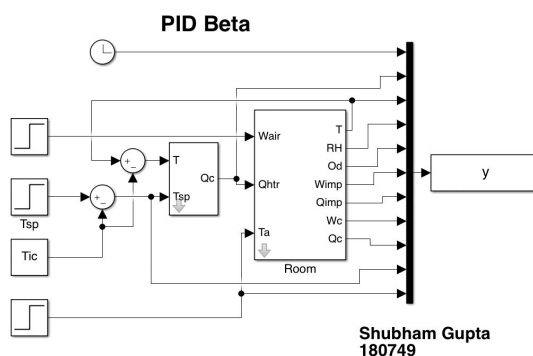
Initial Parameters

Q_{ic} = 50, RH_{ic} = 30, T_{ic} = 250C, W_{ic} = 0
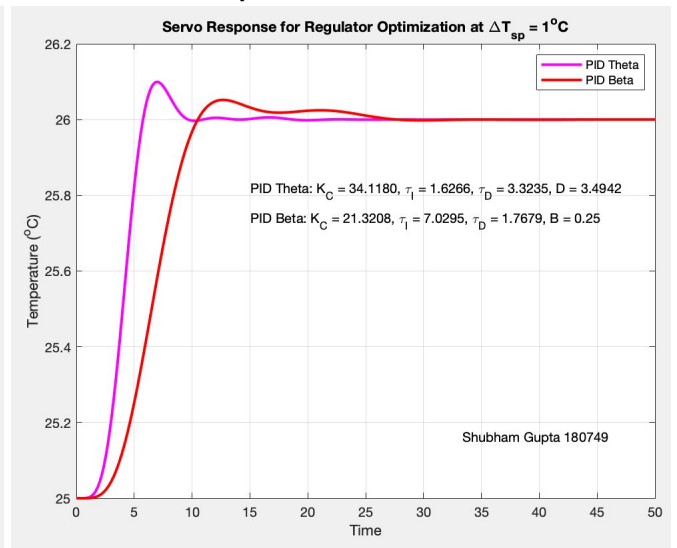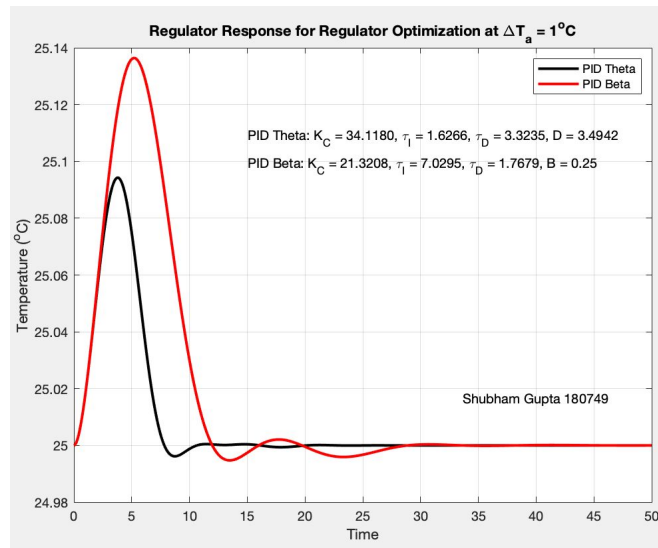K_c = 10, t_I = 10, t_D = 1, D = 0.5, B = 0.25
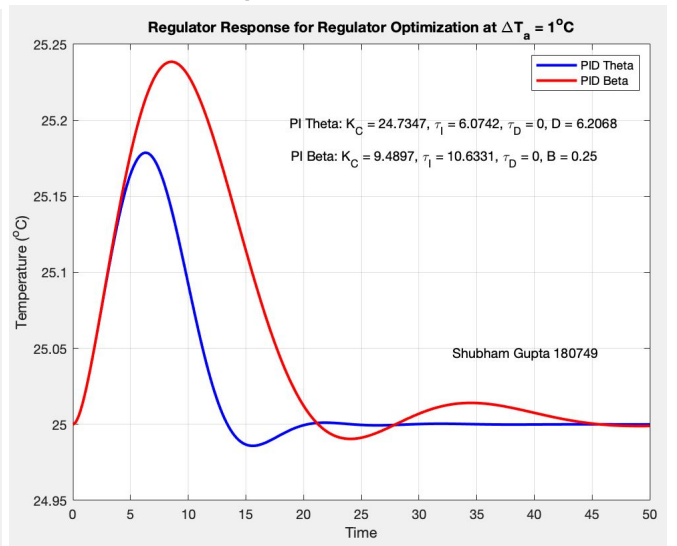
Circuits

- ## Shinskey's controller
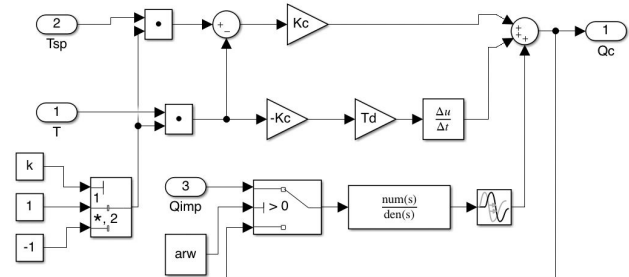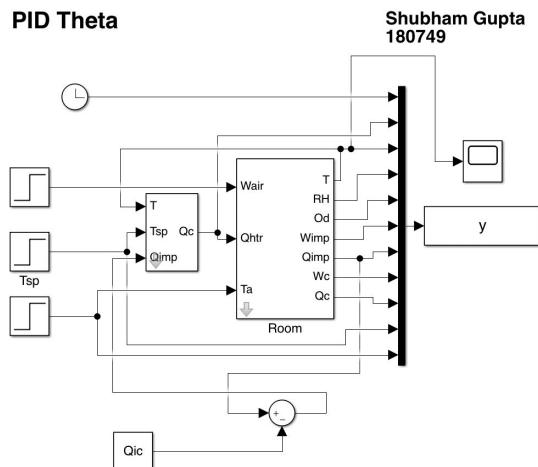
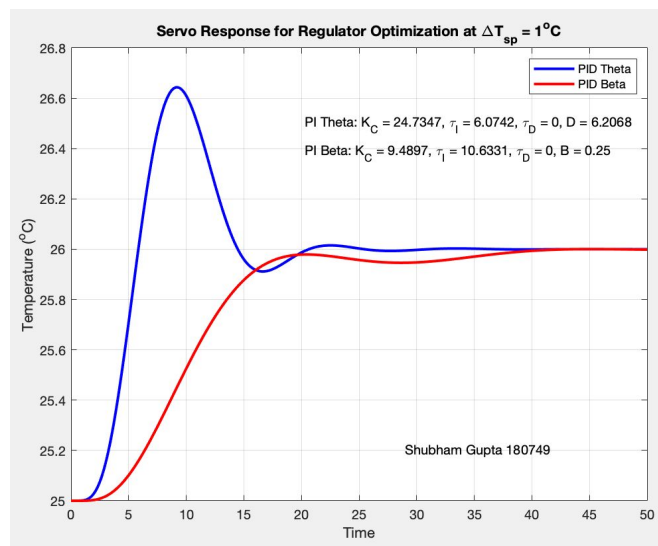- ## Seborg's controller

Regulator & Servo Responses for PID$_\theta$ & PID$_\beta$

Regulator Response for Regulator Optimization at $\Delta T_a = 1^o C$

PID Theta: $K_C = 34.1180$, $\tau_I = 1.6266$, $\tau_D = 3.3235$, $D = 3.4942$

PID Beta: $K_C = 21.3208$, $\tau_I = 7.0295$, $\tau_D = 1.7679$, $B = 0.25$

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Servo Response for Regulator Optimization at $\Delta T_{sp} = 1^o C$

PID Theta: $K_C = 34.1180$, $\tau_I = 1.6266$, $\tau_D = 3.3235$, $D = 3.4942$

PID Beta: $K_C = 21.3208$, $\tau_I = 7.0295$, $\tau_D = 1.7679$, $B = 0.25$

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Regulator & Servo Responses for PID$_\theta$ & PID$_\beta$

Servo Response for Regulator Optimization at $\Delta T_{sp} = 1^o C$

PI Theta: $K_C = 24.7347$, $\tau_I = 6.0742$, $\tau_D = 0$, $D = 6.2068$

PI Beta: $K_C = 9.4897$, $\tau_I = 10.6331$, $\tau_D = 0$, $B = 0.25$

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Regulator Response for Regulator Optimization at $\Delta T_a = 1^o C$

PI Theta: $K_C = 24.7347$, $\tau_I = 6.0742$, $\tau_D = 0$, $D = 6.2068$

PI Beta: $K_C = 9.4897$, $\tau_I = 10.6331$, $\tau_D = 0$, $B = 0.25$

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PID$_\theta$ and PID$_\beta$ Servo Response for different values of B(0.3,0.6,0.9)

Servo Response for Beta response with Regulator Optimization at $\Delta T_{sp} = 1^o C$

$K_C = 21.3208$, $\tau_I = 7.0295$, $\tau_D = 1.7679$

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