EE422G Homework #7 (14 points)

Due March 1, 2007

1. (4 points) (Routh Array) Use Routh Array for the following problems:

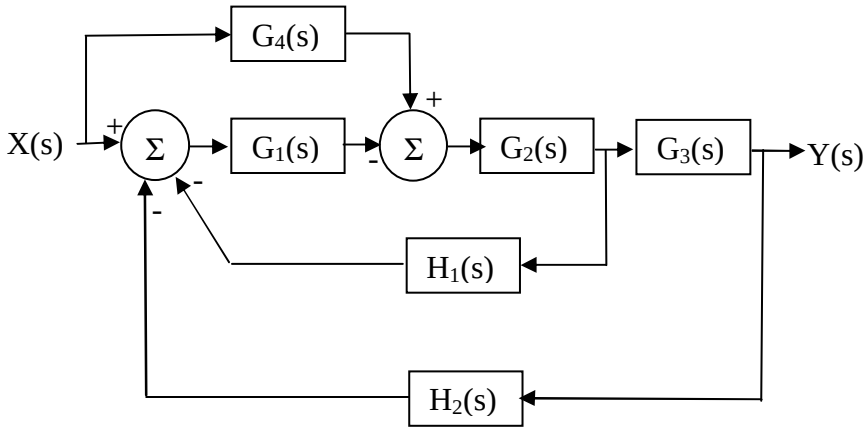
   (a) Does the following system has any poles on the open right half plane?

   $$H(s) = \frac{1}{s^4 + s^3 + 12s^2 + 12s + 36}$$

   (b) Show that a necessary condition for the following system is that -5 ≤ K ≤72.

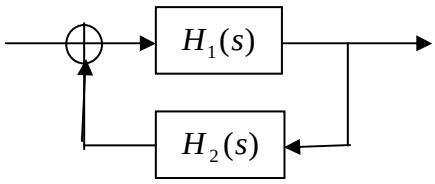
   $$H(s) = \frac{1}{s^3 + 7s^2 + 11s + 5 + K}$$

2. (2 points) Find the transfer function Y(s)/X(s)



3. (4 points) Feedback Systems

   a. Consider the negative feedback system below with $H_1(s) = \frac{-10}{s+1}$ and $H_2(s) = 2$. Check the stability of $H_1(s)$, $H_2(s)$ and the feedback system. Is it true that if all subsystems are stable, then the negative feedback system is also stable?



   b. Design the inverse systems for $H_1(s) = \frac{s+1}{s^2 + 2s + 5}$ and $H_1(s) = \frac{s-1}{s^2 + 2s + 5}$.

4. (4 points) The control of the spark ignition of an automotive engine requires constant performance over a wide range of parameters. The control system is shown in the following figure, with a controller gain K to be selected. The parameter p is equal to 2 for many autos but can equal zero for those with high performance. Select a gain K that will result in a stable system for both values of p. You can ignore the case when the poles may lie on the imaginary axis.