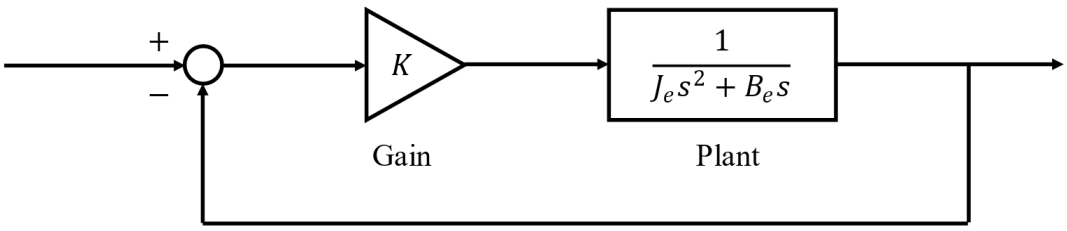
MECH 467 - Tutorial 7 - Root Locus

Given the following open loop system:



1) Find the transfer function of the closed loop system.

2) Find the natural frequency (ω_n) of the closed loop system with respect to the gain K.

3) Find the damping ratio (ζ) of the closed loop system with respect to the gain K.

4) On the s-plane, find the poles of the closed loop system with respect to the natural frequency ω_n and damping ratio ζ.

5) Varying ω_n, sketch the root locus of the system on the s-plane assuming ζ = 0.7.

6) Varying ζ, sketch the root locus of the system on the s-plane assuming ω_n = 300.

7) Assuming the physical system is fixed and stable, is it possible to make the closed loop system unstable while varying K? Prove this with root locus, considering $J_e = 7 \times 10^{-4}$ kg.m^2 and B_e = 0.006 Nms.