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EEE 441

(1) Root locus is a graphical representation of the closed loop poles as a system parameter is varied. The root locus also gives a graphical representation of a system stability; before Presenting root locus.
The root locus technique can be used to analyse and design the effect of a loop gain upon systemic trancient response and stability. The closed loop transfer function for system with a gain K is

$$T(s) = \frac{K G(s)}{1 + K G(s) H(s)}$$

From this equation, a pole exists when the characteristic polynomial in the denominator becomes zero or

$$K G(s) H(s) = -1 = K(2K+1)\ 180°$$

where $K = 0, \pm 1, \pm 2, \pm 3, \pm 4 \ldots$

when -1 represented in polar form as ~~180~~ $K(2K+1)\ 180°$. Alternatively, a value of S is a closed loop pole of $|KG(s)H(s)|$ and

$$\angle KG(s)H(s) = (2K+1)\ 180°$$

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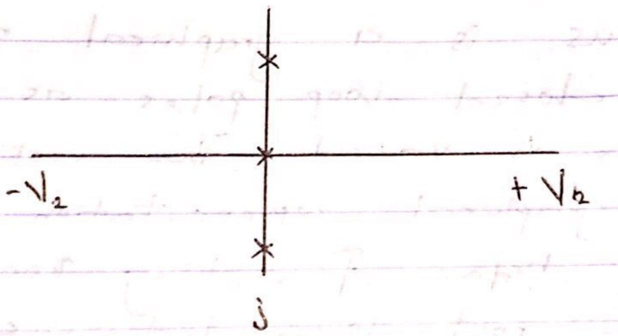
(2) The use of Routh ~~table~~ Hurwitz to find Stability of a closed loop system when entire row is zero on the routh hurwitz table to determine poles of the $j\omega$ axis.



This is the indication of roots on the imaginary axis. This means or makes the system limitedly or marginally stable.

Consider the characteric Equ. below:

$$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$$

s^6	1	8	20	16
s^5	$2/2 = 1$	$12/2 = 6$	$16/2 = 8$	
s^4	$2/2 = 1$	$12/2 = 6$	$16/2 = 8$	
s^3	0	0	0	

Therefore, Application of Auxiliary Equation

S^4 = even

Therefore = $s^4 + 6s^2 + 8s = 0$

to get s^3

$$\frac{dA}{ds} = \frac{d}{ds}\{s^4 + 6s^2 + 8\}$$

$S^3 = 4s^3 + 12s + 0$

$S^3 = 4s^3 + 12s$

S^6	1	8	20	16
S^5	1	6	8	
S^4	1	6	8	
S^3	$4/4=1$	$12/4=3$		
S^2	3	8		
S^1	0.33	0		
S^0	8			

No sign changes, which means NO positive poles,

Due to the entire row of Zero's means there are roots lying on the $j\omega$ axis

This means that the system is marginally stable or has limited stability.