Routh Hurwitz theory

FTMF → Dominador → estabilidade
[P(s)] Routh Hurwitz.

Number of sign changes equal the number of Roots with positive Real parts.

Special case 1:

- If a first-column term in any row is zero, but the remaining terms are not zeros or there is no remaining term
  → the zero term is replaced by a very small positive number ϵ.

Special case 1.1:

- If case 1 and the sign of the coefficient above ϵ its the same as that below it indicates that there are a pair of imaginary roots. Is in the limit of stability.

Special case 2:

- If all the coefficientes in any defined row are zero, it indicates that there are roots of equal magnitude lying radially opposite in the s plane.
- two real roots with equal magnitude and opposite signs and/or two conjugate imaginary roots

special case 2 continue: a line of forces:

- Derive previous line and use its coeficients has replacement.

critério Routh-Hurwitz

stability - any bounded input produces a bounded output.

$W(s) = \frac{N(s)}{D(s)}$ Is stable if all the roots of $D(s)$ have negative real parts.

Routh-Hurwitz criterion - tells us if a given polynomial has roots with positive or non-negative real parts.

Pré-conditions:

- Write the polynomial in s in the following form:

$$D(s) = a_n s^n + a_{n-1} \cdot s^{n-1} + \dots \; a_1 s + a_0$$

- All the coefficientes must be positive necessary but not sufficient to assure stability.
- Arrange the coefficients of the polynomial in Rows and columns according to the following pattern.

n	a_n	a_{n-2}	a_{n-4}	...
$n-1$	a_{n-1}	a_{n-3}	a_{n-5}	
$n-2$	b_{n-1}	b_{n-3}	b_{n-5}	
$n-3$	c_{n-1}	c_{n-3}	c_{n-5}	
...	...	...	...	
0				

- Evaluate the Rows until we run out of elements: the coefficientes b_{n-1}, b_{n-3}, etc are evaluated as follows:

$$\boxed{b_{n-1} = \frac{a_{n-1} \cdot a_{n-2} - a_n \cdot a_{n-3}}{a_{n-1}}}$$

theory

critério Routh-Hurwitz

Routh-Hurwitz criterion states: the number of roots in polynomial $D(s)$ with positive real parts is equal to the number of changes in sign of the coefficients of the first column of the Array.

the necessary and sufficient condition that all roots of $D(s)$ lie in the left-half s plane is that all the coefficients of $D(s)$ be positive and all terms in the first column of the array have positive signs.