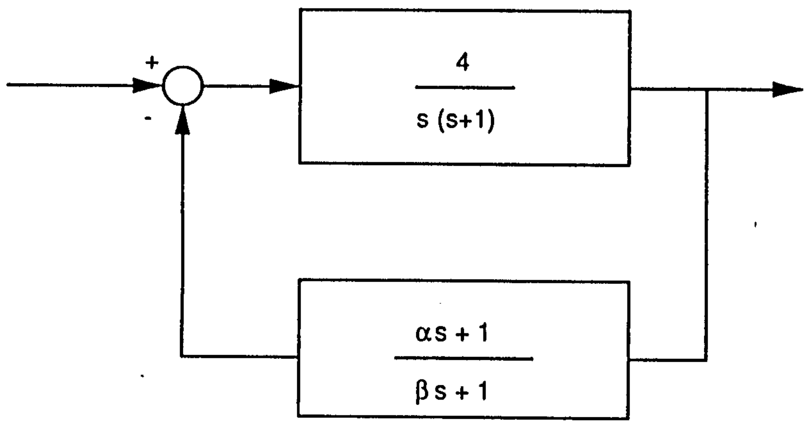
3. Design the feedback compensator $G_c(s)$ for the following feedback system. Design specifications: settling time ≤ 4 seconds, damping ratio ≥ 0.707. Use the root-locus method. (a) Draw the desired region for placing the closed-loop poles on the s-plane (10%) (b) Determine β based on the crossover frequency of the plane. Find α from the root loci(15%).



4. (a) How to use the Nyquist stability criterion to determine if all the closed-loop poles have a settling time $\leq t_s$ and damping ratio $\geq \zeta_0$? Draw the modified Nyquist path and restate the new criterion (10%) (b)Design a testing method to evaluate if all the closed-loop poles of a system are located to the left of $(-\sigma_o, \omega)$. Note in measuring the frequency response function of a system the sinusoidal testing signals with varying frequencies are employed. Give the wave form of your testing signal and explain why you use the signal. State the criterion (15%). $\sigma_o > 0$

083
1