

Practice Problems II - 04

I. Transfer Functions - Stability

a) $H(s) = \frac{1}{s+1}$ $s = -1$ It is asymptotically stable or BIBO stable

b) $H(s) = \frac{1}{s-1}$ $s = 1$ It is BIBO unstable

c) $H(s) = \frac{1}{(s+1)(s-1)}$ $s = 1, -1$ Unstable

d) $H(s) = \frac{1}{s^2 + 3}$ It is unstable because the coefficient of s is 0.

e) $H(s) = \frac{1}{s^2 + 7s + 3}$ You can confirm with the Routh table but if a 2nd order polynomial has +ve coefficients, it is automatically stable.

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

It is stable

s_4	1	7	0
s_3	1	3	0
s_2	4	0	0
s_1	3	0	0
s_0	0	0	0

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

It is unstable

s_5	1	1	3
s_4	1	2	0
s_3	-1	3	0
s_2	5	0	0
s_1	3	0	0
s_0	0	0	0

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

It is unstable as coefficient of s^2 is 0

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

It is unstable as coefficient of s^3 is negative

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

It is unstable because the constant is 0 which means there is a pole at $s = 0$