

Continuous transfer function
System:

ans =

$$\frac{9.8 s^2 - 4.9 s + 61.4}{s^4 + 0.44 s^3 - 0.007 s^2 + 0.11 s}$$

Continuous-time transfer function.

Compensator:

ans =

$$\frac{1.93 s^3 + 1.72 s^2 + 0.43 s + 0.11}{s^4 + 9.76 s^3 + 40.9 s^2 + 76.6 s + 136}$$

Continuous-time transfer function.

Closed Loop:

ans =

$$\frac{9.8 s^6 + 90.75 s^5 + 414.4 s^4 + 1150 s^3 + 3469 s^2 + 4037 s + 8350}{s^8 + 10.2 s^7 + 45.19 s^6 + 113.6 s^5 + 177.9 s^4 + 178.1 s^3 + 112.1 s^2 + 40.82 s + 6.754}$$

Continuous-time transfer function.

Tustin discretization
System:

ans =

$$\frac{0.003857 z^4 - 3.876e-05 z^3 - 0.007713 z^2 + 0.0001167 z + 0.003934}{z^4 - 3.983 z^3 + 5.948 z^2 - 3.948 z + 0.9826}$$

Sample time: 0.04 seconds
Discrete-time transfer function.

Compensator:

ans =

$$0.03241 z^4 - 0.06368 z^3 - 0.001135 z^2 + 0.06368 z - 0.03128$$

$$z^4 - 3.621 z^3 + 4.923 z^2 - 2.979 z + 0.6769$$

Sample time: 0.04 seconds

Discrete-time transfer function.

Closed Loop:

ans =

$$\begin{aligned} &0.003857 z^8 - 0.014 z^7 + 0.01141 z^6 + 0.01637 z^5 - 0.03173 z^4 + 0.009278 z^3 + \\ &0.0138 z^2 - 0.01164 z + 0.002663 \end{aligned}$$

$$\begin{aligned} &z^8 - 7.604 z^7 + 25.29 z^6 - 48.07 z^5 + 57.1 z^4 - 43.4 z^3 + 20.62 z^2 \\ &- 5.599 z + 0.665 \end{aligned}$$

Sample time: 0.04 seconds

Discrete-time transfer function.

Tustin discretization with delay

System:

ans =

$$\begin{aligned} &0.003857 z^4 - 3.876e-05 z^3 - 0.007713 z^2 + 0.0001167 z + 0.003934 \\ &z^5 + z^4 - 3.983 z^3 + 5.948 z^2 - 3.948 z + 0.9826 \end{aligned}$$

Sample time: 0.04 seconds

Discrete-time transfer function.

Compensator:

ans =

$$\begin{aligned} &0.03241 z^4 - 0.06368 z^3 - 0.001135 z^2 + 0.06368 z - 0.03128 \\ &z^5 + z^4 - 3.621 z^3 + 4.923 z^2 - 2.979 z + 0.6769 \end{aligned}$$

Sample time: 0.04 seconds

Discrete-time transfer function.

Closed Loop:

ans =

$$\begin{aligned} &0.003857 z^9 + 0.003818 z^8 - 0.02172 z^7 + 0.01153 z^6 + 0.0203 z^5 - 0.03173 z^4 + \\ &0.009278 z^3 + 0.0138 z^2 \end{aligned}$$



- 0.01164 z + 0.002663



$z^9 - 2.982 z^8 - 1.656 z^7 + 21.34 z^6 - 47.08 z^5 + 57.1 z^4 - 43.4 z^3 + 20.62 z^2 - 5.599 z + 0.665$

Sample time: 0.04 seconds
Discrete-time transfer function.

Halijak discretization
System:

ans =

$$\frac{0.01556 z^3 - 0.03128 z^2 + 0.01588 z}{1.018 z^4 - 4.053 z^3 + 6.053 z^2 - 4.018 z + 1}$$

Sample time: 0.04 seconds
Discrete-time transfer function.

Compensator:

ans =

$$\frac{0.0772 z^4 - 0.2288 z^3 + 0.2261 z^2 - 0.07446 z}{1.39 z^4 - 5.103 z^3 + 7.04 z^2 - 4.327 z + 1}$$

Sample time: 0.04 seconds
Discrete-time transfer function.

Closed Loop:

ans =

$$\frac{0.02164 z^7 - 0.1229 z^6 + 0.2913 z^5 - 0.3686 z^4 + 0.2627 z^3 - 0.09998 z^2 + 0.01588 z}{1.415 z^8 - 10.83 z^7 + 36.26 z^6 - 69.4 z^5 + 83.05 z^4 - 63.63 z^3 + 30.48 z^2 - 8.345 z + 1}$$



$$\frac{0.02164 z^7 - 0.1229 z^6 + 0.2913 z^5 - 0.3686 z^4 + 0.2627 z^3 - 0.09998 z^2 + 0.01588 z}{1.415 z^8 - 10.83 z^7 + 36.26 z^6 - 69.4 z^5 + 83.05 z^4 - 63.63 z^3 + 30.48 z^2 - 8.345 z + 1}$$

Sample time: 0.04 seconds

Discrete-time transfer function.

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