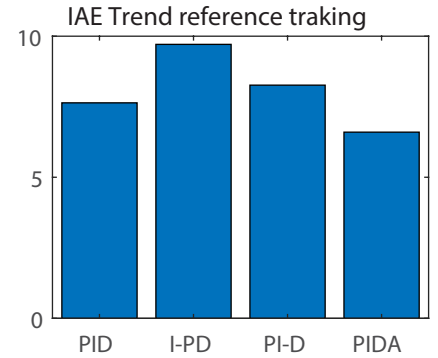
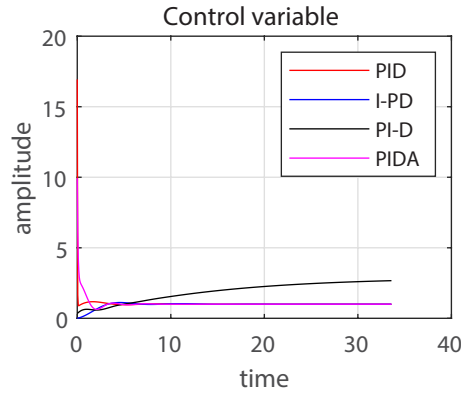
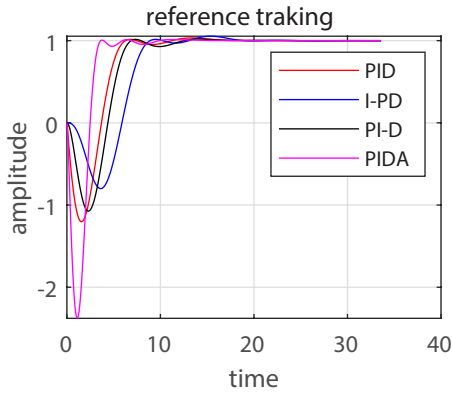


# Right Half Plane Zero

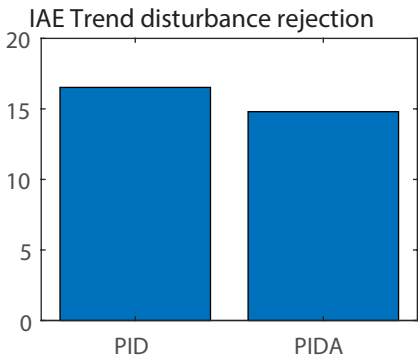
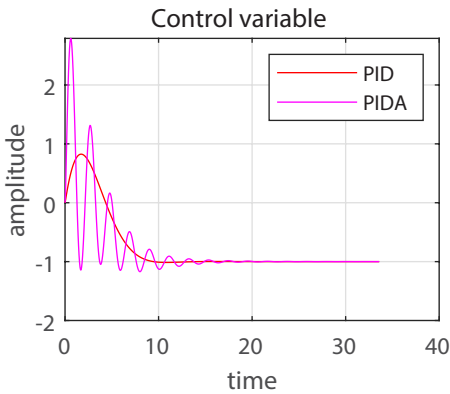
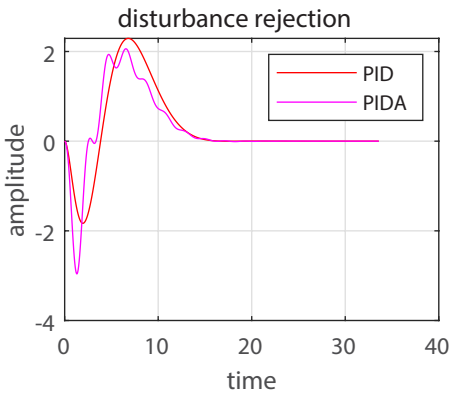
$$G(s) = \frac{1 - 5s}{(s + 1)^3}$$

## Set Point Optimization



|                              | Controllers  |  |  |  |
|------------------------------|--|--|--|--|
| Parameters                   | PID  | I-PD   | PI-D   | PIDA   |
| Controller Transfer Function | $C(s) = \frac{0.8252 s^2 + 0.9543 s + 0.3589}{0.04872 s^2 + 2.64 s}$ | $C_1(s) = \frac{0.1502}{s}$<br>$C_2(s) = \frac{0.3621 s + 0.398}{0.01808 s + 1.0}$ | $C_1(s) = 0.3471$<br>$C_2(s) = \frac{0.1234}{s}$<br>$C_3(s) = \frac{0.3034 s}{0.0128 s + 1.0}$ | $C(s) = \frac{0.4214 s^4 + 1.451 s^3 + 2.317 s^2 + 1.63 s + 0.4415}{0.04242 s^4 + 0.5689 s^3 + 2.367 s^2 + 2.865 s}$ |
| IAE                          | 7,637903378  | 9,710111136  | 8,264793365  | 6,598731751  |
| $K_p$                        | 0,358929536  | 0,398003957  | 0,347137994  | 0,441499978  |
| $T_i$                        | 2,640308828  | 2,649065642  | 2,812369788  | 2,864509727  |
| $T_d$                        | 0,85228221   | 0,891769444  | 0,873894454  | 0,936622689  |
| $T_a$                        |  |  |  | 0,611884287  |
| $N$                          | 46,18846196  | 49,32124623  | 68,25409491  | 1,983096926  |
| $\alpha$                     |  |  |  | 3,455715048  |
| Phase margin                 | 44.0311  | -30.8708 ?<br>Stable = 1   | 47.5696  | 38.0803  |
| Gain Margin                  | 1.3763   | 1.5376   | 1.4167   | 1.2328   |

# Disturbance Rejection Optimization



|                              | Controllers  |   |
|------------------------------|--|---|
| Parameters                   | PID  | PIDA  |
| Controller Transfer Function | $C(s) = \frac{0.5376 s^2 + 0.7939 s + 0.31}{0.02884 s^2 + 2.55 s}$ | $C(s) = \frac{0.1559 s^4 + 0.9247 s^3 + 1.525 s^2 + 1.267 s + 0.39}{0.003719 s^4 + 0.1124 s^3 + 1.055 s^2 + 2.884 s}$ |
| IAE                          | 16,52418459  | 14,8037091  |
| $K_p$                        | 0,309964402  | 0,389991238   |
| $T_i$                        | 2,549842291  | 2,883683992   |
| $T_d$                        | 0,668850105  | 0,976894256   |
| $T_a$                        |  | 0,629224143   |
| $N$                          | 59,13896184  | 4,682334801   |
| $\alpha$                     |  | 8,003455718   |
| Phase margin                 | 48.5309  | 46.5306   |
| Gain Margin                  | 1.5733   | 1.0796  |



