Lab Report 3(170747)

Using Fmincon, we minimized IAE to obtain the optimized controller parameters for regulator response: -

- Filter time
- Controller Gain
- Reset Time
- Derivative time
- Dead time

for **PI, PID and PID + dead time**

$$IAE_t = \int_0^t |y - y_\infty| d\tau$$

The optimized tuning parameters obtained are: -

For PID +dead time

Initial guess=> x_0=[5.0000 2.0765 53.0000 13.2500 10.0000]

x_{opt} = [0.1007 3.8702 9.7942 25.9047 32.9904] PID + dead time

Jopt = IAE_{min} = 12.4766

For PID

Initial guess=> x_0=[5.0000 2.0765 53.0000 13.2500 0.1]

x_{opt} = [0.1122 1.4822 32.9099 23.7210 0.1] PID

Jopt = IAE_{min} = 24.4546

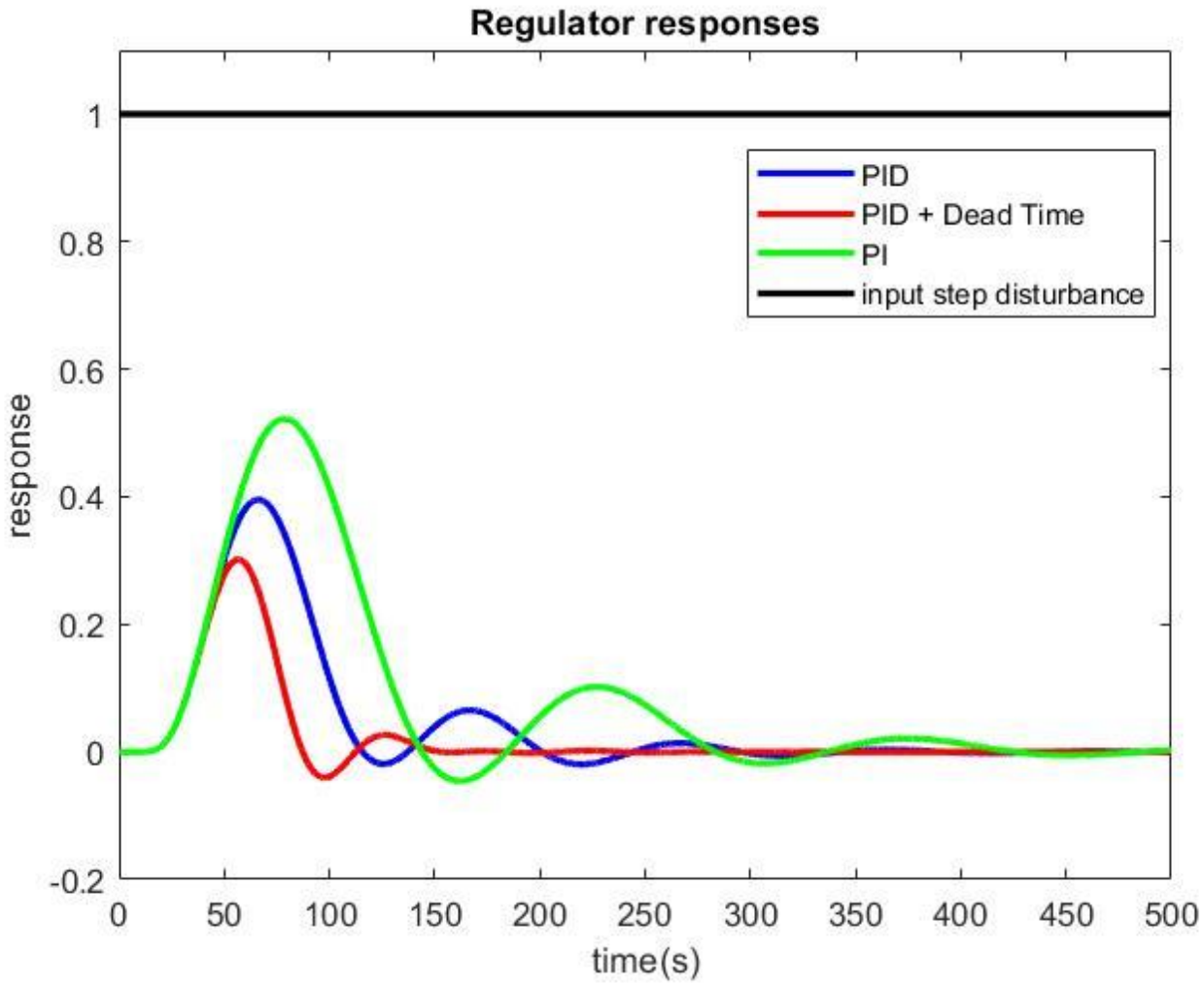
For PI

Initial guess=> x_0=[5.0000 2.0765 53.0000 0 0.1]

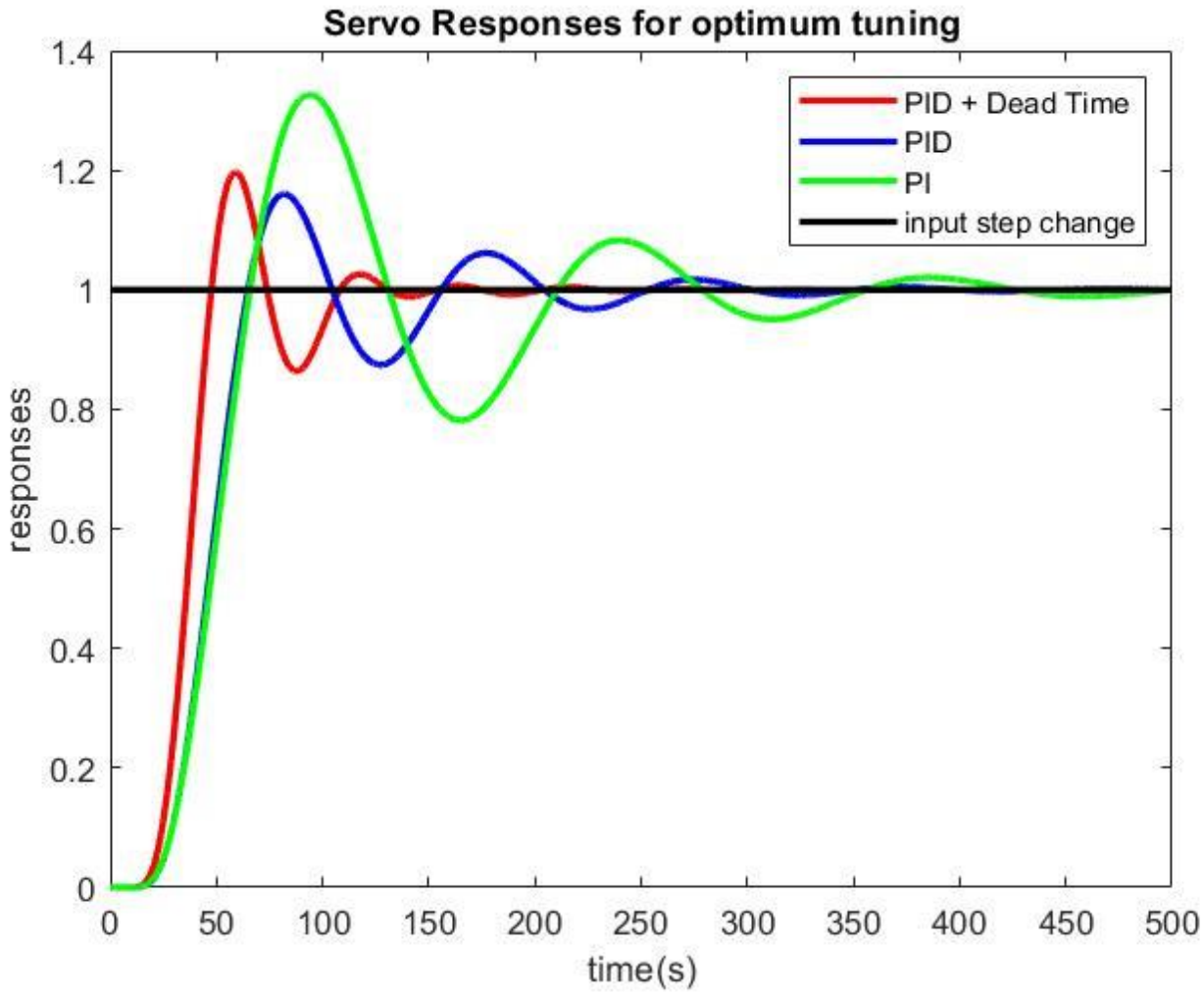
x_{opt} = [0.1000 1.5738 64.3363 0 0.1] PI

Jopt = IAE_{min} = 44.8676

The regulator responses obtained are: -



Using the same tuning parameters Servo responses are plotted



As we can see that PID + dead time gives us a very tight control over the response curve in comparison to PI and PID controllers