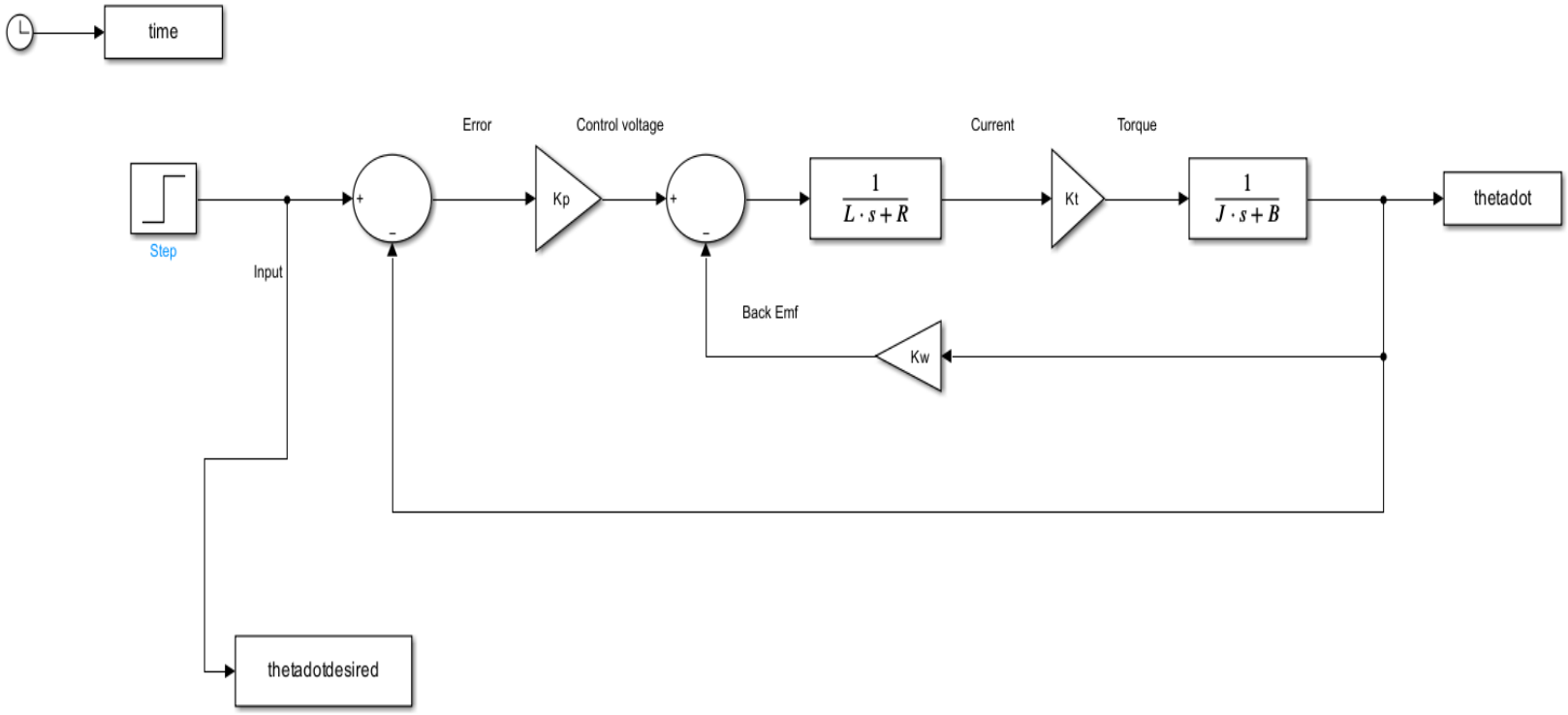
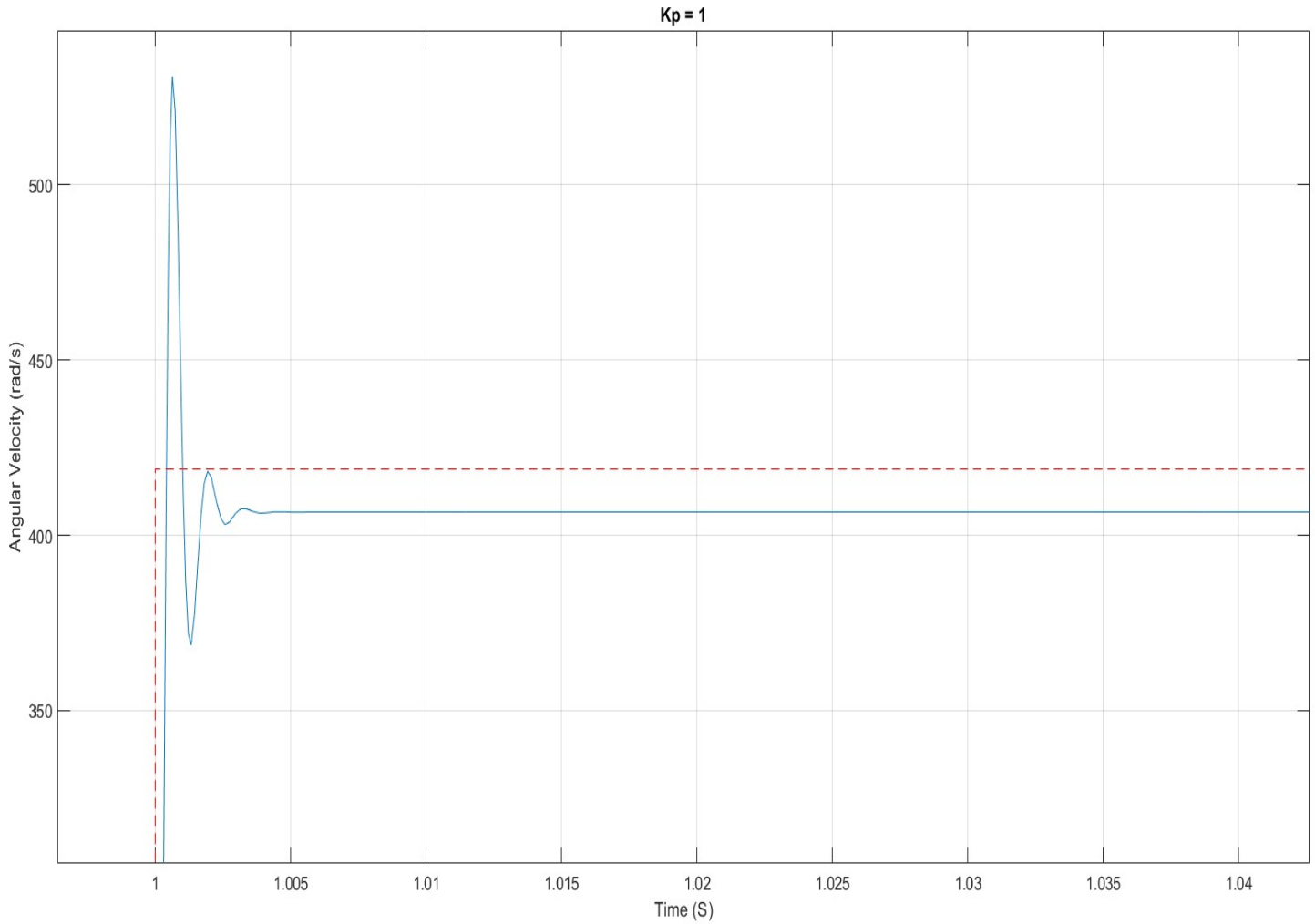
Mechatronics Assignment – Introduction to Simulink

Simulink model 2nd order system based on controlling the velocity of a motor

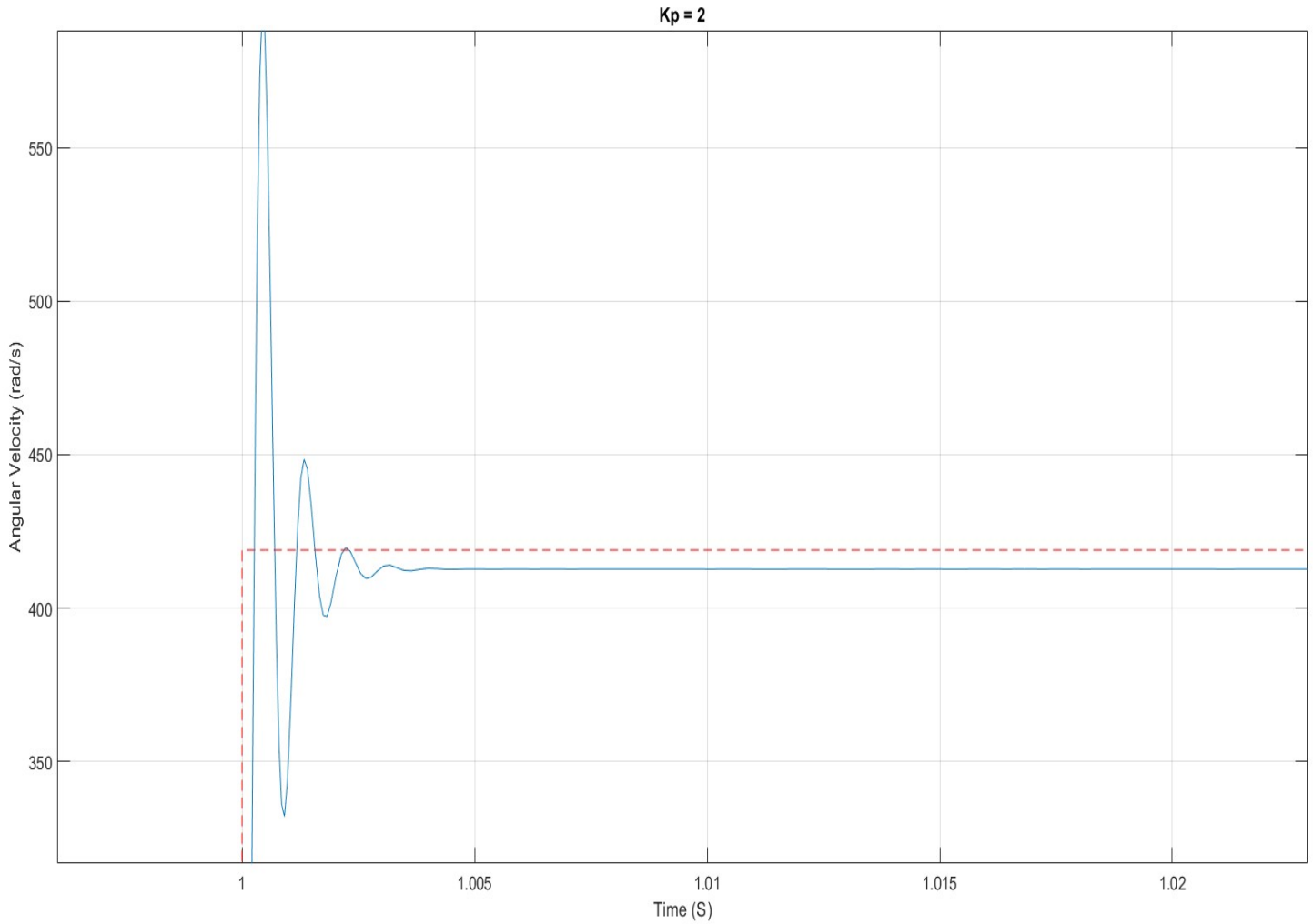
1. **Model with Step Response**



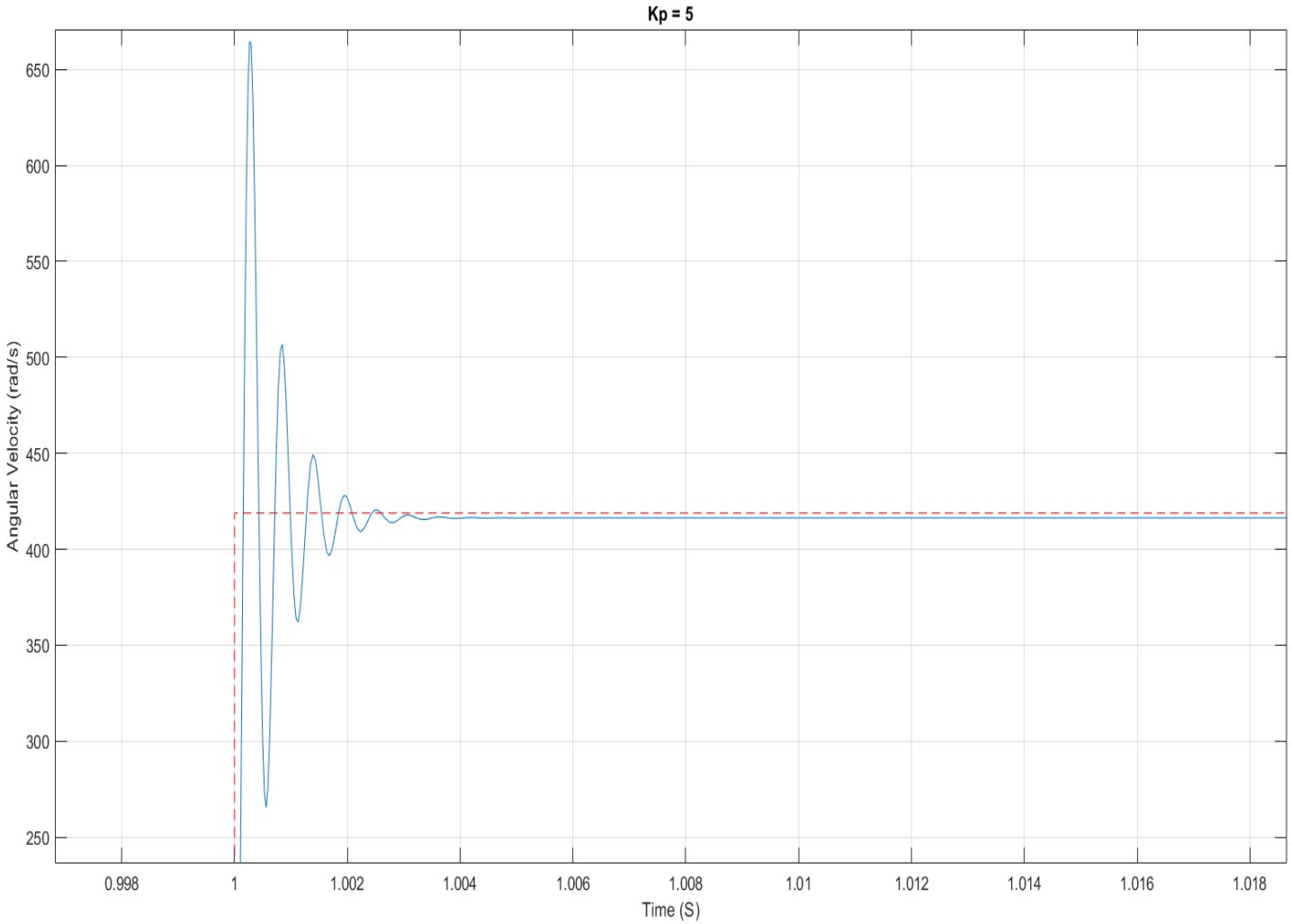
Kp = 1


Kp = 1
Angular Velocity (rad/s)
500
450
400
350
1
1.005
1.01
1.015
1.02
1.025
1.03
1.035
1.04
Time (S)

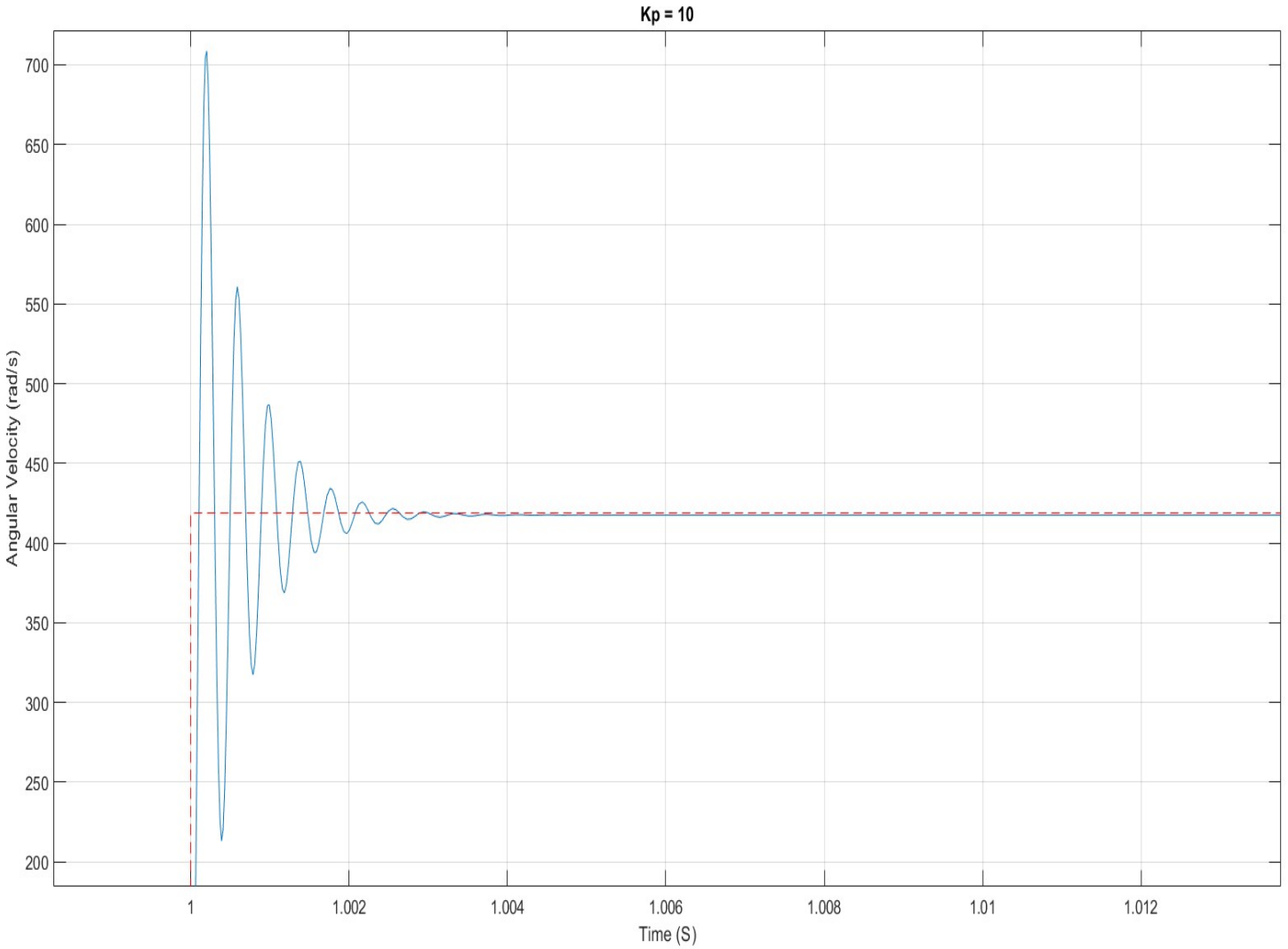
Kp = 2


Kp = 2
Angular Velocity (rad/s)
550
500
450
400
350
1
1.005
1.01
1.015
1.02
Time (S)

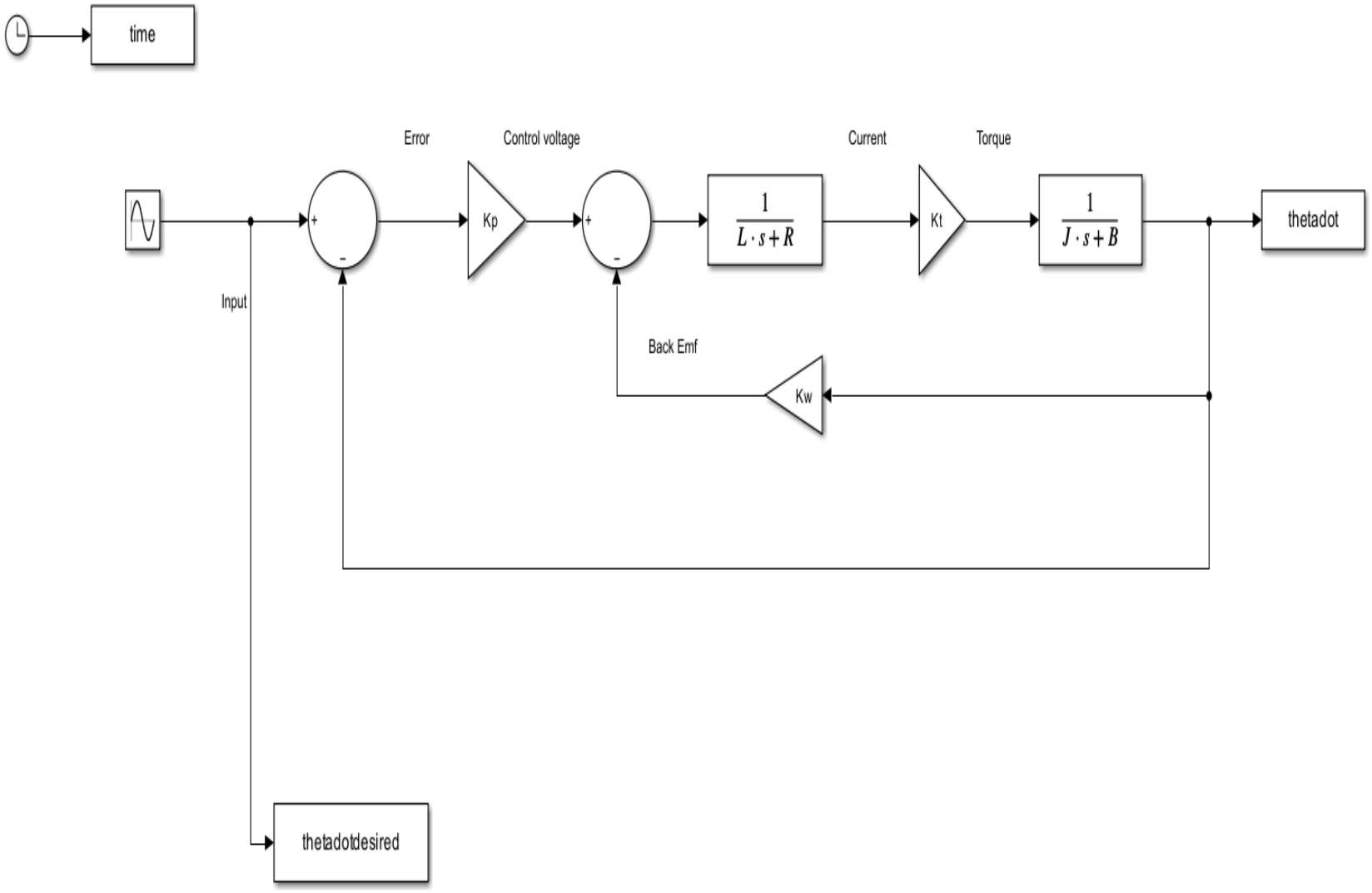
Kp = 5


Kp = 5
Angular Velocity (rad/s)
650
600
550
500
450
400
350
300
250
0.998
1
1.002
1.004
1.006
1.008
1.01
1.012
1.014
1.016
1.018
Time (S)

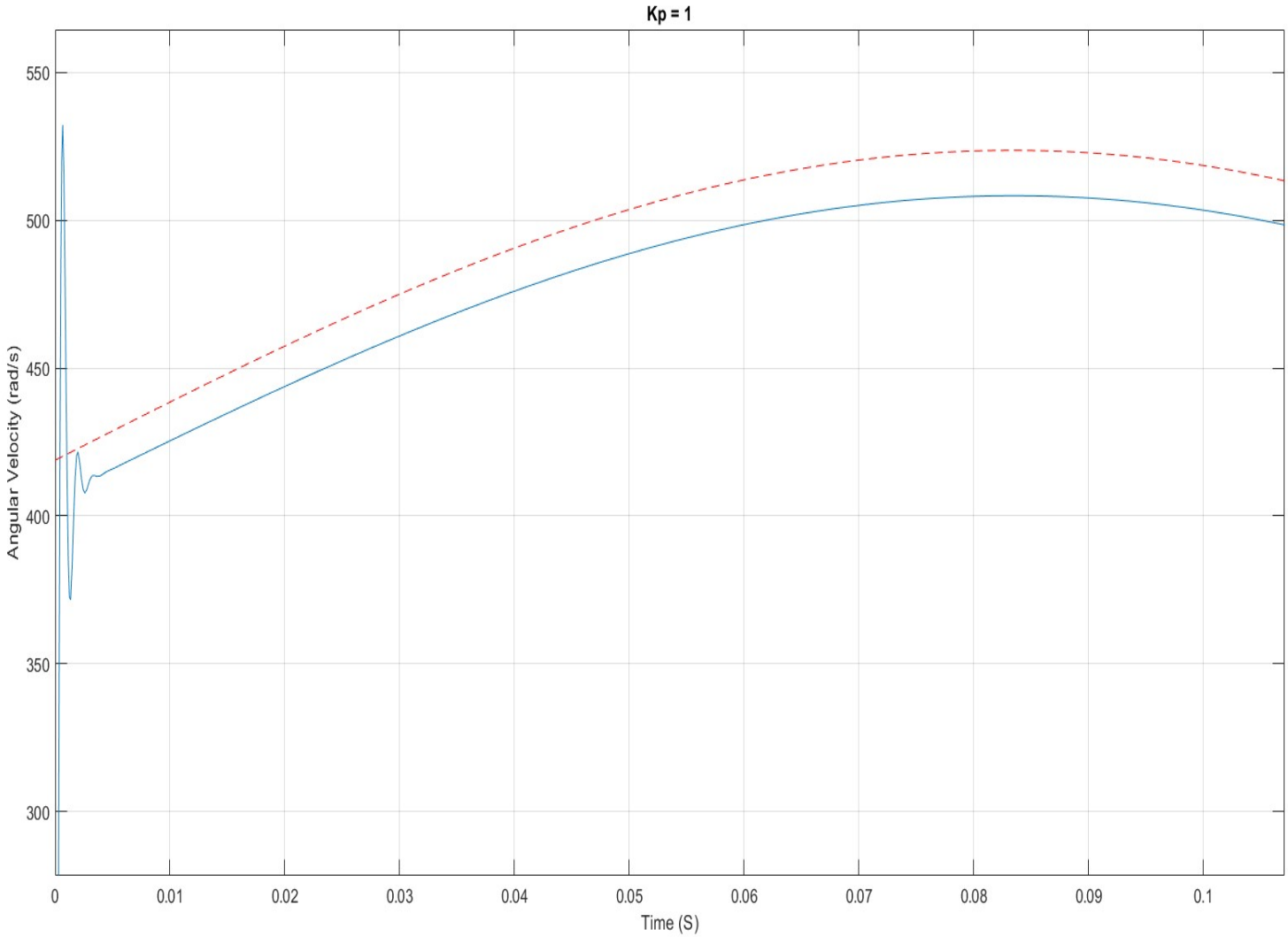
Kp = 10


Kp = 10
Angular Velocity (rad/s)
700
650
600
550
500
450
400
350
300
250
200
1
1.002
1.004
1.006
1.008
1.01
1.012
Time (S)

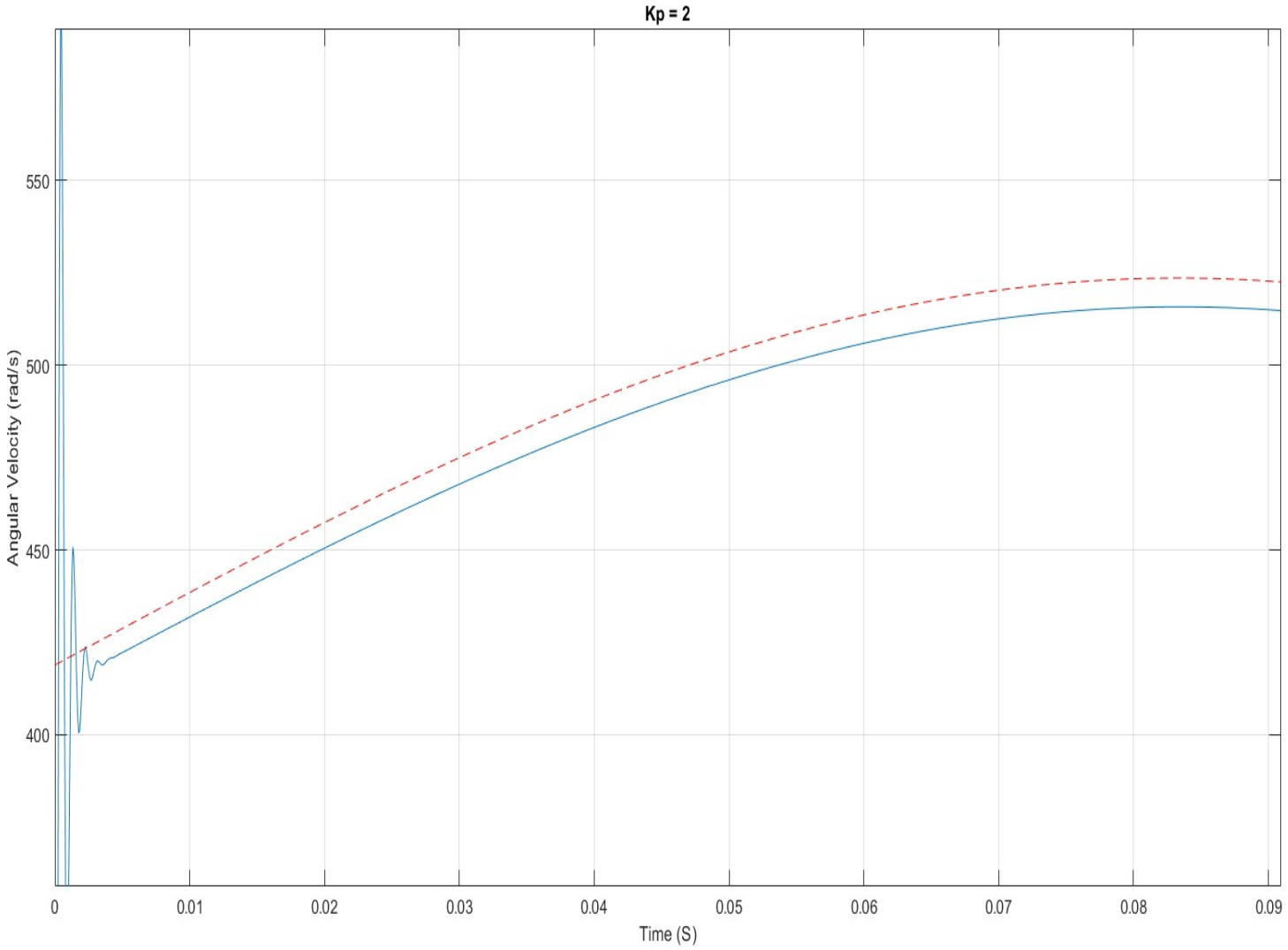
2. Model with Sinusoidal Response



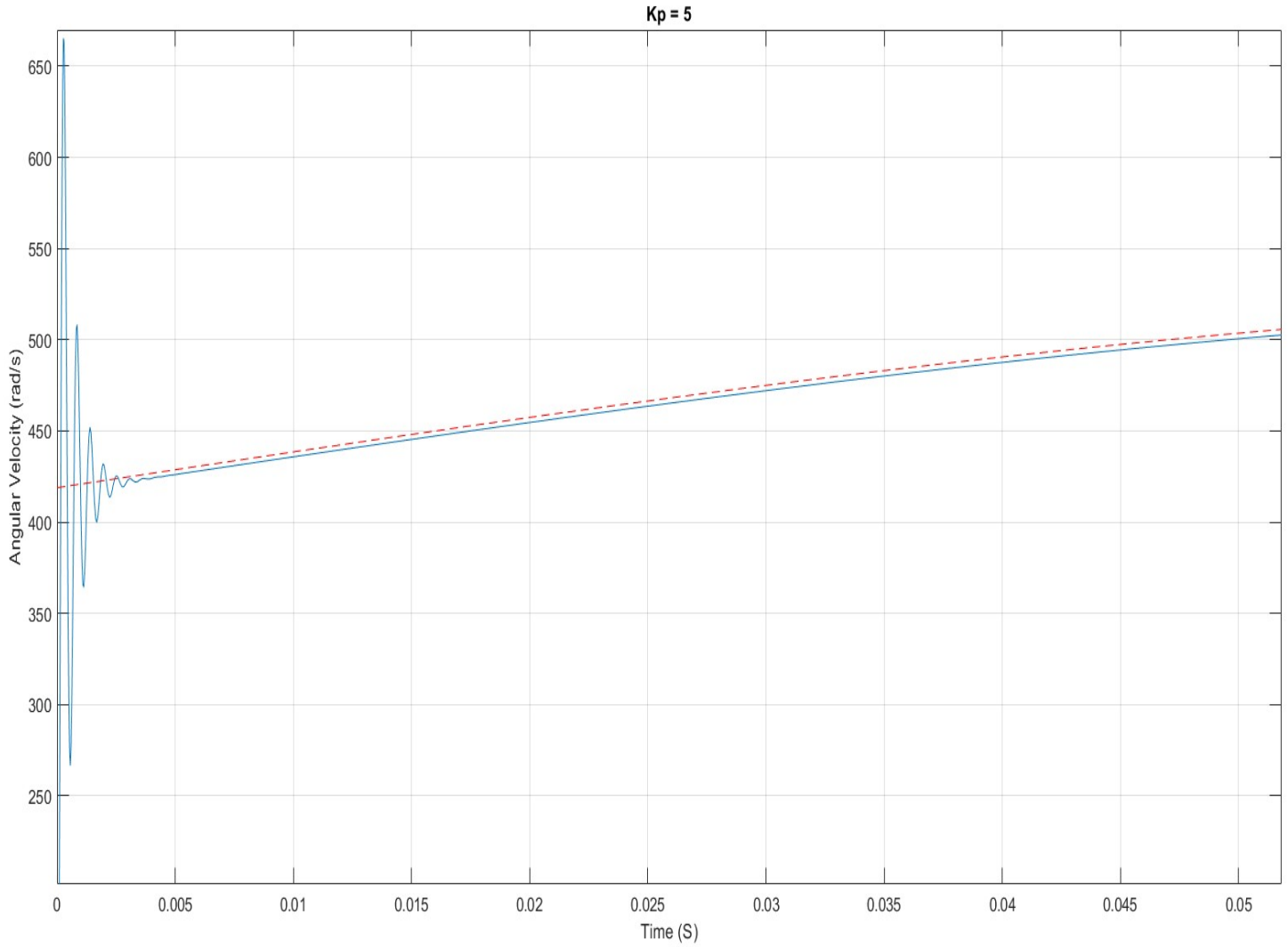
Kp = 1


Kp = 1
Angular Velocity (rad/s)
550
500
450
400
350
300
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
Time (S)

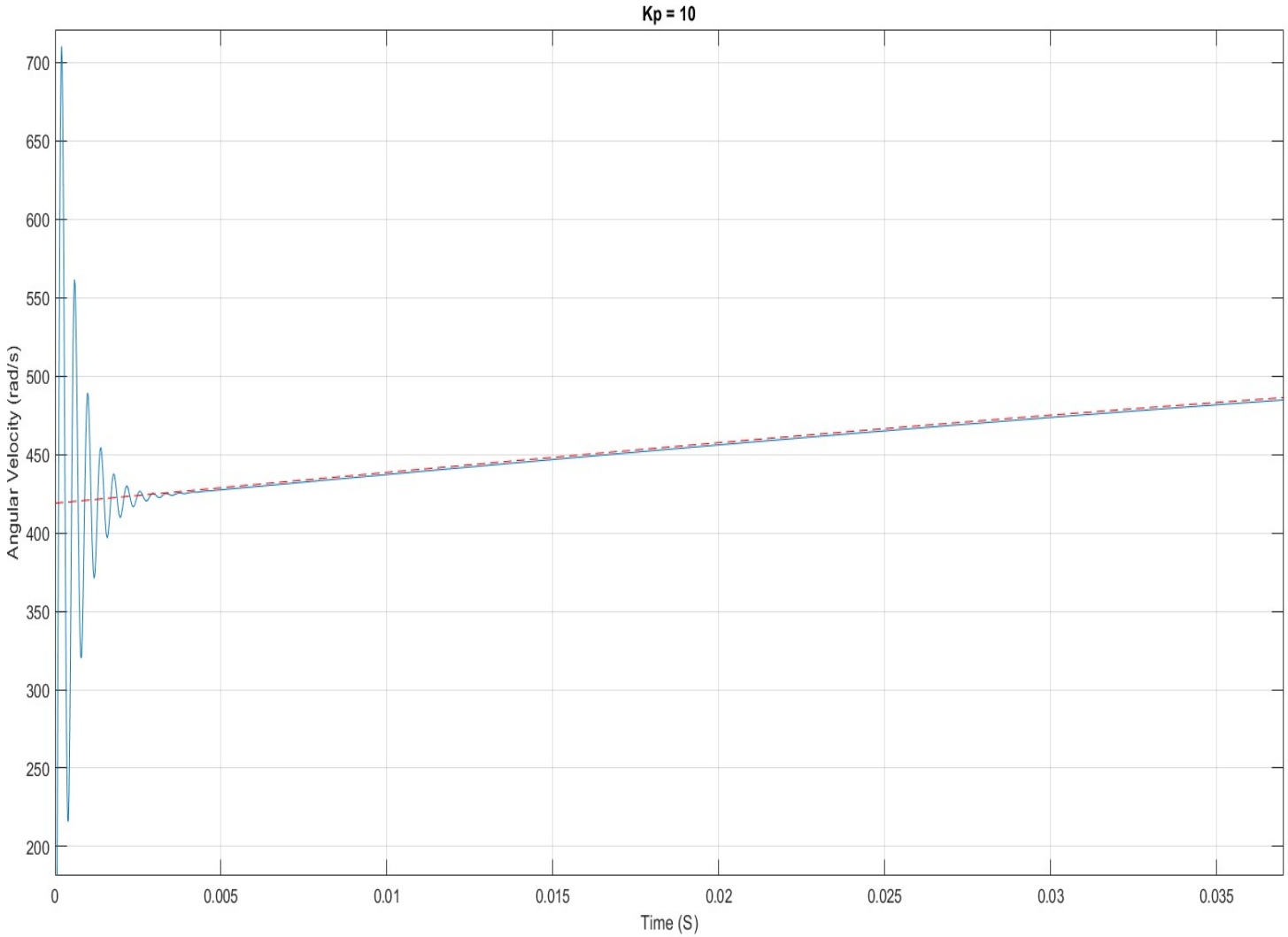
Kp = 2


Kp = 2
Angular Velocity (rad/s)
550
500
450
400
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
Time (S)

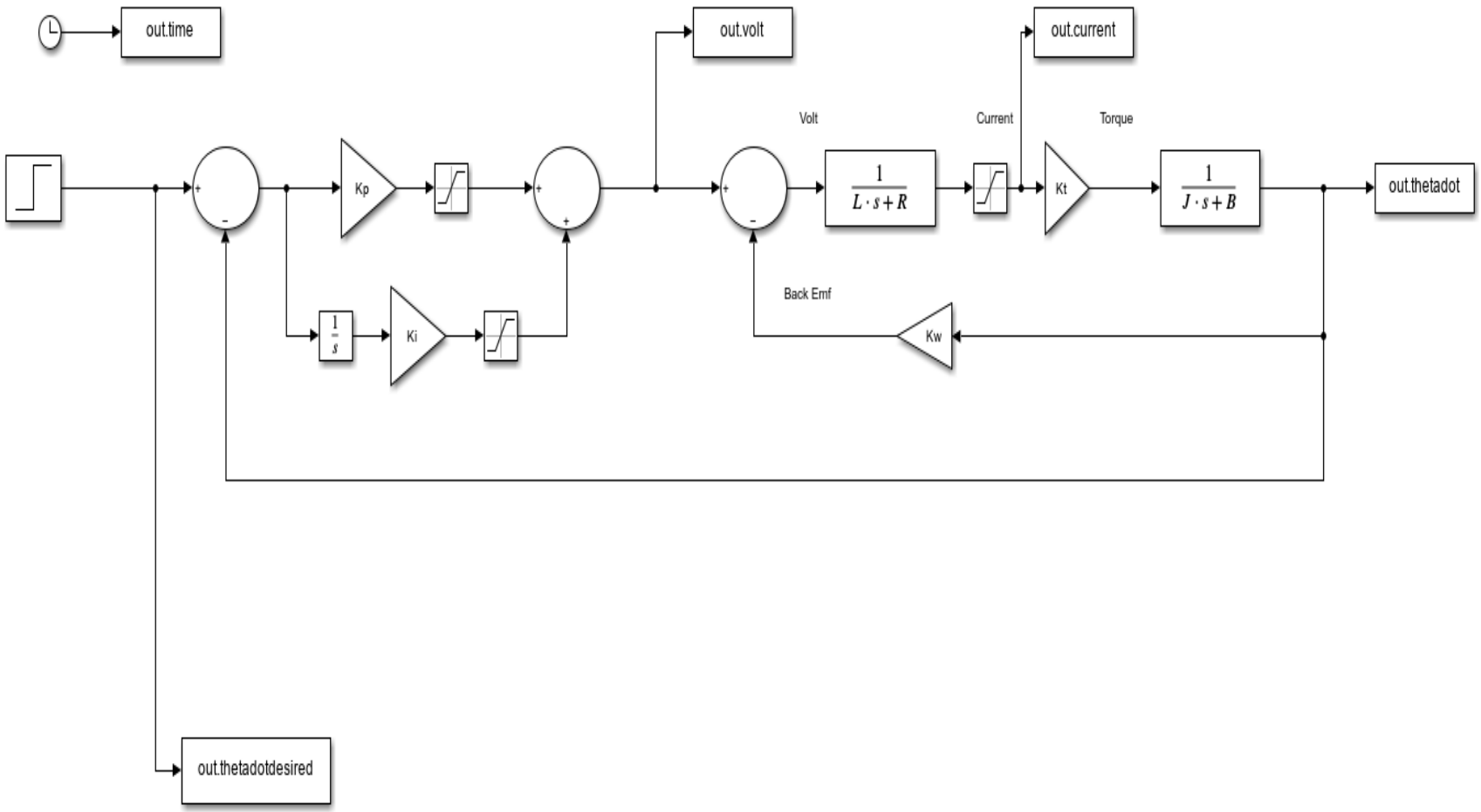
Kp = 5


Kp = 5
Angular Velocity (rad/s)
650
600
550
500
450
400
350
300
250
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
Time (S)

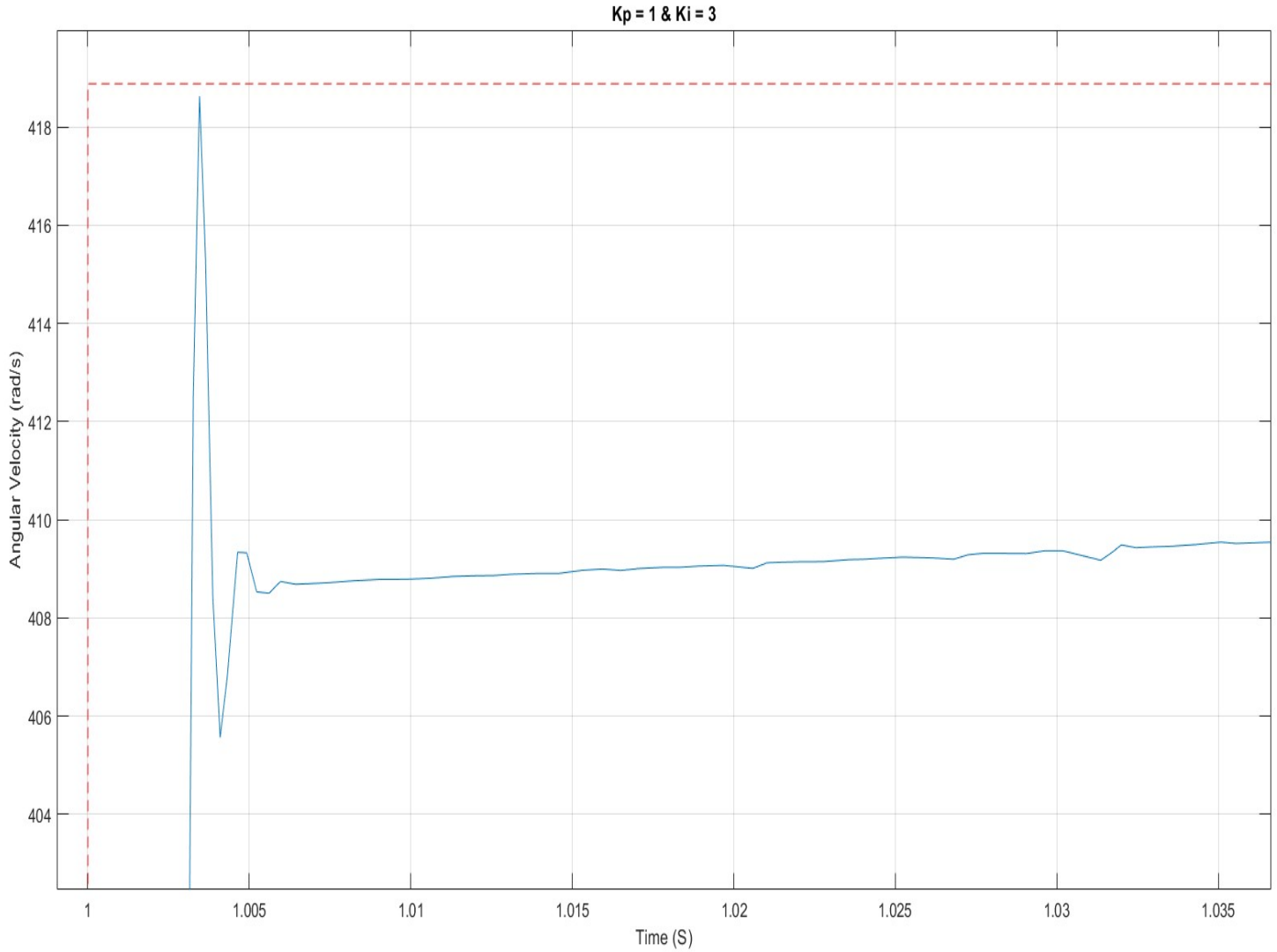
Kp = 10


Kp = 10
Angular Velocity (rad/s)
700
650
600
550
500
450
400
350
300
250
200
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
Time (S)

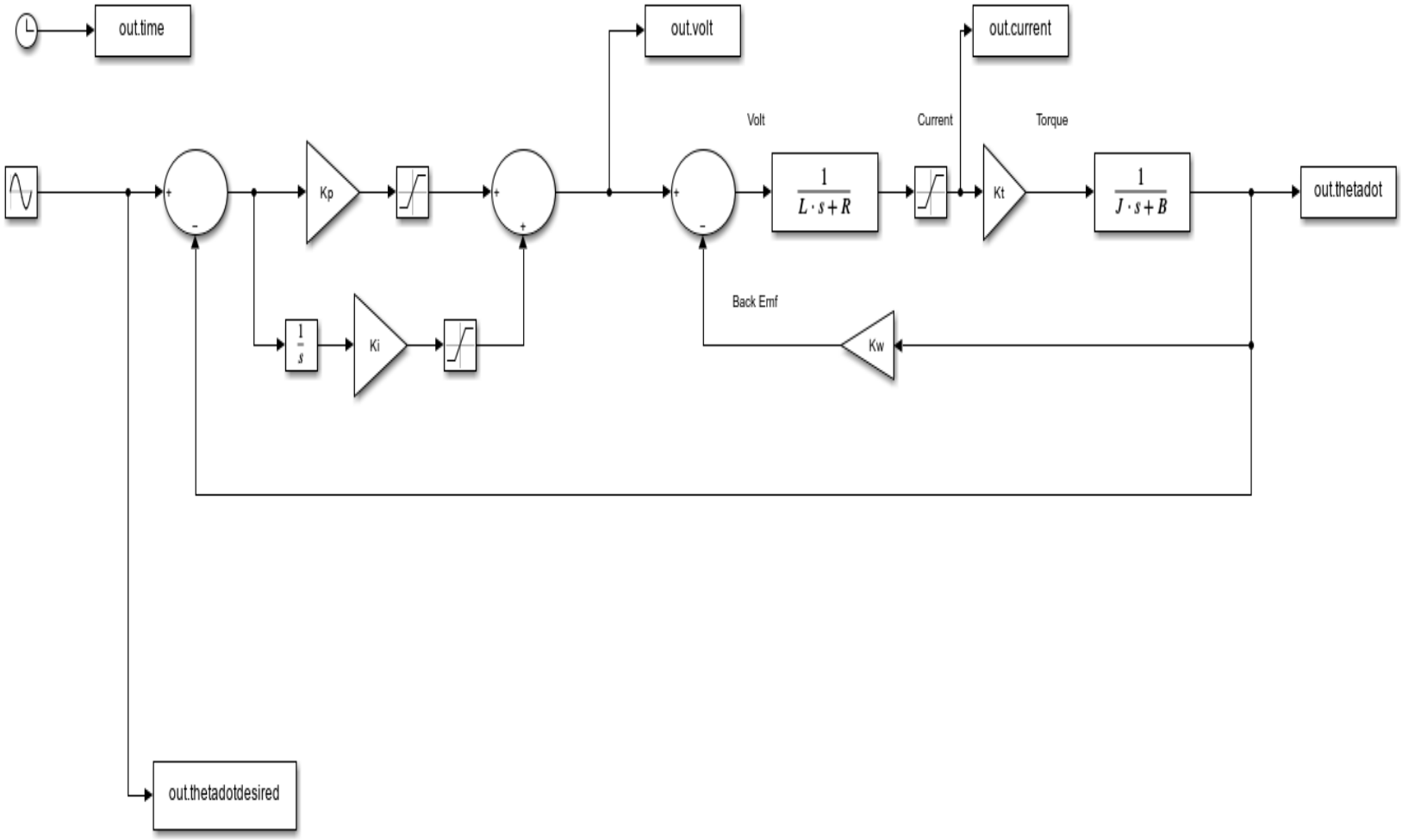
The model with both Kp and Ki and has no overshoot

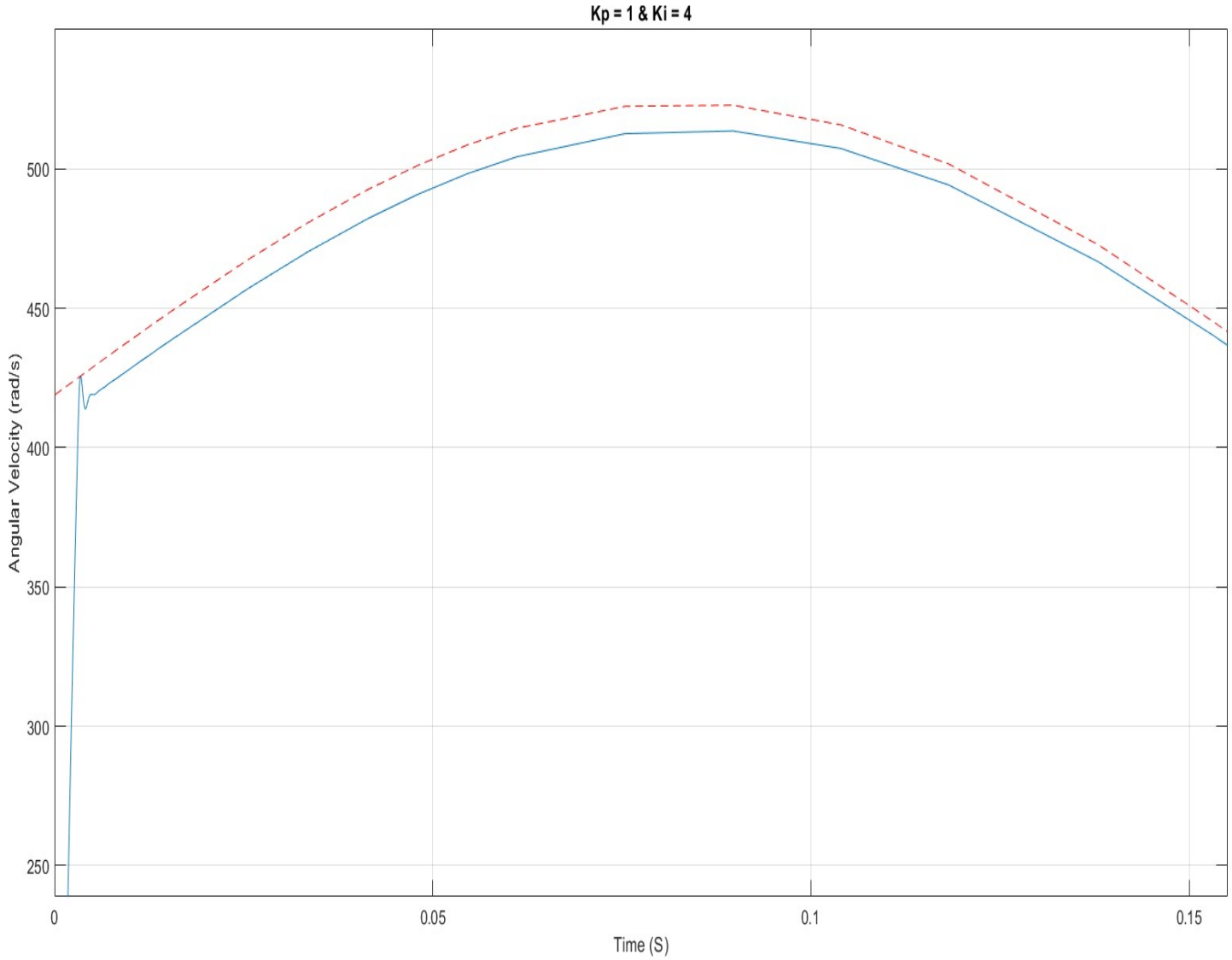


And the best **step response** for **Kp = 1** and **Ki = 3**



Best **sinusoidal response** for **Kp =1** and **Ki = 4**




Kp = 1 & Ki = 4
Angular Velocity (rad/s)
500
450
400
350
300
250
0
0.05
0.1
0.15
Time (S)