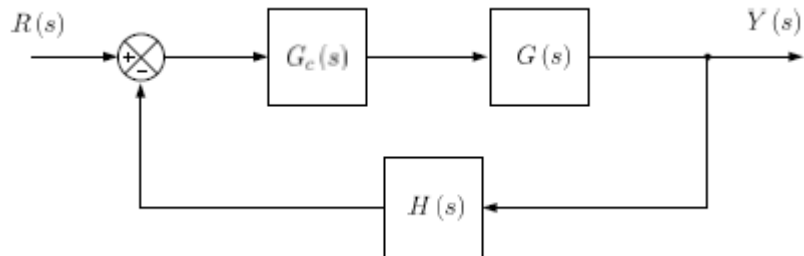# ECE317

Problem:

Consider a feedback system

where,

$$G(s) = \frac{G_o}{\left(1 + \frac{s}{\omega_1}\right)\left(1 + \frac{s}{\omega_2}\right)\left(1 + \frac{s}{\omega_3}\right)}$$

$$H(s) = k$$

where $G_o = 500$, $\omega_1 = 2\pi(10)$, $\omega_2 = 2\pi(100)$, $\omega_3 = 2\pi(300)$. and $k = 0.5$ and $G_c(s) = 1$.

Determine the loop gain of the system $T(s)$, and for this loop gain using asymptotic approximations only,

    i.   Sketch the three components of the Bode magnitude plots individually and subsequently obtain the total magnitude response. Annotate the plots.
    ii.   Sketch the three components of the Bode phase plots individually and subsequently obtain the total phase response. Annotate the plots.
    iii.   Using your results from (i) and (ii), sketch the Bode magnitude and phase plots in standard Bode plot form where the phase response is shown below the magnitude response. Label all break frequencies, slopes of sloping lines, gains of sloping lines and phase levels on zero slope lines.
    iv.   Using the plots from (iii), determine the phase margin and the associated crossover frequency.
    v.   Using the plots from (iii), determine the gain margin and the associated crossover frequency.
    vi.   Determine whether the closed loop system is stable.