ME 5990
Machining Dynamics
Homework Assignment 3

Problem 1

Using the energy-based approach to generating stability limit diagrams, determine the stability limit (w_{lim}, limiting **width** of cut, in mm) at spindle speeds of 2500 rpm, 3000 rpm and 3500 rpm. The structure has a stiffness of $5 \cdot 10^5$ N/m, a damping ratio of 0.05, and a natural frequency of 50 Hz. The process gain is $K_{p_q} = -800$ N/mm^2. Show your work or the equations used if you use a spreadsheet, including the associated values of ω_c (converted to Hz), ϕ_c (converted to degrees) and ε_c (converted to degrees) for each speed. **Hint:** Watch your units.

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