Problem 1)

<u>Problem 1</u>:

A linearized model of the relationship between a wind turbine's blade pitch and speed is given by the following plant transfer function:

$$G(s) = \frac{7200}{5s+1}$$

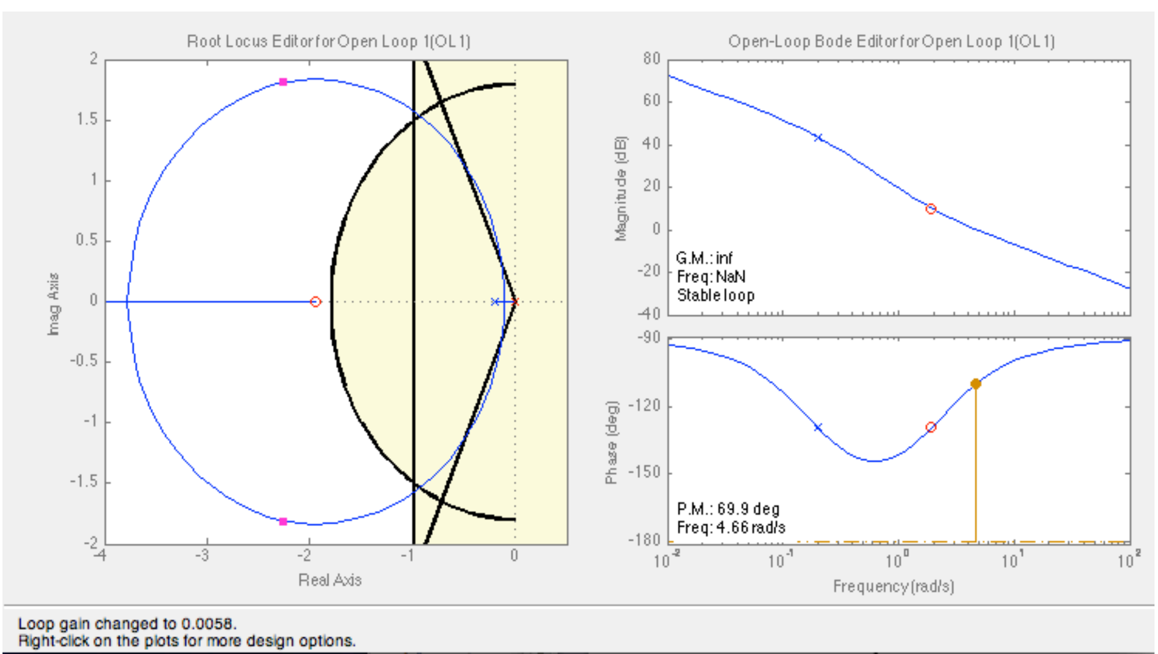
Using the Matlab SISO tool, design a PI controller, D(s), to control the speed of the turbine blades.

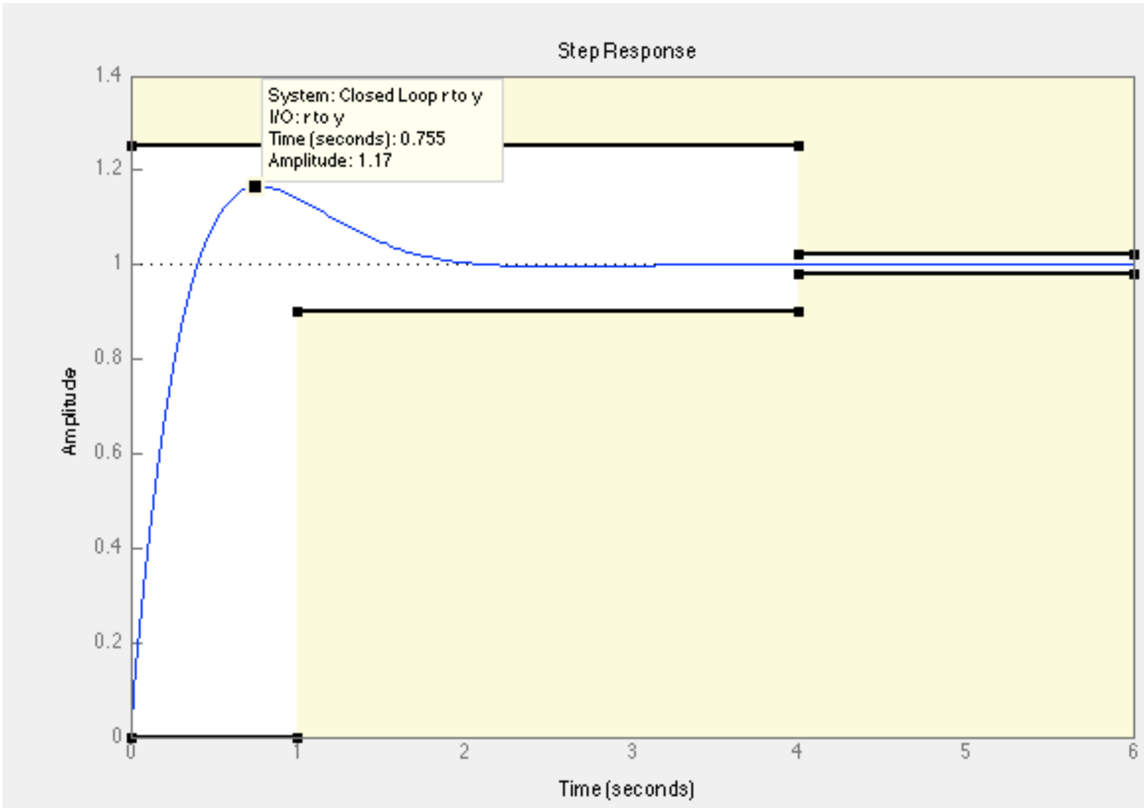
$$D(s) = K_P + \frac{K_I}{s} = K_P\left(\frac{s+\tau_C}{s}\right)$$

where $\tau_C = K_I/K_P$.

$$D(s) = .0058\left(\frac{s+1.94}{s}\right)$$

Kp=.0058, tc=1.94



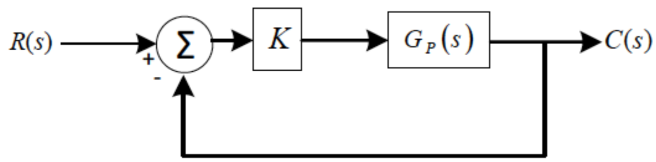


as can seen in the step plot above, the system meets all constraints

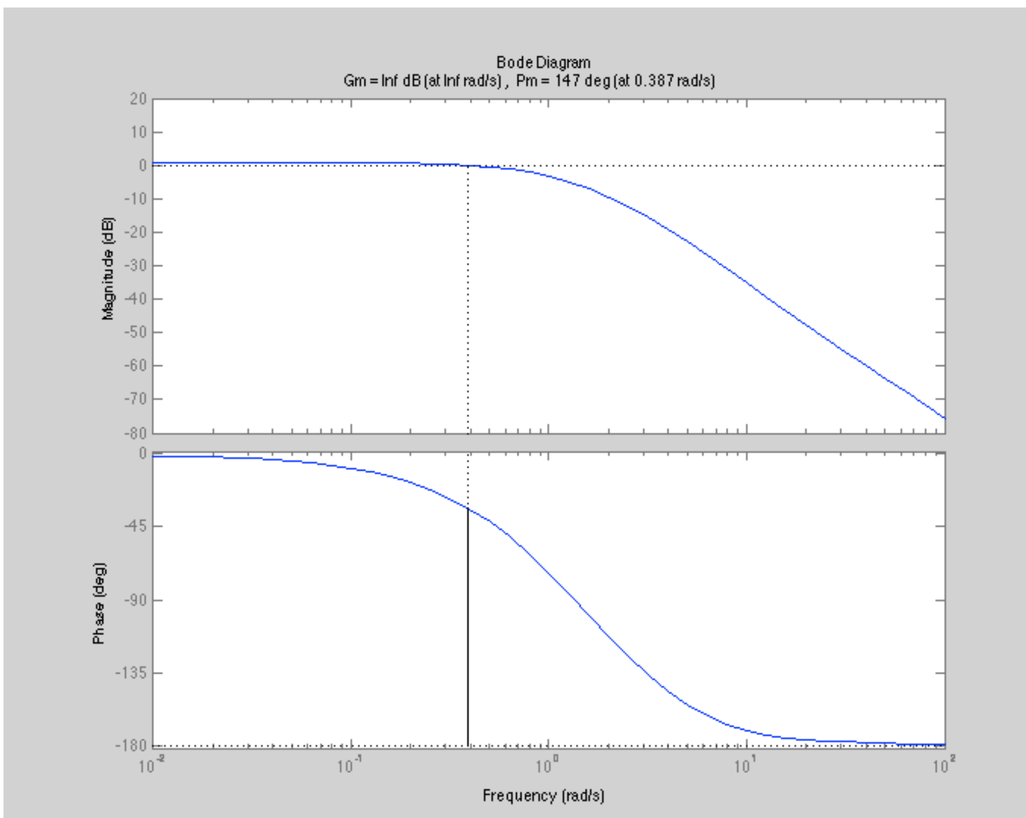
Mp=17%
tp=.755 seconds
tr=.323 seconds
ts=1.75 seconds
ess=0

Problem 2)

Problem 2:
For a system with plant $G_p(s)$ and K = 1.64, determine the gain crossover frequency, phase margin, plant Type i and the appropriate error coefficient, K_i.



$$G_P(s) = \frac{s+8}{(s+1)(s+2)(s+6)}$$




```
Phase Margin = 147 degrees

Gain Crossover Frequency
      wc= getGainCrossover(sys,1)
      wc=0.3874
```